Attachment D: The Lower Hunter Water Security Plan

Our water storages deplete quickly during drought

While the Lower Hunter's existing water supply system performs well in average climate conditions, it is vulnerable to drought due to its small storages, high natural losses (e.g. evaporation) and reliance on rainfall.

In 2019-20, the Lower Hunter experienced one of its most serious droughts on record. Water storage levels dropped to 52 per cent, the lowest level in 40 years. During the worst drought on record in 1979-81, storages fell from 96 per cent to 31 per cent in just 17 months, an average of almost 4 per cent per month. Historical storage levels in the Lower Hunter are shown in Figure 1.

Figure 1: Historical water storage levels in the Lower Hunter

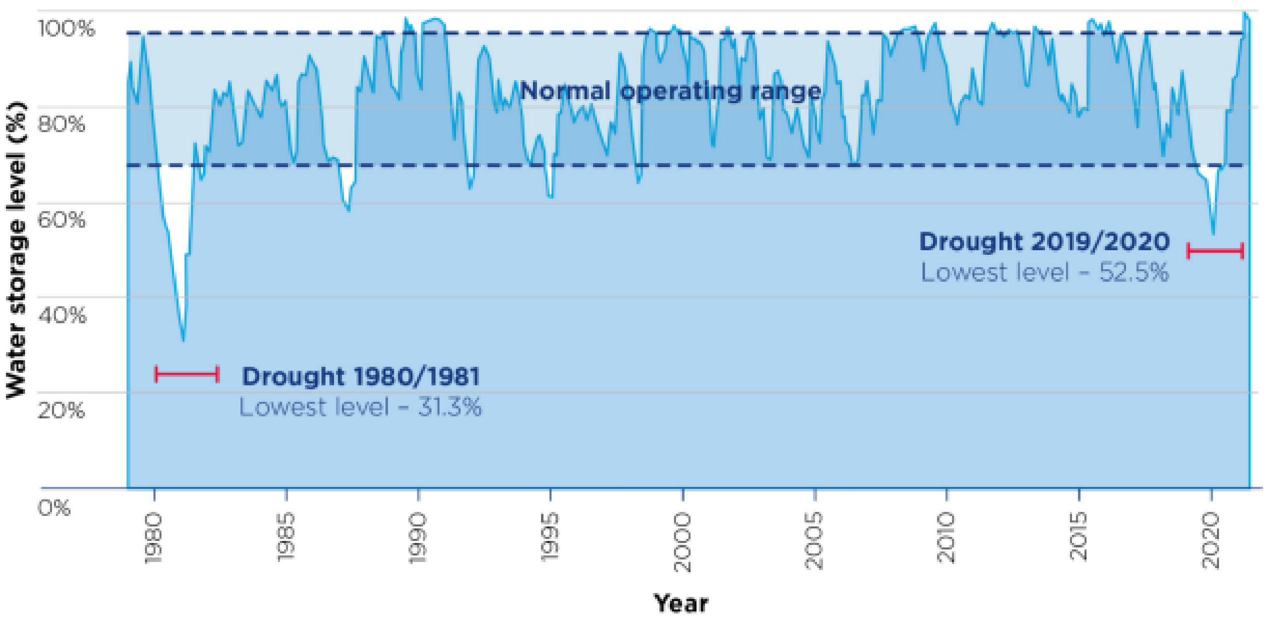
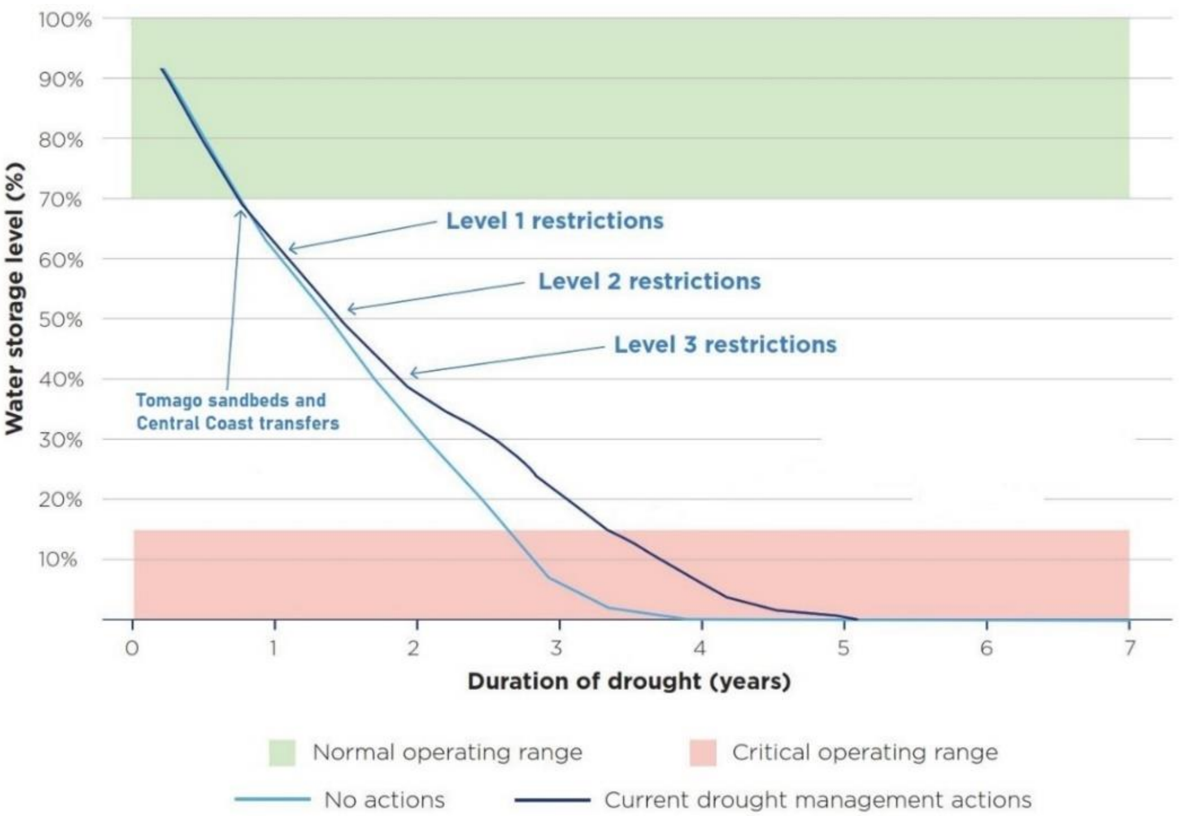


