THE CARLSBAD Desalination Project

Enhancing Water Reliability for San Diego County

The Carlsbad Desalination Plant is capable of delivering more than 50 million gallons of fresh, desalinated drinking water per day–enough to serve approximately 400,000 people in San Diego County. Commercial operations began in late 2015, providing the region with a reliable and locally controlled water source.

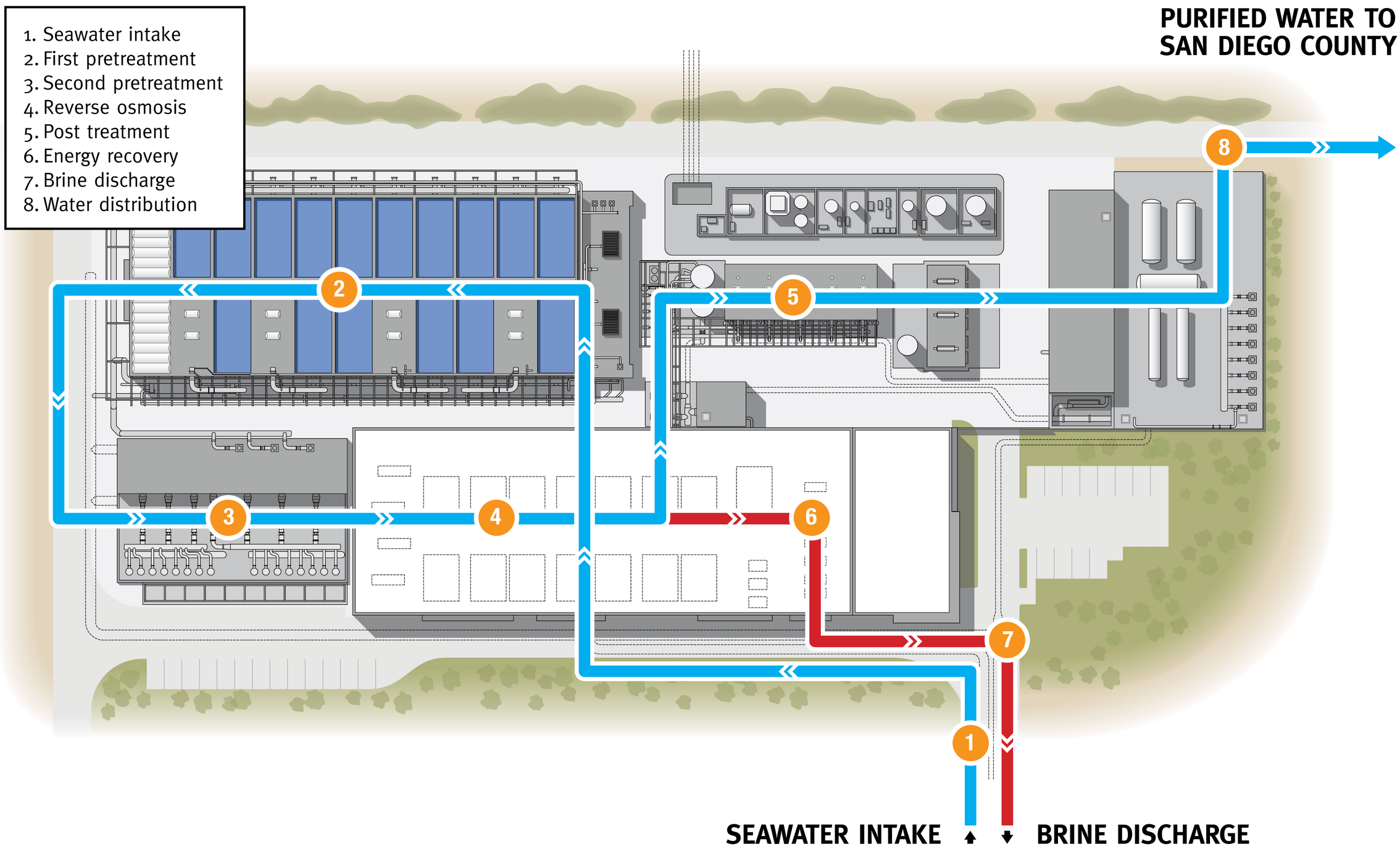
Produces

50 MILLION GALLONS of water per day

Serving

400,000 people in San Diego County

The Desalination Plant and Process Locations



Welcome and Overview

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San Diego County Water Authority

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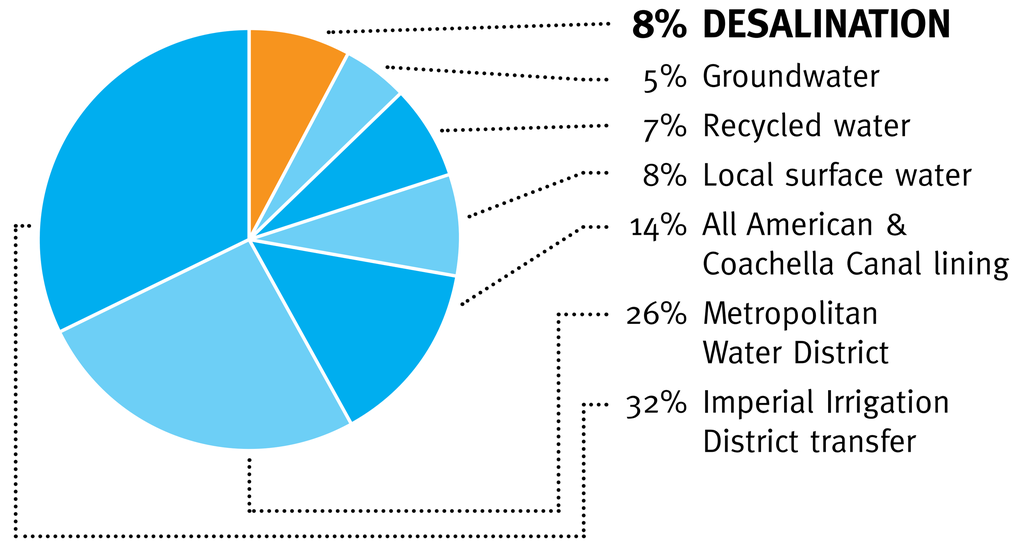
The Plant's Role in San Diego County

This semiarid region has limited local water resources, with relatively small aquifers and no major rivers. In recent decades, San Diego County has imported more than 80 percent of its water from Northern California and the Colorado River.

