AI-based railway flood monitoring wins the Schreyer p. 12

It's a tie for the Environmental Award! pp. 20 and 22

WHO disease treatment module wins Philanthropy Award p. 24

CANADIAN • CONSULTING
Engineer
September/October 2025
ccemag.com
For professional engineers in private practice

2025 Awards

Wataynikaneyap power project ties for the Engineering A Better Future Award. **P. 16**

Environmental Award and Award of Excellence

Salton Sea Species Conservation Habitat

Knight Piésold

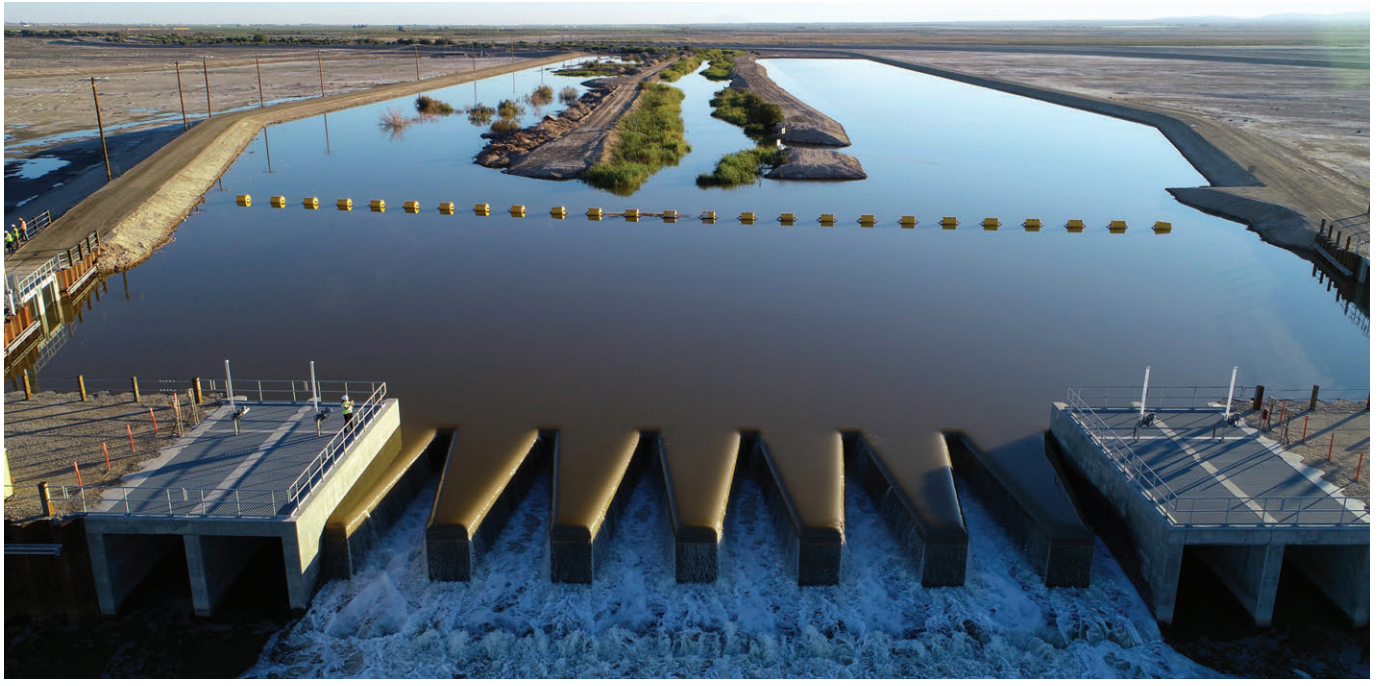

PHOTO COURTESY KIEWIT.

California's Department of Water Resources (DWR) selected a partnership between Knight Piésold in Vancouver and Kiewit Infrastructure West in Porway, Calif., as the preferred engineering, procurement and construction (EPC) bidder to design the Salton Sea species conservation habitat project. This initiative has revitalized more than 4,000 acres of aquatic and terrestrial habitats along the shores of the state's largest lake, which sits approximately 250 ft below sea level.

The landlocked saltwater lake has been shrinking for decades, due to reduced inflows and increased evaporation exposing large areas of lakebed. With no source of additional inflow to help maintain the previous surface area and salinity, the development of manmade, shallow habitat ponds was found to be the best solution for restoring aquatic and terrestrial habitats that had been lost.

The resulting habitat supports biodiversity for local fish, migratory birds and native vegetation and significantly enhances air quality, helping to improve health in surrounding communities.