Figure 2 shows the modelled performance of our system during a severe drought, represented by a repeating sequence of the 1979-81 drought. Water storage levels can fall from typical operating levels to critically low levels in around three years in a severe drought, even with a range of drought response measures in place to slow the rate of depletion including transferring water from the Central Coast region, operating the Tomago Sandbeds water source, and implementing staged water restrictions.

Hunter Water has some of the most severe water restrictions policy in Australia, with Stage 3, triggered at a storage level of 40 per cent, seeing the banning of all outdoor use.

The rate of depletion of our system is steep compared to many other Australia cities - our storages can drop quickly during hot, dry conditions. But they can also recover quickly with significant rainfall. For comparison, a similar reduction for Sydney's water supplies would take four to five years.

Figure 2: Possible drought depletion curve for the Lower Hunter



While unlikely, running out of water would have catastrophic consequences

If a severe drought was to continue beyond three years, the water supply system could fail, and the Lower Hunter could run out of drinking water.

While the likelihood of our system running out is low, the consequences would be severe for our region and the NSW economy. The water supply system would effectively be switched off and our community rationed to a daily water allowance collected from designated water-fill stations. This scenario is equivalent to a 'Day Zero' scenario experienced by Cape Town in South Africa in 2018. Our wastewater collection system would struggle due to extremely low flows causing odour and septicity issues, with potentially severe public health consequences. Many industries would be shut down, with severe economic losses – heavy losses would be realised even before we ran out of water. The LHWSP estimated economic losses of our region running out of water to be about $6 billion per year.

A more variable climate makes it hard to know how long a drought may last

We have around 100 years of climatic records which is a relatively small window of data in the scheme of things. We now know more about our region's long-term historic climate records, known as palaeoclimate. Through tree rings and ice cores, we know there have been longer and drier droughts over the past 1,000 years, some lasting many decades, across eastern Australia. We also know our climate is changing – it is shifting and experiencing greater variability and extremes.