The Carlsbad Desalination Project is an important component of the San Diego County Water Authority's long-term strategy to improve the region's water supply reliability by diversifying its supply sources. This strategy has allowed the region to reduce its dependence on imported water sources that are vulnerable to droughts, natural disasters and regulatory restrictions. The plant accounts for about one-third of all water generated in the county.

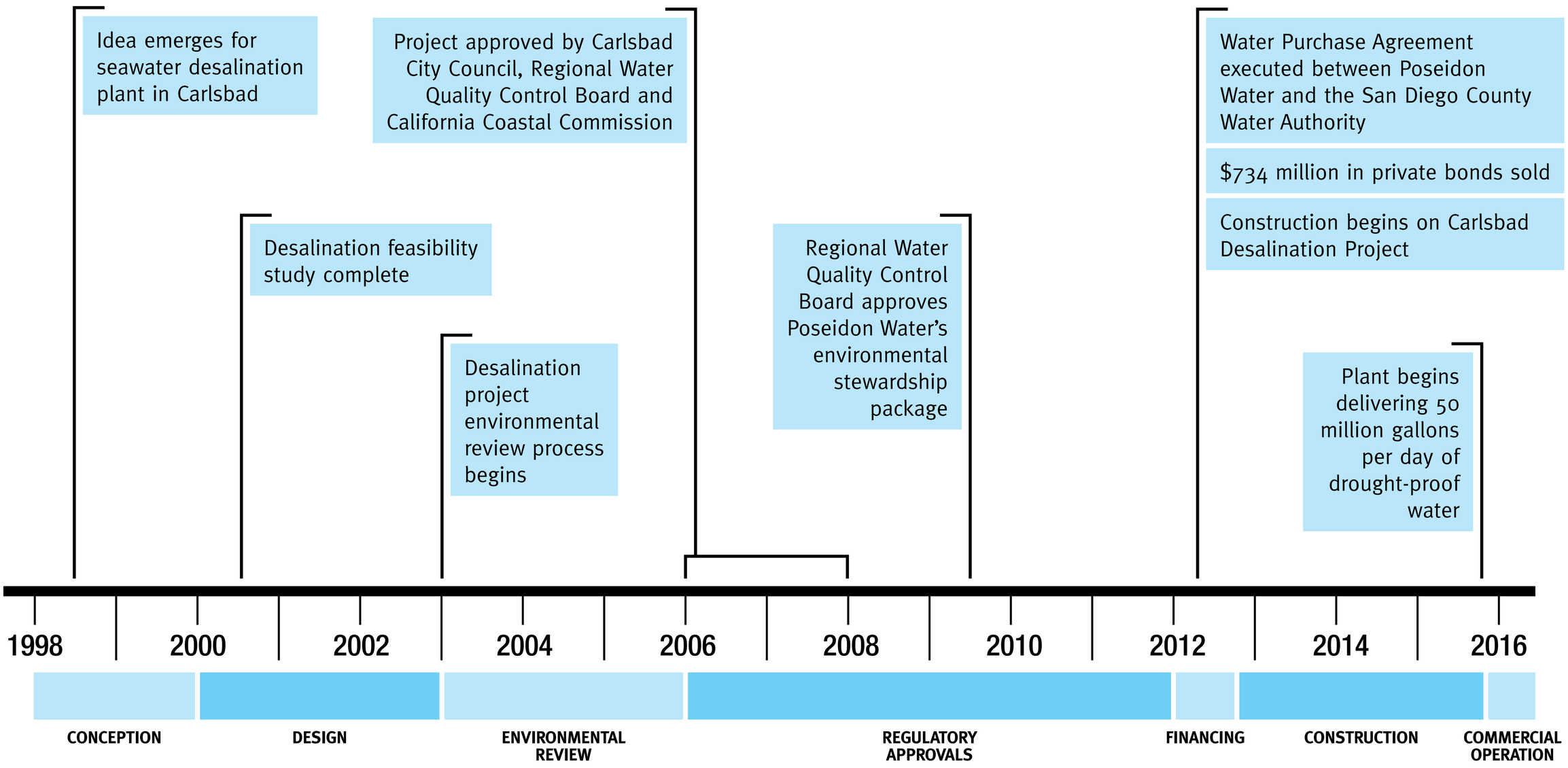
Projected San Diego County Water Sources in 2020



The Road to Desalination in Carlsbad

The idea for a seawater desalination plant in Carlsbad arose in the 1990s, and it took years of planning and review to make that vision a reality. Taking into account the needs of the local community, the region and the environment, a team of engineers and experts developed a proposal for a desalination plant adjacent to the Encina Power Station on the Agua Hedionda Lagoon and a 10-mile pipeline to transport the desalinated water to the Water Authority's Second Aqueduct in San Marcos.

By the end of 2012, all of the necessary approvals were in place. The Water Authority and Poseidon Water entered into a 30-year Water Purchase Agreement for the entire output of the plant, and construction began. It took nearly three years and more than 1 million labor hours to complete the project and start commercial operations.