Healthier for animals and people

The team developed a new wetland habitat to mitigate environmental and health-related concerns, creating a more sustainable aquatic ecosystem to counter the Salton Sea's hypersaline water conditions, which have become inhospitable to most species. The lake is currently more than two times saltier than the Pacific Ocean and its salinity is only projected to increase further as it continues to recede.

"Showcases a common-sense engineering approach to the restoration of a severely degraded ecosystem in a challenging location."
– Jury

The restoration is helping rebuild the food chain by addressing disruptions that have severely impacted bird species.

Meanwhile, the suppression of dust and reduction of airborne particulates—containing chemicals and pollutants—that are blown by wind from exposed, fine-grained lakebed sediments will prevent health risks for residents of Imperial Valley, who have historically suffered from asthma rates several times higher than the regional average.

The particles are also prevented from settling on nearby agricultural lands and threatening soil quality.

Setting the flow

A key requirement of the new habitat was to provide water with lower salinity. The design team's concept used gravity flow—in lieu of more expensive and energy-intensive pumping systems—to divert fresh water from the New River into mixing basins with the saltier water pumped from the Salton Sea. The gravity flow system incorporates a labyrinth weir, flow control gates and settling ponds.

Other features include variable-speed pumps for delivering hypersaline flows, easily removable and replaceable diffuser pipes and the capability to isolate each habitat pond for independent operation. These allow for adaptive management.

Climate change considerations were also incorporated into the project, particularly the potential for high-intensity rainfall events. The design allows for flood flows to pass without impacting water levels.

The concepts that were tested and proven throughout design and construction have resulted in a 'toolbox' of cost-effective methods that will be carried forward for future restoration work.

Geotechnical challenges

The project's key challenges included construction on exposed lakebed sediments in a high seismic area with liquifiable foundation materials. Sub-aqueous berm construction and accounting for a highly saline environment were also difficult.

The project team developed more than 27 km of earthen berms on exposed soft lakebed sediments, requiring specialized designs and construction methods to ensure stability. With a limited amount of subsurface data available, they implemented a conservative berm design that would remain stable under the worst anticipated conditions and used thicker earthfill lifts to create a 'bridge' over soft foundation areas. Seepage mitigation, including a barrier, was implemented to address any concerns about seepage and internal erosion.

An offshore pump station, located one mile from shore to ensure its functionality as the sea recedes, necessitated the construction of a new causeway through the Salton Sea. The project team pushed local earthfill out from the shore, minimizing the need for material transportation. This approach resulted in uncompacted fill depths exceeding 10 ft in some areas. A geotechnical site investigation after completion confirmed the causeway would provide long-term, stable access to the pump station.

Lower seismic loads were adopted for earthfill berms, while critical infrastructure was designed to remain operational after seismic events. This strategy ensured cost-effectiveness without compromising safety.

Performing as prescribed

The team's final design met or exceeded all of the DWR's expectations and prescribed performance criteria. They successfully created a habitat covering a combined area twice the size of downtown Vancouver and Stanley Park. Endangered species are now flourishing, migratory birds have returned in greater numbers, fish populations are recovering and native vegetation is once again thriving.

The restoration of aquatic and terrestrial habitats provides economic opportunities through ecotourism and recreational activities as diverse birdlife returns to the area. One aspect of the project was the construction of a visitors' centre, which provides information about the purpose of the project, restoration objectives and long-term plans to continue to restore the shorelines, all to increase public awareness and engagement.

The successful development of cost-effective methods for large-scale environmental restoration also has broader economic implications. The same methods can be applied to future projects to reduce costs and increasing the feasibility of similar restoration efforts elsewhere.

The project was completed within the allotted budget and schedule, a significant achievement given the complex nature of the work and the challenging site conditions. Next, ongoing expansion projects are set to add an additional 7,800 acres of habitat. **CCE**

PHOTO COURTESY KNIGHT PIÉSOLD.

Fresh and saline water are mixed. Photo courtesy Knight Piésold.

Salton Sea Species Conservation Habitat, Westmorland, Calif.

Award-winning firm (prime consultant): Knight Piésold, Vancouver (Keith Ainsley, P.Eng.; Sam Mottram, P.Eng.).

Owner: California Department of Water Resources.

Other key players: Kiewit Infrastructure West Co. (client), State of California, U.S. Federal Government and the Inflation Reduction Act (funding), Tourney Consulting Group (concrete testing), Northwest Hydraulic Consultants (hydraulic modelling), Geosyntec (geotechnical studies), LSA Associates (habitat restoration and features design), Geoserve (structural design).