Our system is becoming more vulnerable with climate change, with longer and more severe droughts expected to occur more regularly. It also means that we have low confidence in our ability to predict the likelihood of running out of water – with only 100 years of observed data, and a changing climate, we just can't know with the level of certainty needed to tell our community and stakeholders during a drought that "everything will be ok".

Our system relies solely on rainfall, and leaves no time to respond reactively

There are two ways to prevent a water system from running out:

- having such a large amount of reliable storage that no foreseeable drought could ever lead to the water storages emptying.
- Implementing climate-independent water supplies to meet customer demand after, or as, natural storages are depleting.

The Lower Hunter is the only major urban city in Australia without a climate independent supply of water. We don't have large storages, so a severe drought can take us out relatively quickly – by the time we know we are in a drought we only have a few years to deliver climate independent sources to meet customer demand.

A key insight gained from development of the LHWSP was the community's expectation for a minimum 'enduring' supply regardless of the severity of a drought. Based on limiting their water use around the home during a severe drought (noting outside use is already banned), our community told us the minimum supply they were prepared to accept was 100 litres per person, per day.[1]

This level of minimum achievable demand is estimated to be approximately 120 megalitres (ML) per day for the entire supply system, growing over time with population growth.[2]

Although not strictly rainfall-independent, our current bulk water system is considered able to supply about 30 ML per day of enduring supply, associated with ongoing flows from the Chichester catchment. There is a large shortfall – 90 ML per day – between this current enduring supply, and what our community considers to be a realistic level of water use when our storages have emptied.

We estimate our sustainable supply based on an acceptable risk of reaching a critical point in our drought plan

The response of the community and stakeholders in the most recent drought, when our storages reduced to 52 per cent, and our engagement through the LHWSP, cemented that it's not acceptable for a region the size of ours to run out of water. We must have a credible plan to protect the economic prosperity and essential public health of the region in a drought.

There are three risk thresholds that define the level of services we use to define our sustainable system yield. These were developed and agreed with stakeholders and underpin the LHWSP:

- Water restrictions should not be imposed more than 1 in 10 years
- Water restrictions (at any level) should not be imposed more than 5 per cent of the time
- The annual risk of reaching the 36-month point in the drought plan should not exceed 2 per cent in any year.

The third criteria is important. It recognises that a sustainable and resilient system requires having time to respond in a drought. The 36-month point approximates how much time is required to deliver a climate-independent source of water (e.g. a desalination plant).

Based on a repeat of the 1980-81 drought sequence, and ambitious assumptions about how quickly a desalination plant could be delivered in an emergency response scenario (three years), we would need to trigger this action at a total storage level of about 85 per cent to have the plant operational before we potentially reach critical water storage levels. This effectively means we would need to be reactively responding during 'normal' conditions, rather than during a prolonged drought.

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[1] For comparison, the best performing regions in NSW during the last drought reduced demand (under the highest restriction level) to ~115 litres per person, per day.

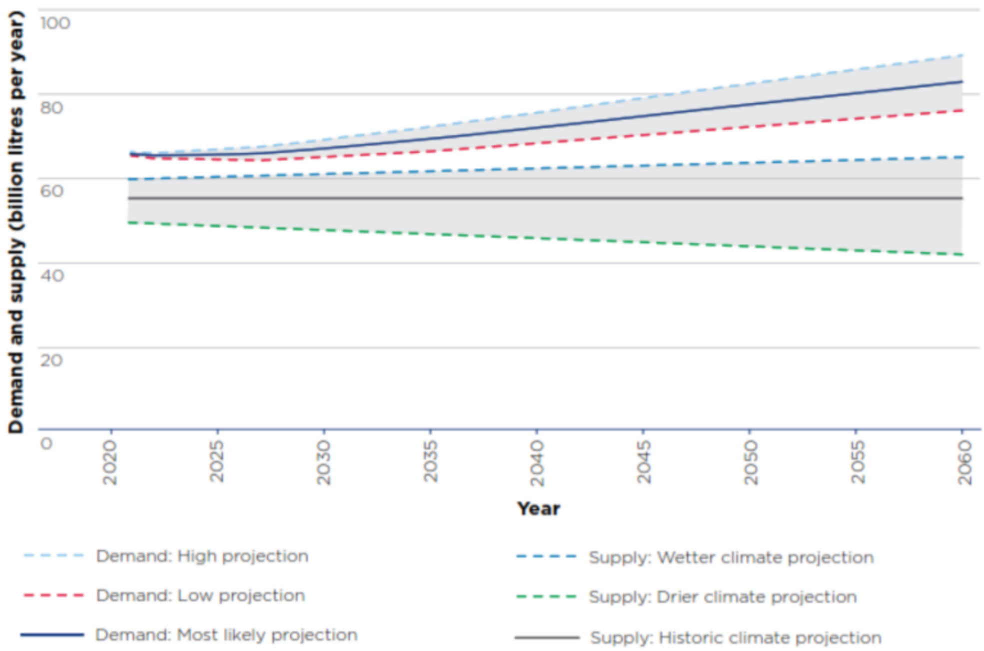
[2] Adjusting for water losses and restricted non-residential water use.