Desalination's Role in San Diego County

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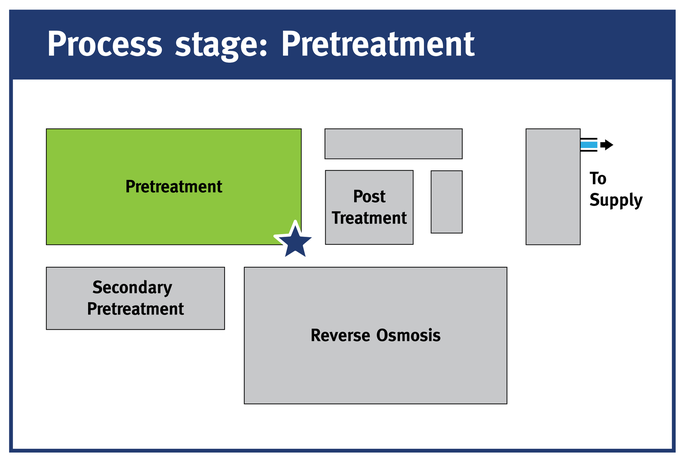
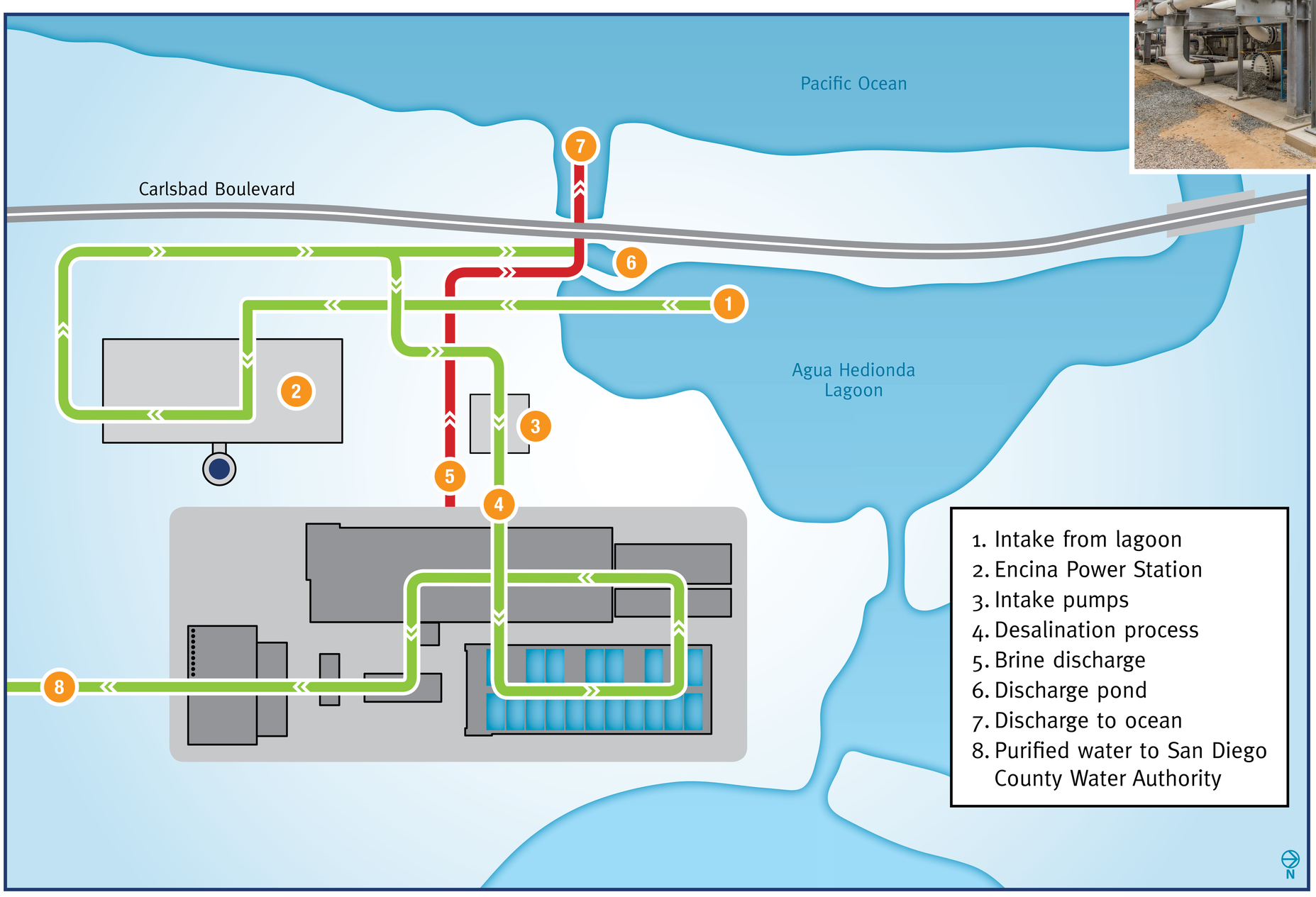
Drawing Water from the Pacific Ocean

On a typical day, the Carlsbad Desalination Plant uses 100 million gallons of seawater from the Pacific Ocean that enters through an intake on the shores of Agua Hedionda Lagoon. Seawater is drawn into the pump station and transported to the plant via the 72-inch seawater feed pipe to begin the desalination process.

Roughly half of the water flowing through the plant is converted into drinking water for the region. The remaining water, carrying all of the original salt and minerals, is returned to the ocean.



