

MAY 2026

LVMWD x OceanWell

SUBMERGED WATER FILTRATION TESTING
AT LAS VIRGENES RESERVOIR





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BACKGROUND

EXPLORING DESALINATION *for* LAS VIRGENES MUNICIPAL WATER DISTRICT

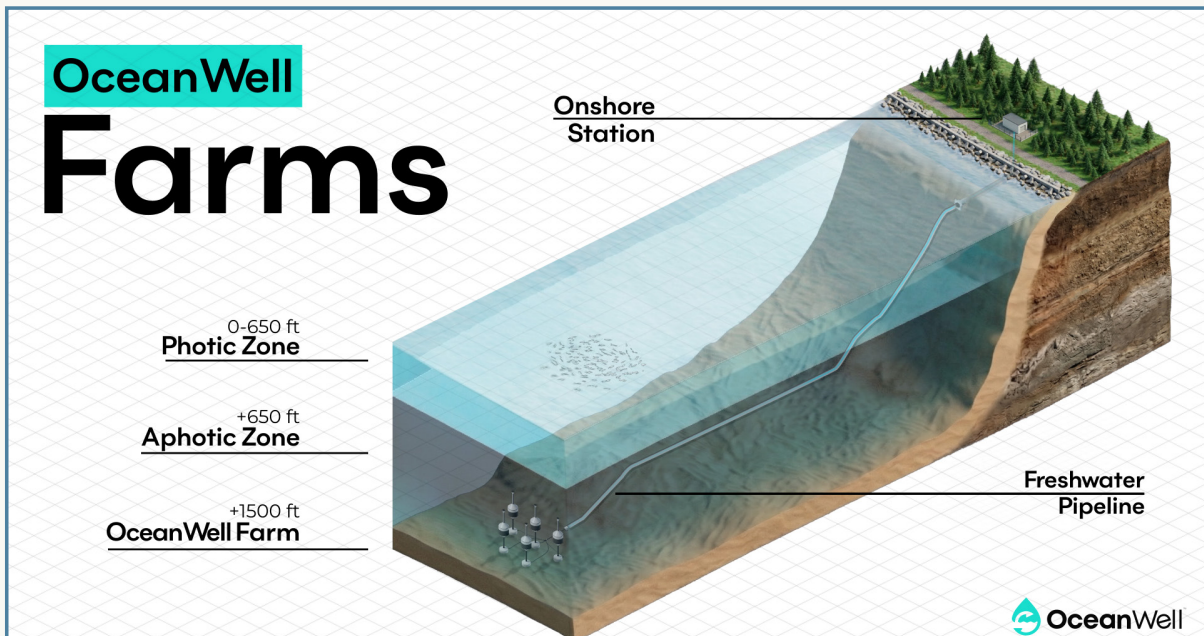
In Southern California, climate change, prolonged droughts, and depleted groundwater reserves have severely strained traditional water supplies. This crisis is particularly acute for water agencies that are highly dependent on the State Water Project (SWP) for their imported water. Agencies such as the Las Virgenes Municipal Water District (LVMWD) rely almost entirely on water originating in the northern Sierra Nevadas, which must be pumped approximately 400 miles over the Tehachapi Mountains—a heavily energy-intensive journey. In 2022, State Water Project allocations dropped to 0%—highlighting the urgency of developing more reliable local water supplies.

During years of diminished rainfall and shrinking snowpack, this imported supply is compromised, leaving SWP-dependent communities highly vulnerable to near-term, severe water shortages and pushing them toward a potential water supply crisis. To build climate resilience and protect their communities, these agencies must explore new, local, and drought-proof water supply options. Desalination has emerged as a critical diversification strategy because it can provide a reliable freshwater supply drawn directly from the ocean, completely independent of the state’s variable weather and snowpack.

Pursuing desalination also aligns with California’s broader water strategy to adapt to a hotter, drier future by reducing the region’s reliance on stressed and fragile imported water systems. Consequently, LVMWD committed to its ratepayers to pursue innovative ocean desalination projects, recognizing that tapping into the Pacific Ocean could be an essential step to securing a stable, reliable water future. Any future investment in new water supply options will be carefully evaluated to balance reliability, environmental stewardship and cost for ratepayers.