There is a shortfall - demand exceeds sustainable supply

In average climatic conditions, Hunter Water supplies or uses about 68 GL per year of drinking water. Despite increasing adoption of water conservation measures, our total water demand is expected to grow due to population growth. The residential population in the Lower Hunter has grown at a rate of around 1 per cent per year over the last 25 years and is forecast to continue growing at a similar rate.

The current supply system has a sustainable yield of around 55 GL per year. The average water demand exceeds yield by approximately 13 GL per year. Figure 3 shows the supply-demand shortfall as presented in the LHWSP. Upper and lower forecasts are shown for both yield and demand.

Figure 3: Shortfall between sustainable supply and water demand (2022 LHWSP)



The LHWSP is a whole-of-government plan informed by extensive community and stakeholder engagement

Released in April 2022, the LHWSP is a whole-of-government plan informed by our community's values and preferences. It considers a variable and changing climate, the expected growth of the region, and a range of demand and supply options.[1] The plan is referenced in the NSW Government's Statement of Expectations and was approved by the NSW Government Cabinet.[2]

An extensive engagement program to understand community views, values and preferences informed decision-making for the LHWSP. Across four phases of engagement (2019 to 2021), we used a wide range of communications and engagement tools and techniques to involve our community in the plan. Figure 4 provides an overview of the engagement.

The LHWSP identifies four priorities: safe drinking water, making the most of what we've got, improving the resilience of the system, and water for life. It sets out a diverse program of actions across these priorities that will ensure we have a sustainable and resilient water supply into the future.

[1] https://www.hunterwater.com.au/our-water/water-supply/water-in-the-lower-hunter/lower-hunter-water-security-plan

[2] Further details, including a copy of the LHWSP are available on our website: https://www.hunterwater.com.au/our-water/water-supply/water-in-the-lower-hunter/lower-hunter-water-security-plan

Figure 4: Engagement for the Lower Hunter Water Security Plan

The LHWSP aims to improve water security by reducing drinking water use and increasing supply via new water sources

The LHWSP was underpinned by extensive hydrological, economic and financial analysis to compare different ‘portfolios of actions’ and identify a preferred portfolio. The portfolios were evaluated using cost-benefit analysis, supported by a qualitative/quantitative non-monetary assessment and community insights. The analysis considered the balance and interplay between up-front and drought response investment, varying levels of service, and many different combinations of supply and demand interventions.