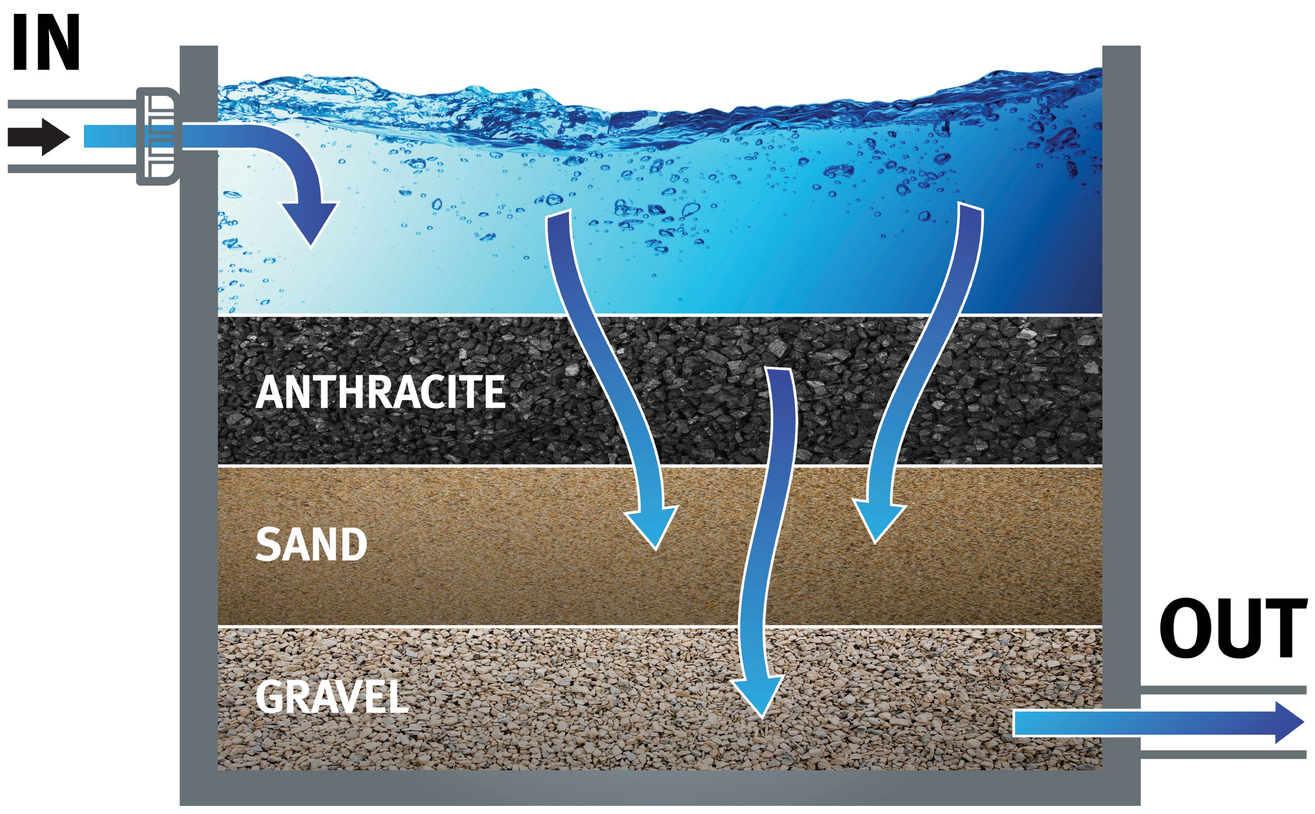


TRANSPORTS
100 MILLION GALLONS
OF SEAWATER INTO THE PLANT PER DAY

Removing Impurities

Most people think of desalination only as removing salt, but the process also removes other mineral, biological and organic impurities to produce extremely high-quality water.

When seawater arrives at the plant, it goes through a pretreatment process to eliminate algae, organic materials and other particles. Seawater is pumped into multimedia filter tanks which contain layers of anthracite and sand atop a bed of gravel. Then, the water moves into the second pretreatment stage to remove smaller impurities.



Water Intake and Pretreatment

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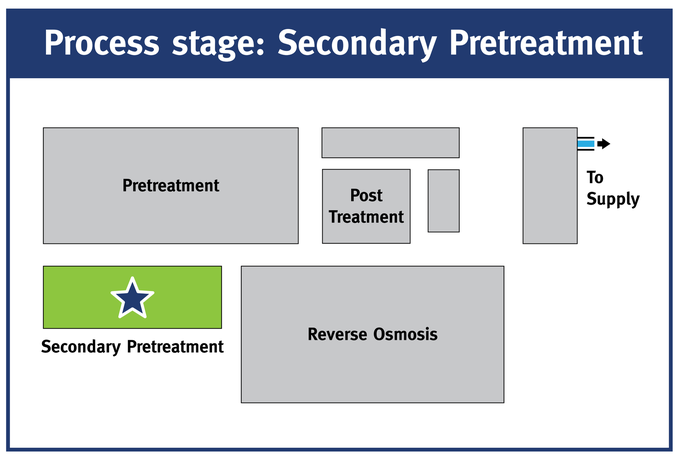
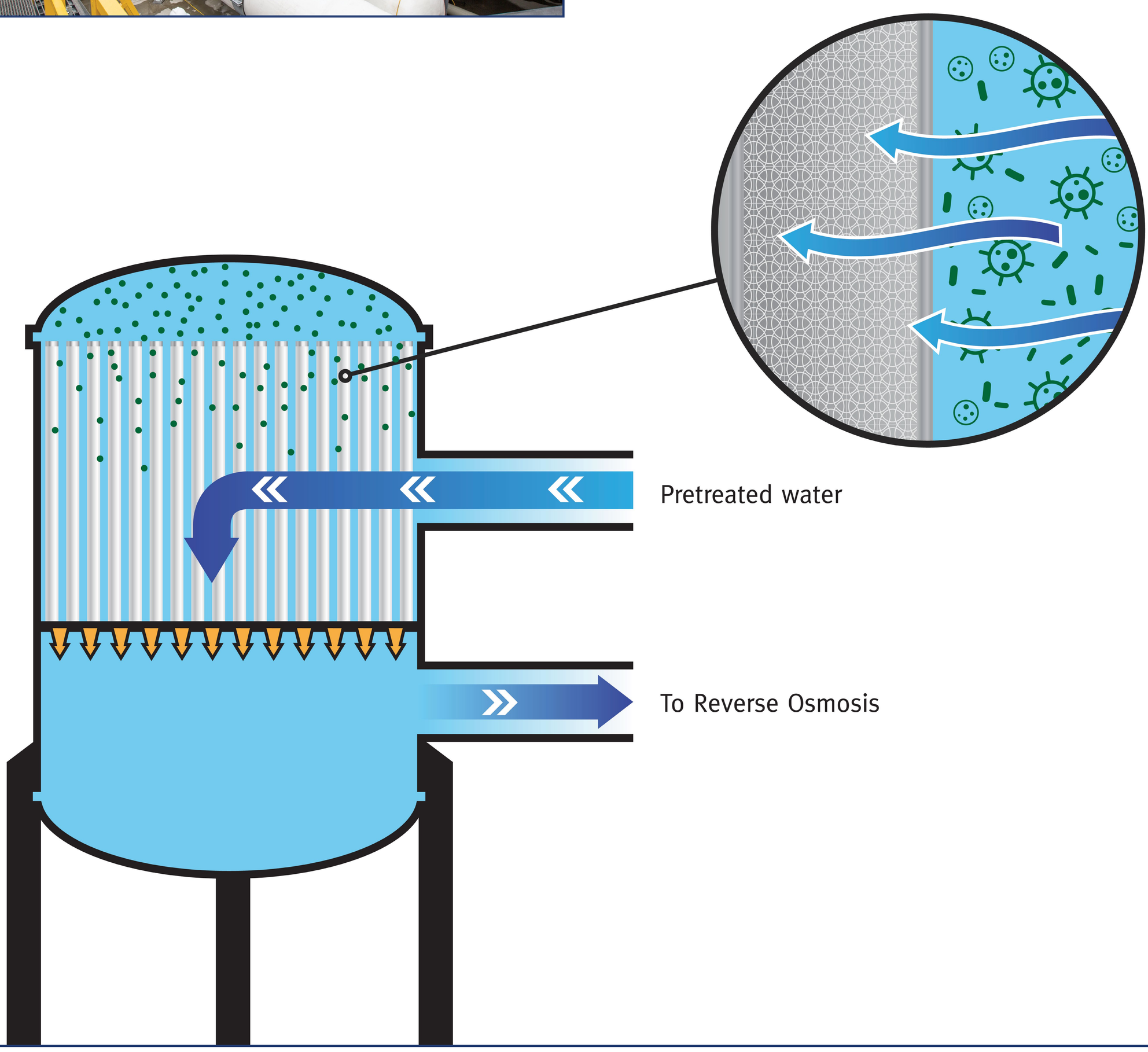
Secondary Pretreatment