OVERVIEW

HOW OCEANWELL TECHNOLOGY WORKS



OceanWell technology reimagines traditional water purification by moving the entire process deep underwater. Instead of building large, expensive plants on the coast, the company deploys modular “pods” on the ocean floor. By placing these pods so deep, the system uses the ocean’s natural weight—known as hydrostatic pressure—to physically push seawater through reverse osmosis membranes. This natural pressure filters out salts, bacteria, viruses, and other impurities to create high-quality, ultra-clean drinking water.

Because the ocean’s natural pressure does the heavy lifting of forcing water through the filters, the system is incredibly energy efficient. Electricity is primarily only needed to pump the resulting fresh water back to the shore, which cuts overall energy use by up to 40% compared to conventional land-based desalination plants. Furthermore, the pods

operate at a low extraction rate, meaning they only pull a small amount of fresh water from the seawater they take in. This leaves behind only a mild, low-concentration brine that is safely dispersed high above the seafloor, avoiding the toxic, highly concentrated brine discharges that often plague traditional desalination.

To further protect the ocean’s ecosystem, OceanWell uses a specialized LifeSafe™ intake system designed with an “environment-first” philosophy. The system pulls seawater in at extremely low velocities, which allows fish and other aquatic life to safely and freely swim around the pods without getting sucked in or trapped. Additionally, the pods feature an automated backwashing process that routinely cleans the screens and has demonstrated the ability to return many microscopic organisms back to their natural environment.

The Big Idea

Subsea Pods

The technology operates at 400 meters depth because natural (free) energy, driven by gravity, is available to push seawater through a reverse osmosis (RO) membrane and remove salt. The freshwater is pumped to shore to maintain a pressure differential on the RO membranes and keep the process operating. While the pumps pressurizing the freshwater do require purchased energy, the projected energy savings compared to onshore desalination is up to 40% based on modeling and pilot validation.

At depth, the intake water to a pod is cold, clear and relatively free of. OceanWell's LifeSafe™ system is designed to maximize the survival of organisms and return them to the ambient ocean, alive.

The patented seawater outfall is located well above the sea floor and releases only a mild brine with little to no impact on the subsea ecosystem. In short, OceanWell technology leaves the salt and sea life where it belongs—in the ocean.



SNAPSHOT

PILOT PROJECT SYNOPSIS



The Las Virgenes Reservoir, located in Westlake Village, California, is a freshwater reservoir, which holds a three-month supply of treated drinking water for customers. The total capacity is approximately 9,500 acre-feet, which is around 3.1 billion gallons of water.

The reservoir was created to assure reliable drinking water delivery to LVMWD customers during peak seasonal demand. The reservoir is also a “backup” during scheduled shutdowns for maintenance, in times of drought, or in the event of earthquakes and other emergencies. Water delivered and stored in Las Virgenes Reservoir is treated potable water from the Metropolitan Water District of Southern California (MWD). To help protect water quality, LVMWD owns 360 acres of land immediately surrounding the reservoir.

The Las Virgenes Municipal Water District (LVMWD) pursued this desalination project primarily to secure a drought-proof and climate-resilient local water supply for its 70,000 customers. LVMWD is highly dependent on water imported through the State Water Project, which requires pumping water approximately 400 miles from the northern Sierra Nevada Mountains.

In recent years, prolonged, record-setting droughts and diminished snowpack have severely stressed this imported supply, leaving the region highly vulnerable to water shortages. Facing a potential water supply crisis, the LVMWD Board of Directors pledged to pursue new, reliable local water sources to help insulate the community from future water shortages.

In March 2025, OceanWell began testing of a pilot-

scale subsea water-treatment system in Las Virgenes Reservoir to evaluate reliability, water quality, energy use, fouling behavior, and cleaning methods in a real-world operating environment. The pilot served as a critical step toward offshore desalination, demonstrating that an underwater system can reliably produce high-quality freshwater while operating under dynamic environmental conditions.

By partnering with OceanWell, LVMWD is exploring an environmentally responsible approach to desalination that overcomes the historical drawbacks of traditional, land-based plants. OceanWell’s deep-sea technology utilizes the ocean’s natural hydrostatic pressure to reduce energy consumption by up to 40% and is designed to significantly reduce concentrated brine discharge compared to traditional systems. LVMWD leadership emphasized the importance of finding a solution where “ocean desalination and environmental stewardship can go hand-in-hand,” making this reservoir pilot a crucial stepping stone toward a full-scale commercial water farm in the Pacific Ocean. The pilot provides early data to help determine whether this technology could play a role as part of LVMWD’s long-term water supply strategy.