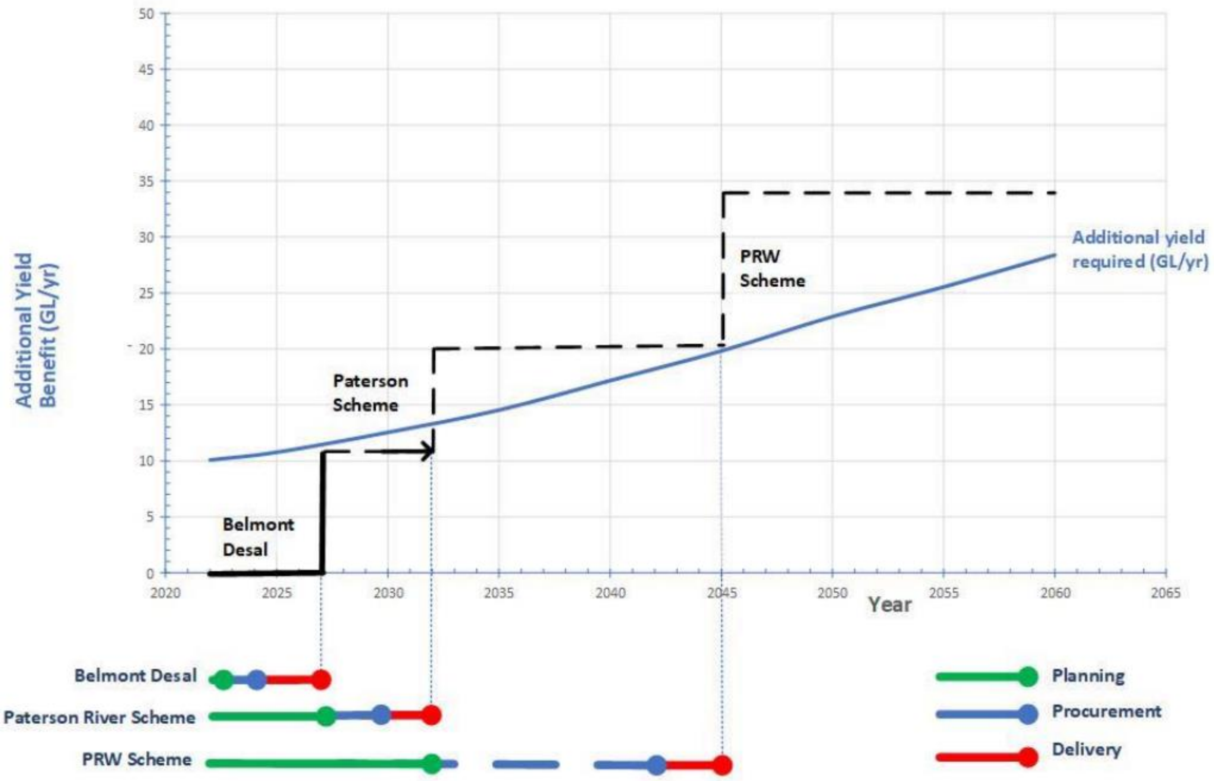
The extensive and consultative LHWSP governance process resulted in a preferred portfolio of actions to address the current supply-demand deficit and increase enduring supply:

- Increased investment in water efficiency, leakage reduction, and (non-drinking) recycled water programs. The LHWSP set ambitious targets across these areas.
- Delivering the 30 ML per day desalination plant at Belmont as a permanent supply augmentation rather than as a drought response.[1]
- Progressing a business case for a new connection to the Upper Hunter in the form of an offtake scheme drawing from the Paterson River (Paterson River Connection project).
- Exploring purified recycled water for drinking (PRW) as a future water supply option when required.
- A drought management plan including delivery of a separate drought-response desalination plant, if triggered in a severe drought, to meet the community’s enduring supply requirements. Delivery of this plant would be enabled by up-front readiness activities to reduce lead times and delay commencing construction as far into a drought as possible.

Figure 5 shows the required timing of supply augmentations in the LHWSP. The Belmont desalination plant adds 11GL to our sustainable yield, just about bridging the existing supply-demand deficit. Subsequent augmentations (Paterson River Connection and PRW) are necessary to address projected population growth and balance demand and supply over the 40-year horizon of the plan.

[1] Identified in the 2014 Lower Hunter Water Plan and adapted through subsequent NSW Government consideration, a desalination plant at Belmont was Hunter Water’s key planned drought-response action prior to development of the LHWSP.

Figure 5: Supply augmentations identified in the Lower Hunter Water Security Plan



Our community has reduced their water use in recent years

We recognise that conserving water is critically important to improving water security, Water conservation programs received the most support of all actions proposed as part of the LHWSP.

To reduce the amount of leakage from our water distribution system we have been surveying our network manually each year looking for leaks while transforming to reduce leakage through a combination of digital monitoring and pressure reduction.

We have also been working with the community to encourage them to use less water. This has been occurring through a combination of water conservation messaging, efficiency programs, and supporting commercial customers who use large quantities of water to both detect hidden leaks and use water more efficiently. Our community is using 8% less water now than what they were in 2016, due in part to these initiatives.