Before seawater enters the reverse osmosis filters to separate the salts, it must go through the second stage of pretreatment called microfiltration to remove smaller–oftentimes microscopic–impurities. At this point, virtually all impurities other than dissolved salts and minerals have been removed from the water, but it still needs to go through one more step to remove the dissolved salts and minerals to be ready for drinking.





Secondary Pretreatment

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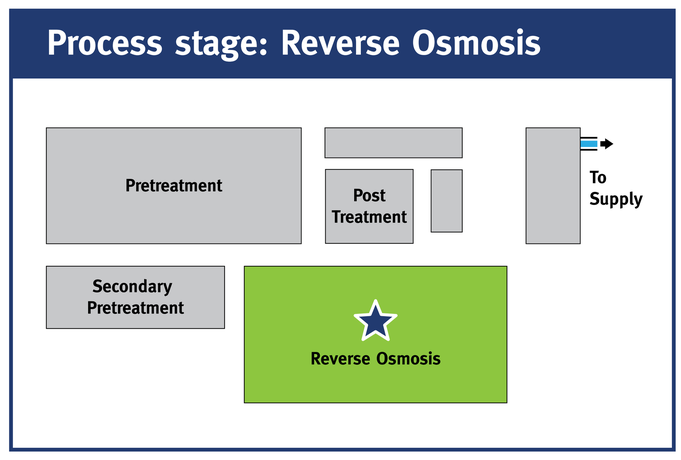
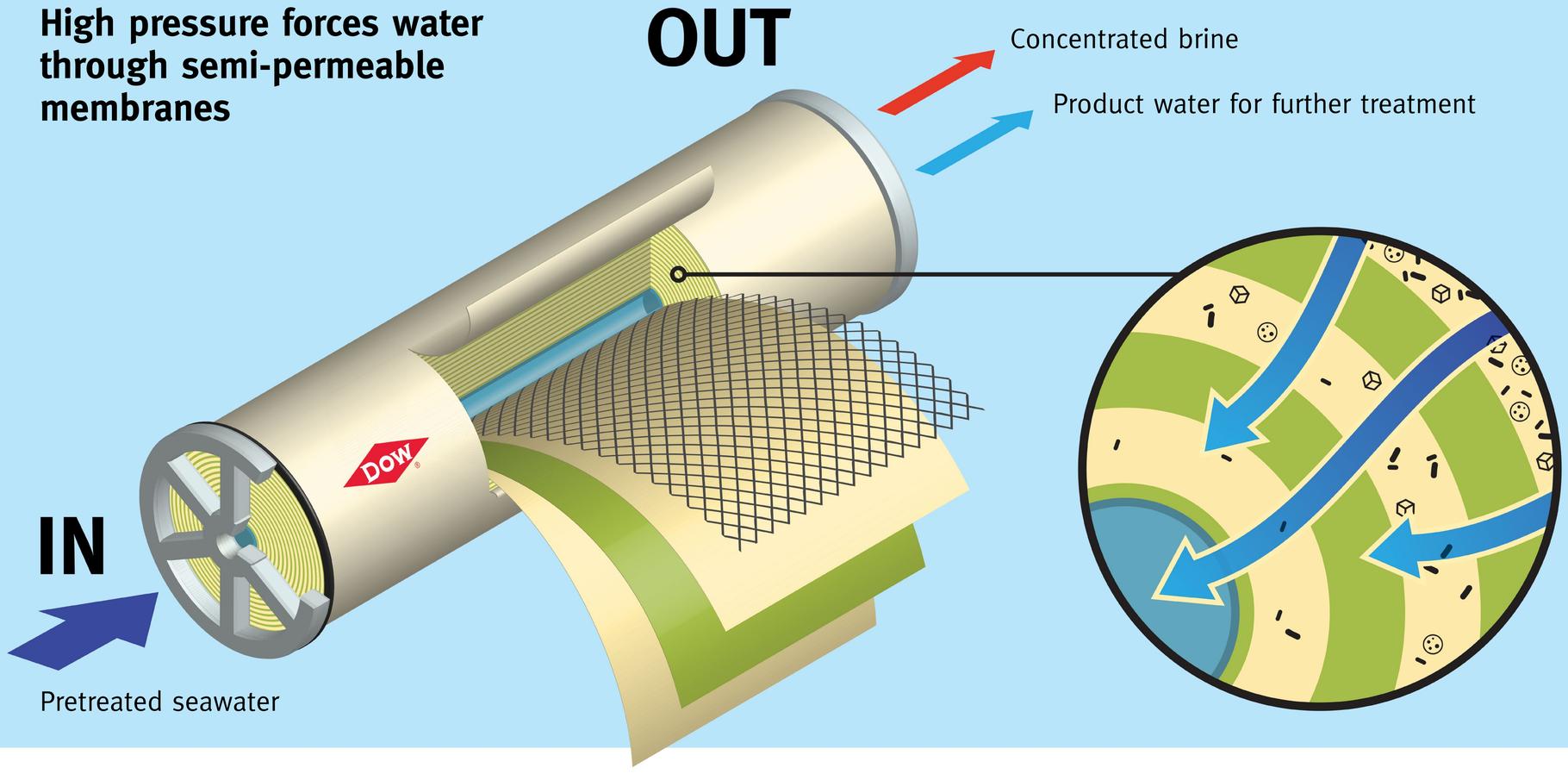
The Center of the Desalination Process