NOTE: *This was a pilot demonstration, not a full-scale drinking water facility. Several conclusions in the source report are promising, but still preliminary, and will require further testing, engineering, permitting and independent review before any broader deployment decisions. These features were evaluated at pilot scale in a reservoir environment and will require further validation in ocean conditions.*



The pilot project, launched in March 2025, tested OceanWell's technology in a real-world, biologically active environment—an important step in evaluating long-term performance and reliability.

A new frontier is emerging.

BEYOND THE SURFACE

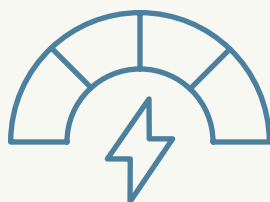
Join LVMWD and OceanWell for an exploration into a revolutionary approach to desalination with the OceanWell Pod.



**TURNING EARLY-STAGE INNOVATION INTO
POTENTIAL FUTURE WATER SUPPLY SOLUTIONS.**

KEY FINDING #1

ENERGY EFFICIENCY



The DWPR Final Report confirms that the OceanWell pilot system operated with high energy efficiency during its time in the Las Virgenes Reservoir. The report measures this efficiency in terms of “specific energy,” which simply refers to the amount of power required to produce a specific volume of fresh water. During the trial, the pilot system achieved a low specific energy of approximately 1 kilowatt-hour per cubic meter (kWh/m³). This result was a major success, as it closely matched the engineers’ theoretical predictions for how much energy the system should use when operating at a depth of 50 feet. Energy use varied depending on system configuration. For example, tighter prefilters improved protection from debris but required more energy to operate.

To understand this energy use, it helps to look at the system’s internal hardware. At the reservoir’s 50-foot depth, the energy workload was split roughly 50/50 between two main components: a circulation pump that draws the surrounding water into the system, and a permeate pump that pushes the newly filtered fresh water up to the surface. The technical report noted that energy use could fluctuate depending on the hardware configuration. For instance, when a tighter, less permeable prefilter was installed to better protect the system from algae and debris, the circulation pump had to work harder to pull water through, causing a slight jump in total power consumption.

Most importantly, these shallow-water energy findings validate the technology’s massive energy-saving potential for deep-ocean use. Because the pumps operated at their expected efficiencies in the reservoir, engineers are confident that the system will hit its targets when eventually deployed 1,300 feet deep in the Pacific Ocean. In the deep sea, the immense natural weight of the water—known as hydrostatic pressure—naturally forces water through the filters, meaning the system will barely need the permeate pump to do any heavy lifting. Ultimately, this reservoir data confirms projections that OceanWell’s deep-sea pods have the potential to use up to to 40% less energy than traditional, land-based desalination plants. These results were observed at shallow depth in a reservoir environment and will need to be validated under deep ocean conditions

KEY FINDING #2

MARINE LIFE SAFETY



Pilot footage confirms safety of intake system

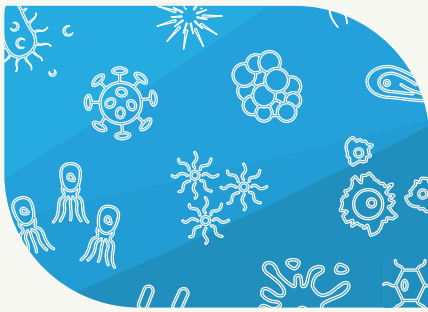
To confirm that the intake was truly safe for local wildlife, engineers deployed an underwater remote-operated vehicle (ROV) and cameras to monitor the system in action. The resulting footage showed fish freely and safely swimming directly around the intake screens during normal operations and cleaning cycles without getting stuck to the surfaces. The environment around the pods remained so natural and undisturbed that a grebe—a type of diving freshwater bird—was filmed actively hunting a school of fish right next to the operating equipment. The report concludes that this provides strong preliminary evidence that the low-velocity design successfully eliminates the impingement of any aquatic life larger than the screen’s tiny half-millimeter openings.

Microscopic life returned unharmed to habitat

While the outer screens protect larger animals from impingement, the report also examined what happens to the microscopic life, such as plankton, that are small enough to get pulled through the screen’s tiny gaps. These microscopic organisms are caught by internal prefilters and routinely returned to the reservoir through an automated “backwash” process, which simply reverses the water flow to gently flush out the system. Researchers attached a fine mesh net to the system’s discharge valve to capture these backwashed organisms and examined them under a microscope. They found substantial evidence of living algae, diatoms, and tiny aquatic crustaceans (copepods), proving that microorganisms can survive the process and be safely returned to their natural habitat. This represents a significant improvement compared to traditional intake systems, which typically assume a 100% mortality rate for any organisms pulled inside. While many organisms were observed to survive the process, some mortality was also documented, indicating continued refinement will be important.



