



COASTALOCK interlocking tidal pool system Port of San Diego in partnership with EConcrete 2024 Innovative Partnership Awardee

The Port of San Diego and EConcrete formed a partnership to establish the pilot project through a Blue Economy Agreement as a part of the Port's Blue Economy Incubator (BEI). The Port created the BEI to assist in the creation, early development, and initial scaling of new Blue Economy business ventures along San Diego Bay. The Port's vision for the BEI is to establish innovative partnerships with early-stage companies to build a portfolio of businesses who can deliver social, environmental, and economic benefits to the Port and the region. BEI projects include solutions for sustainable aquaculture and other issues that impact San Diego Bay. The BEI program removes barriers for entrepreneurs and provides key assets and support services, including subject matter expertise, permit-ready infrastructure, entitlement assistance, marine spatial planning tools, market access, and funding.

Over half of the San Diego Bay shoreline is armored to protect it from erosion. Over the past several years, the Port has been exploring innovative nature-based and habitat-friendly shoreline solutions that could provide ecological enhancements, shoreline resiliency, and protection. EConcrete formally applied to the BEI in 2018 with a pitch to provide the Port with a unique product called COASTALOCK. EConcrete is an early-stage company composed of a multidisciplinary team of renowned marine ecologists, biologists, geologists, concrete experts, engineers, and designers.

On July 24, 2019, the Port and EConcrete formalized the partnership with the goal of launching a pilot project of the new COASTALOCK design: a 74 interlocking tidal pool armor system. As part of the pilot project, COASTALOCK units replaced traditional shoreline armoring, or riprap, by providing ecological armoring, shoreline stabilization, and well-defined local ecosystems that mimic natural tide pools. In March 2021, the COASTALOCK pilot project was deployed. EConcrete installed COASTALOCK units in two sections along the Port's Harbor Island, where the current waterfront armor protection is traditional shoreline armoring, or riprap rock mound, which offers limited habitat value. Monitoring of the pilot project occurred over 26 months and included reports done every six months. The reports investigated the effectiveness of the project's structural integrity and ability to recruit native marine species, in comparison to control units of riprap. The primary goal was to create a well-defined local ecosystem that mimics natural rock tidepools and provide favorable environments for abundant and rich biodiversity.

A total of 42 invertebrates, 25 algae species, and four fish species were documented throughout the monitoring period, both on the COASTALOCK units and control units. At the end of the 26-month monitoring period, the species richness on the COASTALOCK units continued to demonstrate a diverse community, including 15 algae species, 19 sessile invertebrates, and 11 mobile invertebrates, whereas, on the control rocks, there were 7 algae species, 14 sessile invertebrates, and 5 mobile invertebrates. EConcrete's bio-enhancing concrete products, such as COASTALOCK, have a reduced carbon footprint

compared to Standard Portland cement-based concrete, due to a combination of a proprietary mixture integrating by-products and recycled materials, and the unique ability to enhance biological processes such as biocalcification and photosynthesis which facilitate carbon dioxide (CO₂) assimilation. EONcrete is currently conducting analysis regarding CO₂ sequestration in the form of CaCO₃ build up on the

COASTLOCK units. Based off preliminary analysis, the 74 deployed COASTLOCK units have 310.8 m² of surface area and have an annual CaCO₃ growth 739,704 grams per year, an annual Co₂ equivalent (CO₂e) of .088 tons. The control units, which were legacy riprap with the same surface area, only have CaCO₃ buildup of 93,240 grams per year, nearly eight times less than the COASTLOCK units.

By offering its pilot project facilitation services, the partnership with EONcrete provided the opportunity to demonstrate the unique COASTLOCK product in a real-life scenario, allowing the product to scale up and be replicated across coastal/urban environments traditionally dominated by armored shorelines. The overall success of the pilot project allows the company to market its success and gain access to a variety of previously unobtainable markets. Under the Blue Economy Agreement, COASTLOCK will remain in place and will continue to be monitored and could be expanded along the shoreline.