Reverse osmosis is the heart of the Carlsbad Desalination Plant. During this process, dissolved salt and other minerals are separated from the water, making it fit for consumption. This reverse osmosis building contains more than 2,000 pressure vessels housing more than 16,000 reverse osmosis membranes.



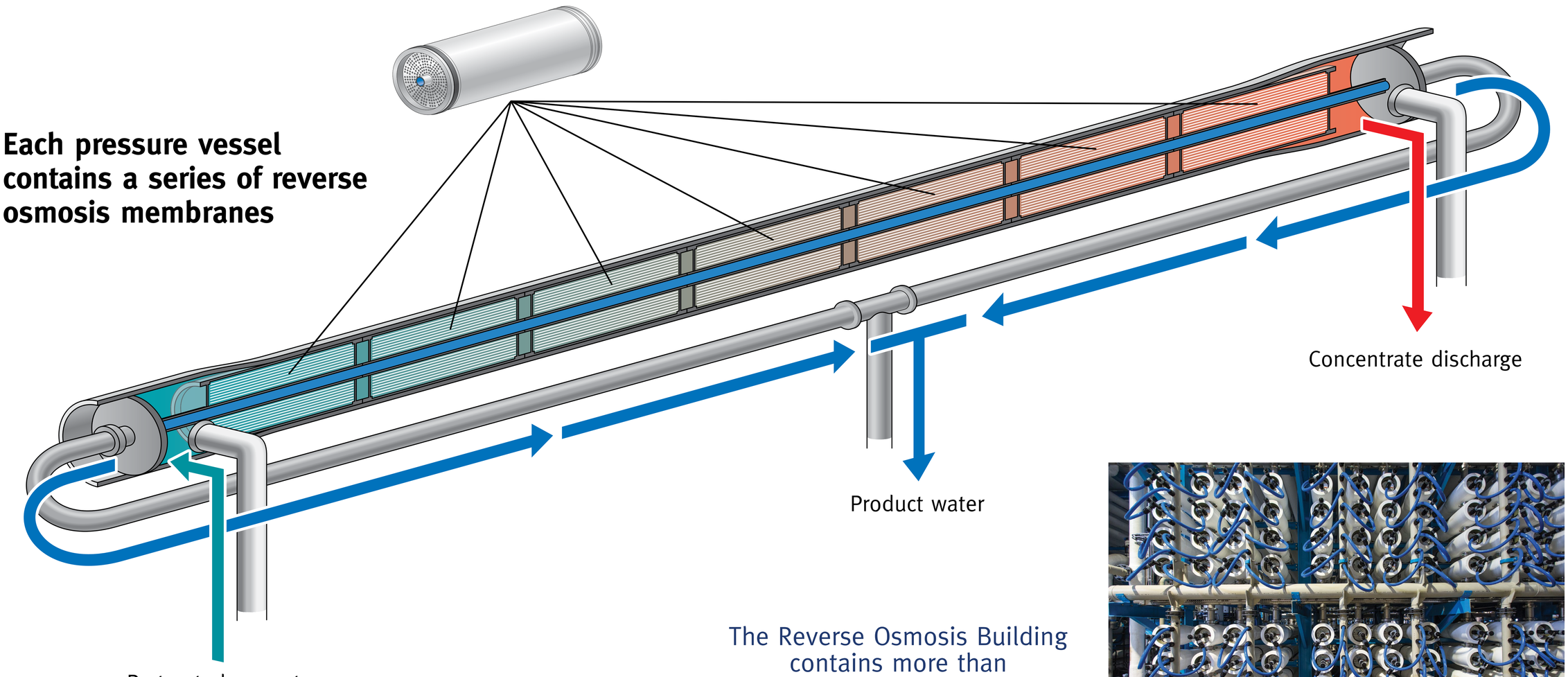
High pressure forces water through semi-permeable membranes



How Reverse Osmosis Works

Reverse osmosis is a process that separates dissolved minerals and other impurities from water by pushing water through semi-permeable membranes. These membranes act like microscopic strainers that allow only water molecules to pass through, leaving behind the salt, minerals and other impurities such as bacteria and viruses.