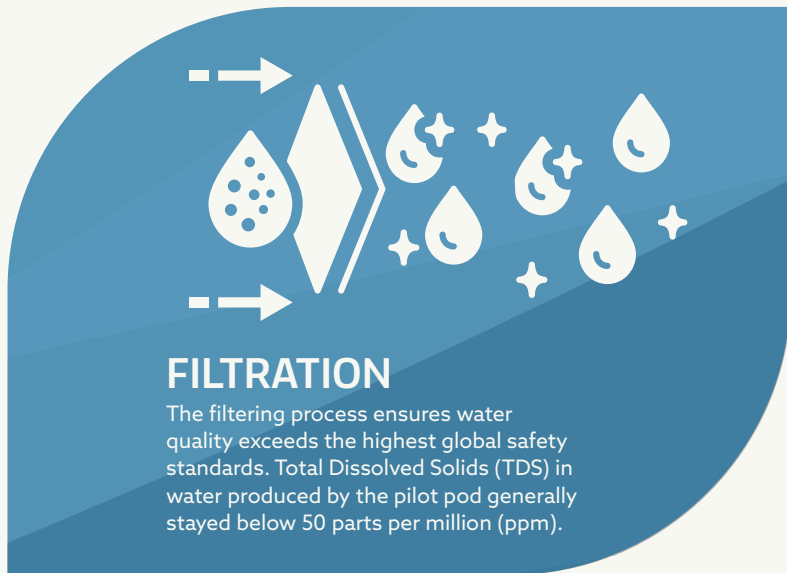
TRADITIONAL DESALINATION HAS HISTORICALLY HARMED AQUATIC ECOSYSTEMS BECAUSE ITS POWERFUL PUMPS PULL MARINE LIFE INTO THE INTAKE SCREENS (A FATAL PROBLEM KNOWN AS “IMPINGEMENT”) OR PULL TINY ORGANISMS ENTIRELY INTO THE PLANT’S PLUMBING, WHICH IS CALLED “ENTRAINMENT.” THE OCEANWELL PILOT REPORT DETAILS HOW THE POD IN THE LAS VIRGENES RESERVOIR SUCCESSFULLY MITIGATED THESE DANGERS USING ITS SPECIALIZED LIFESAFE™ INTAKE SYSTEM. RATHER THAN RELYING ON FORCEFUL SUCTION, THIS SYSTEM DRAWS WATER INTO THE SUBMERGED PODS AT EXTREMELY LOW VELOCITIES, CREATING A GENTLE FLOW THAT DOES NOT GENERATE A DANGEROUS, INESCAPABLE CURRENT.



MARINE SAFETY



ENERGY EFFICIENCY



FILTRATION

The filtering process ensures water quality exceeds the highest global safety standards. Total Dissolved Solids (TDS) in water produced by the pilot pod generally stayed below 50 parts per million (ppm).



RELIABILITY

10x PURER

Than World Health Organization drinking water standards

93% UPTIME

Over the 3-month longevity test, scheduled maintenance every 2-3 weeks accounted for the only downtime experienced during the trial

KEY FINDING #3

WATER FILTRATION & RELIABILITY



Exceptionally Pure Water: The system produced freshwater that was roughly ten times purer than standard drinking water requirements. The filtered water (also called “permeate”) generally contained fewer than 50 parts per million (ppm) of total dissolved solids, which are the salts and impurities left in water. To put that in perspective, the World Health Organization’s limit for safe drinking water is 500 ppm, meaning the pilot’s water was well below the safety threshold. At the very start of the trial, the impurity levels were even lower, at less than 10 ppm. Water quality remained consistently high throughout the pilot, even as environmental conditions such as temperature and biological activity changed over time. Membrane fouling and maintenance needs over extended operation will require continued research and analysis.

Success in Challenging Conditions: The system achieved these high purity levels despite operating in a tough, unpredictable environment. The lake’s water quality fluctuated significantly due to high winds, heavy rain, changing temperatures, and seasonal algae blooms. The untreated lake water typically had impurity levels over 320 ppm. Even when the lake was highly “bioactive” (teeming with algae and microorganisms), the system continuously delivered crystal-clear water without a drop in quality.