Belmont desalination plant - the time to act is now

We can't rely on rain alone anymore. The Belmont desalination plant will help secure our region's water supply for generations to come as we face increasing climate variability and change. It will:

- Reduce our reliance on rainfall, meeting around 15% of today's average demand for water and increasing our enduring supply to 60 ML per day. Note: this only achieves half of the community's required ~120ML/day of enduring supply.
- Reduce the chance we run out of water. The desalination plant reduces our risk of triggering drought response emergency actions from almost certain (97 per cent over a five-year period) to 2 per cent in any given year.[1]
- Crucially, provide us more time to respond in a drought by slowing our rate of depletion.

In addition to these water security/drought benefits, the Belmont desalination improves the resilience of our water supply system. We rely heavily on the Grahamstown Dam and water treatment plant to supply customers during peak demand conditions. Belmont desalination diversifies our supply and adds resilience against known water quality risks at Grahamstown Dam, including potential algal bloom events.

The ability to quickly increase water supplied from Belmont will also add resilience to our water supply network, providing an additional supply point in the case of a major asset failure in our distribution system.

Given the extent of supply shortfall and pace our system depletes, demand management and recycling remain important, but are not enough to protect us against drought.

We are futureproofing this investment by making the site resilient to climate change, and ensuring the capacity of the plant can be expanded later – either as a response to drought, or to increase supply as our community grows.

Belmont desalination plant has been investigated for over a decade – desalination was first identified as a temporary drought-response in the 2014 Lower Hunter Water Plan. A business case was recently completed for the plant as a permanent drought-response action.

The LHWSP demonstrated that an up-front supply augmentation is essential – our system doesn't provide the luxury of time to respond by building large infrastructure reactively in a drought sequence.

Implementation of Belmont desalination as an up-front supply augmentation has been underway since release of the LHWSP in 2022. Since the LHWSP was developed, construction costs for all infrastructure, including desalination, have increased substantially.

We revised the economic analysis to reflect these updated costs and other new information. This confirmed that Belmont remains the preferred supply option. A revised Detailed Business Case (DBC) was prepared in late 2023 and assured by Infrastructure NSW (INSW) through the 'Health Check' process, and then submitted to the NSW Government. In June 2024, the NSW Government provided in principle approval for the delivery and funding of the Belmont desalination plant. The Department of Planning, Housing and Infrastructure granted planning approval in September 2024.

Design and delivery of Belmont Desalination is well progressed. Preliminary design has been completed and the contract for design and construction has been awarded to John Holland. Detail design is being finalised. Construction will commence in late 2024. Construction, completion, and commissioning will occur in 2027 with first water scheduled for 2028. A two-year performance testing and optimisation period will follow, before moving into normal operational modes in 2030.

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[1] Note: This is based on normal maximum storage levels at Grahamstown Dam. With reduced storage levels to address dam safety issues (described in the following section), the likelihood is much higher.

Lower levels at Grahamstown Dam further highlights the importance of delivering Belmont desalination

A recently completed risk assessment has identified several dam safety risks at Grahamstown Dam, some of which are above the legislated safety threshold. To protect the community, Huner Water is required to take action to reduce the risks so far as is reasonably practical.

A key risk is the potential for an earthquake to cause the main dam wall on the Raymond Terrace side of the dam to fail and release water in an uncontrolled manner to lower-lying areas downstream. The likelihood of this occurring is approximately 1 in 3,500 or 0.03 per cent per year.

Dam upgrades are complex, and will take some time to be scoped, planned, approved and delivered. In chapter 4 and chapter 9, we explain what this could mean for future expenditure and customer bill impacts.

To combat potential flooding if an earthquake did occur, reducing the community safety risk in the short-term, we lowered the maximum water level in Grahamstown Dam to the equivalent of 82 per cent of the dam's capacity, reducing our overall system capacity to 88 per cent.

This change exacerbates our existing supply-demand shortfall, increasing the likelihood of entering water restrictions and potentially running out of water. With the lowered maximum storage levels at Grahamstown, triggering of Belmont Desalination Plant as a drought response becomes almost certain, supporting the decision to deliver now.

Optimally evaluating, designing and delivering dam upgrades takes time, and we may be operating with lowered water storage capacity for the next several years. During this period, our water supply will be less secure, providing further impetus for us to add additional water supply capacity and diversify our water sources.