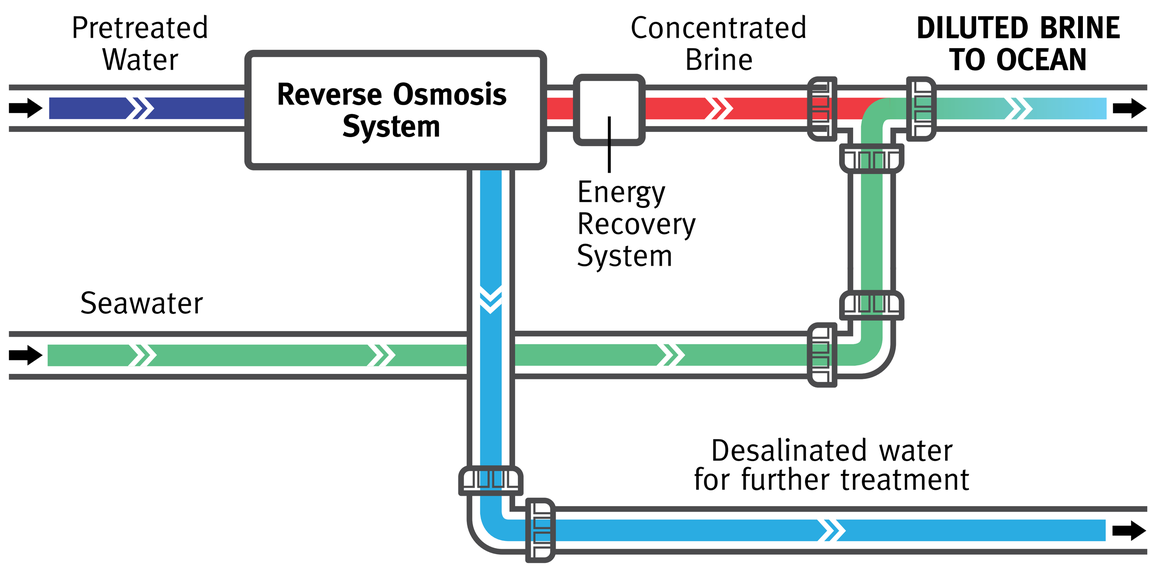
Each pressure vessel contains a series of reverse osmosis membranes



The Reverse Osmosis Building contains more than
2,000 PRESSURE VESSELS

Returning Salty Water to the Sea

The byproduct of reverse osmosis—called brine—contains roughly twice as much salt as seawater. Before it's discharged to the ocean, brine from the plant is diluted with seawater to reduce its salinity and ensure minimal impacts to the ocean.



The Reverse Osmosis Process

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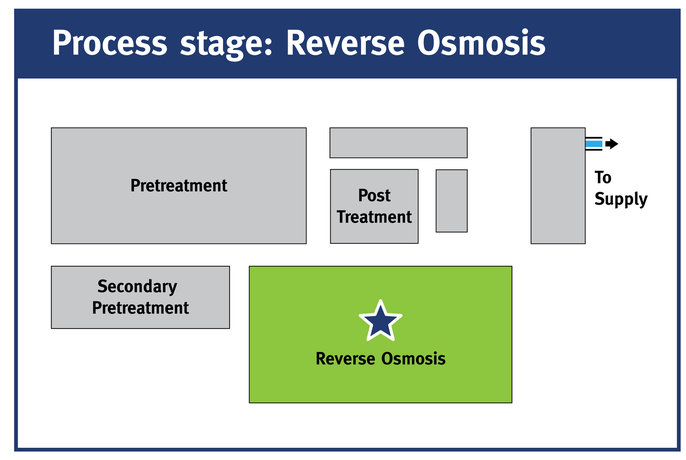
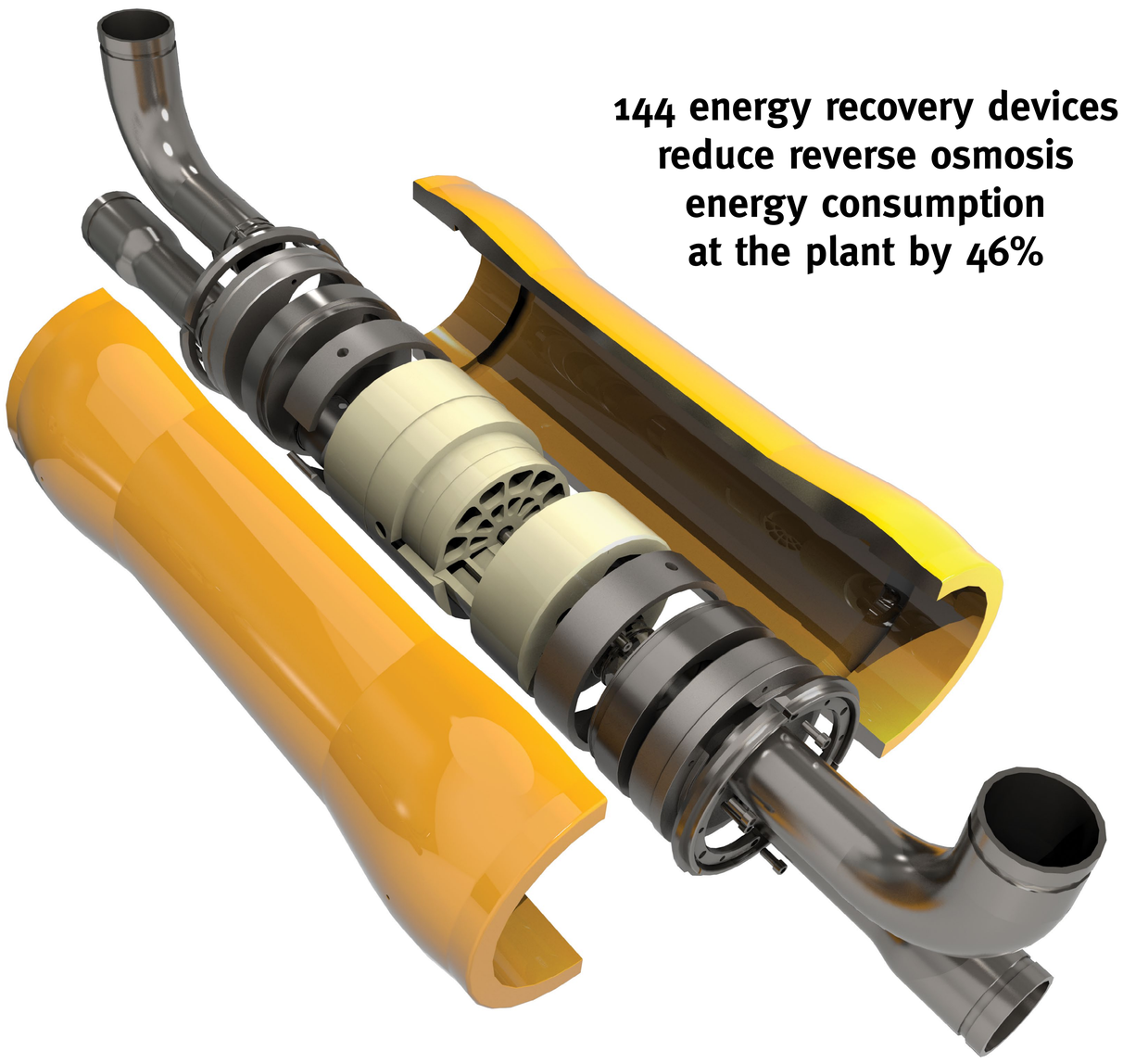
Recycling Energy to Conserve Resources

The Carlsbad Desalination Plant uses energy recovery devices that recycle the pressure from the reverse osmosis process. These devices save an estimated 146 million kilowatt-hours of energy per year, reducing carbon emissions by 42,000 metric tons annually—roughly equivalent to the annual greenhouse gas emissions from 9,000 passenger vehicles.