Reliable Volume: Over the course of the three-month endurance test, the system consistently maintained its performance, producing over 150,000 gallons of this highly purified freshwater. OceanWell successfully maintained flowrates over three months of continuous operation at 93% uptime. Performance over longer durations and under ocean conditions will require further evaluation.

CONCLUSION

WHAT IT MEANS & WHAT'S NEXT



As California enters a period of permanent water stress driven by climate change and unpredictable hydrology, seawater desalination remains one of the state's few genuinely drought-proof water supply options. By running this pilot project at the Las Virgenes Reservoir, LVMWD is promoting science-based decision-making and generating the empirical data required to help guide the District's investments in future infrastructure and help state regulators modernize permitting frameworks and safely integrate new water technologies into California's supply portfolio.

Delivering the Data Regulators Need

Before state agencies can authorize emerging offshore technologies, they require concrete evidence that a system is both efficient and environmentally defensible. The reservoir pilot successfully delivered this real-world data, proving that subsea reverse osmosis can operate safely and reliably:

Proven Reliability and Purity

During its multi-month endurance test, the pilot operated continuously with a 93% uptime, producing over 150,000 gallons of freshwater. The system delivered ultra-pure water with fewer than 50 parts per million of total dissolved solids, far exceeding World Health Organization standards for drinking water.

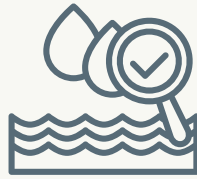
Addressing Energy Concerns

Traditional onshore desalination is highly energy-intensive. The pilot confirmed that OceanWell's technology, which uses natural underwater hydrostatic pressure to drive filtration, operates with a low specific energy of roughly 1 kilowatt-hour per cubic meter (kWh/m³) of water processed (or treated) in shallow conditions. This validates projections that deep-sea deployment has the potential to cut energy use by up to 40%, aligning with the state's goals for climate-resilient and low-carbon infrastructure.

Validating Marine Life Protection

The most significant regulatory hurdle for ocean desalination involves the protection of aquatic ecosystems. Underwater cameras and testing during the pilot demonstrated that OceanWell's low-velocity LifeSafe™ intake allows fish to swim safely around the equipment and safely returns entrained microscopic organisms back to the environment. This provides crucial evidence that the technology can eliminate the high marine mortality rates associated with traditional open-water intakes.

CONCLUSION (CONT'D)



Understanding Cost Benefits

While full-scale costs are not yet defined, the pilot demonstrated energy efficiency improvements that could help reduce long-term operating costs compared to traditional approaches. Costs for potential future applications are still being evaluated and will be considered alongside reliability and environmental performance.

Co-Designing Frameworks with State Agencies

With the pilot providing a successful proof-of-concept, LVMWD is using these findings to lead a collaborative approach to regulatory reform in California. LVMWD is intentionally engaging early with regulatory bodies, such as the California State Lands Commission and the State Water Resources Control Board. Instead of viewing these agencies as gatekeepers, LVMWD aims to collaborate with them as co-architects of a responsible, statewide framework for research pilots, demonstration projects and future full-scale systems utilizing emerging offshore technologies

Modernizing the California Ocean Plan

The empirical data gathered from the reservoir pilot supports ongoing efforts to amend the 2015 California Ocean Plan. LVMWD, OceanWell and other emerging desalination advocates are pushing to update the more rigid, previous standards with science-based performance standards, which would provide the flexibility needed for offshore and deep-sea systems.

Creating a “Line of Sight” for Innovation

By forming a public-private partnership, LVMWD and OceanWell have established a blueprint for bringing innovative water solutions to market. The goal is to establish a clear, transparent, and streamlined permitting strategy in the next few years.

Ultimately, this pilot study does more than test a single machine; it creates the space for public water agencies and private innovators to collaborate. By providing science-driven data to regulators, this project paves the way for a defensible, statewide permitting pathway that will allow California to safely embrace the next generation of drought-proof water technology.

Bolstering LVMWD’s Water Diversification Strategy

The future of water in our region requires a strategy that continues to prioritize conservation, water reuse and the exploration of diverse future water supplies. Together, these efforts will provide a balanced, long-term approach to strengthening water reliability in our communities. As LVMWD continues to evaluate future water supply options, any potential next steps will be carefully assessed to balance reliability, environmental benefits and affordability for ratepayers.