There are 144 energy recovery devices at work in the plant, reducing the overall energy consumption of the reverse osmosis process by 46 percent.

The energy recovery devices capture the hydraulic energy created by the high pressure reject stream of seawater produced during the reverse osmosis processes and transfer it into incoming seawater, without consuming any electrical power themselves.



144 energy recovery devices reduce reverse osmosis energy consumption at the plant by 46%

Annual savings from Energy Recovery devices:

42,000 METRIC TONS OF CO_2

Equivalent to

EMISSIONS FROM 9,000 PASSENGER VEHICLES

Energy Recovery Devices

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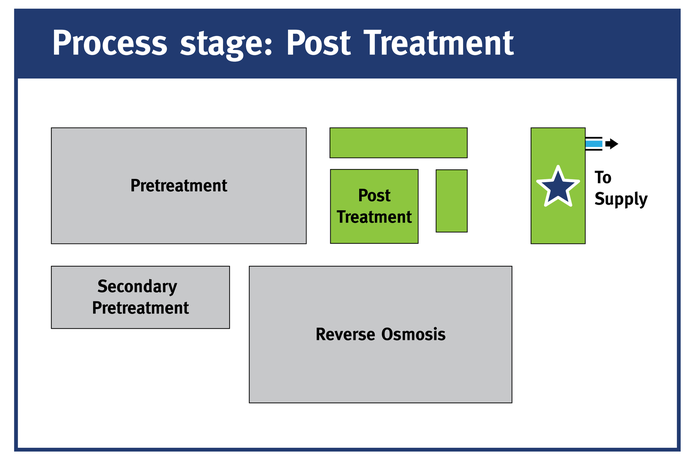
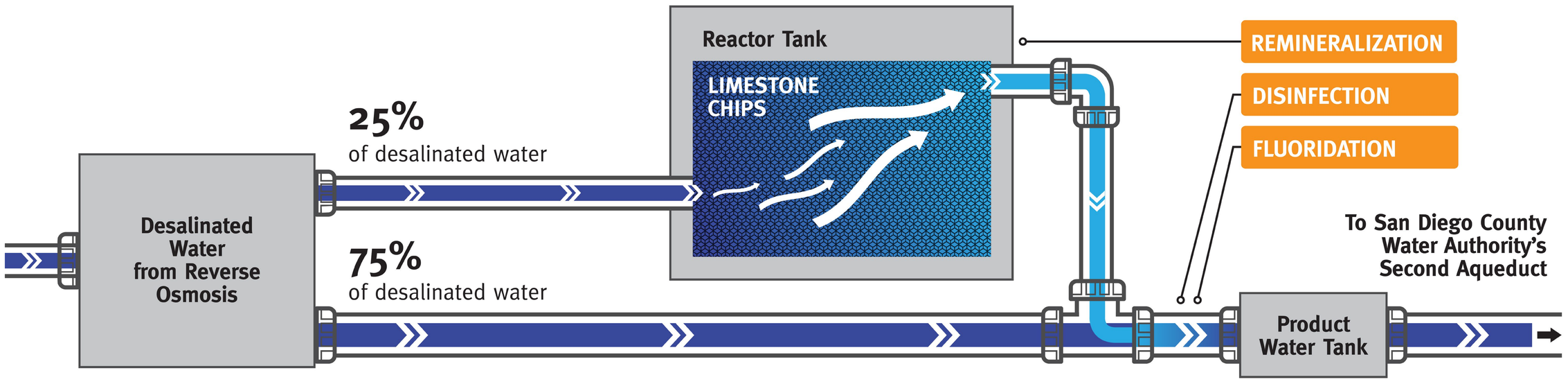
Finishing the Process

After reverse osmosis filtration, the fresh water is nearly ready for consumption. But before making its way into your faucet, the water must undergo “post treatment.” This includes adding some minerals back into the water and disinfection with chlorine.





From the Carlsbad Desalination Plant to You

Now the water begins its journey from the plant to taps all across San Diego County. That process starts by pumping water through a 10-mile, 54-inch pipeline to the east through Carlsbad, Vista and San Marcos to the San Diego County Water Authority’s Second Aqueduct. Then, the water moves north to the Water Authority’s Twin Oaks Valley Water Treatment Plant, where it’s blended with imported water supplies and routed into large-diameter pipes for delivery throughout the region.

Benefits for the San Diego Region

The Carlsbad Desalination Project improves our regional quality of life by protecting and preserving the coastal environment. It ensures the continued stewardship of the 300-acre Agua Hedionda Lagoon adjacent to the plant, along with its recreational and marine resources. In addition, Poseidon Water is restoring 66 acres of coastal wetlands in San Diego Bay. To top it off, the Carlsbad Desalination Project is the first major infrastructure project in California that has adopted a comprehensive strategy to eliminate its carbon footprint. That means we can have a highly reliable, drought-proof water source in an environmentally responsible way.

The Carlsbad Desalination Plant provides San Diego County with an independently-controlled, drought proof supply of drinking water. This has effectively improved regional water supply reliability by reducing reliance on imported water sources dependent on rain and snowpack. While there is no single method to combat San Diego County’s water supply challenges, the plant is a critical resource for meeting the region’s current and future needs. By restoring local control to the region’s water supply, the Carlsbad Desalination Plant stands as a pillar of its water reliability future, which will be quenching the thirst of San Diego County for generations to come.

The Final Steps

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