

**State Water Resources Control Board and Regional Water Quality Control Boards****Supplemental Environmental Project (SEP) Proposal Form**

**Name of Project:** Living Shorelines - Sweetwater Channel

**Project Applicant:** City of San Diego / Port of San Diego

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**Project Category (check one or more)**

- Public Health
- Pollution Prevention
- Pollution Reduction
- Environmental Restoration and Protection
- Assessments and Audits
- Environmental Compliance Promotion
- Other project with environmental and/or public health benefits

**Project Location (include, as appropriate, city, county, address, waterbody)**

The location of the SEP is within the Sweetwater Hydrologic Unit (HU 909). The Sweetwater HU is approximately 145,000 acres extending from South San Diego Bay to Cuyamaca Rancho State Park. The Sweetwater HU includes 4 major water bodies: Sweetwater River, Sweetwater Reservoir, Loveland Reservoir, and San Diego Bay. Portions of the San Diego Bay National Wildlife Refuge (NWR), including Sweetwater Marsh, are contained within the Sweetwater HU. The proposed project area is located along approximately 1,000 combined linear feet of existing armored shoreline along the north and south side of Sweetwater River Channel in San Diego Bay (Figure 1).

**Project Description**

Approximately 75% of San Diego Bay's existing shoreline is armored with rock revetment (riprap), concrete or similar hardened engineering following a historical approach to shoreline protection. This armoring has decreased intertidal and wetland habitat, reduced natural storm surge and flood protection measures, and decreased opportunities for carbon sequestration via aquatic resources. As a proactive measure to support the California Climate Adaptation Strategy goal of accelerating nature based climate solutions, and acknowledging that the majority of existing shoreline is hardened in some capacity, the Port of San Diego (Port) is actively looking to implement various alternative solutions for existing hardened shorelines. While the preference from a natural resources' management perspective is to pursue entirely

softened shorelines and avoid engineered armoring, a considerable percentage of the existing armored shorelines in San Diego Bay cannot be softened due to infrastructure demands and spatial limitations. By approaching existing armored shorelines as an opportunity rather than an obstacle, the Port intends to creatively implement hybrid shoreline alternatives that balance the need for structural integrity with the intrinsic value of a natural shoreline. These solutions can improve long-term resiliency to sea level rise, but more importantly, create opportunities for carbon sequestration, enhancement of habitat and biodiversity, improved accessibility and connectivity to the natural environment, and support other ecosystem services while maintaining structural needs.

As an innovative response aligned with this approach, and to create resiliency and ecosystem services within an existing armored shoreline, the City of San Diego Public Utilities Department (PUD), in partnership with the Port of San Diego, proposes a pilot project that would install eco-engineered shoreline support along the Sweetwater Flood Channel. In San Diego Bay, the Port successfully installed a similar pilot project along Harbor Island using EONcrete COASTALOCK interlocking tide pool units made from biologically enhanced concrete as an alternative solution to traditional armored shorelines. This project removed and replaced existing traditional riprap with a habitat friendly solution that increases biodiversity, productivity, and ecosystem services while continuing to provide the equivalent shoreline stabilization required for the area. EONcrete has developed a variety of technologies to provide sustainable solutions to coastal and marine infrastructure using a suite of bio-enhancing admixtures, science-based forms and liners, and complex textures and design features inducing biological growth of rich, diverse flora and fauna. In March 2021, the Port and EONcrete installed 150 linear feet of interlocking tide pool armor units, COASTALOCK (Figure 2), at two locations along Harbor Island to replace an existing riprap shoreline. These units were installed and oriented to mimic rocky intertidal habitat for local marine life. Following installation, post-construction biological and structural monitoring commenced to evaluate the performance and success of the tide pool armor units compared to traditional riprap. To date, the project has shown promising results exceeding initial expectations. Algae, shellfish and other marine life are creating a richer, diverse, and natural community with a lower ratio of invasive to native species among the COASTALOCK units compared to traditional riprap, and the shoreline is expected to be more structurally sound than traditional riprap as the biological growth forms an exoskeleton over time to further protect and support the units.

This SEP proposes a new pilot project to replace portions of existing riprap shoreline along Sweetwater Flood Channel with similar habitat friendly living shorelines that provide slope stability, increase biodiversity, habitat value, and resiliency while continuing to provide necessary shoreline protection. The proposed project consists of removing approximately 1,000 linear feet of existing riprap and replacing it with habitat friendly innovative living shorelines along the existing armored shoreline of the Sweetwater Flood Channel in San Diego Bay. Together the proposed SEP promotes restoration of aquatic ecosystems in accordance with R9-2015-0041 and furthers recovery of marine and wetland systems in accordance with the San Diego Water Board's Practical Vision. Although informed by the Harbor Island project location directly facing into San Diego Bay, this proposed SEP will demonstrate the ability to also improve habitat value and water quality in a different environment. The proposed location in south San Diego Bay is within the Sweetwater Channel which experiences significant recreational use (Pepper Park and an existing marina) and is adjacent to an operational waterfront (National City Marine Terminal) on the northern edge of the channel and natural marsh habitat along the southern edge of the channel.

The 1,000 linear feet is a conservative estimate of how much shoreline could be addressed given the funds available for this SEP. This is supported by precedent project(s) as well as an engineering cost estimate. It is a conservative estimate that incorporates current and expected material and construction costs. There could be an opportunity to increase the linear footage, or there could be reason to reduce the linear footage based on changing markets. Also, if cost estimates shift during the project, additional monitoring efforts could be funded with the remaining funds. The specific shoreline locations were selected for several reasons, including alignment with future planning initiative to expand Pepper Park, anticipated permitting pathways, navigational considerations and accessibility, in addition to the environmental considerations and opportunities. This SEP would complement proposed projects within the [National City Bayfront Projects EIR](#) and would provide additional information for future projects that are proposed. The Sweetwater channel also presents a unique opportunity for environmental benefits given the proximity to the marsh along the south channel shoreline, including nesting areas for endangered and protected species. A living shoreline at this location can bridge the needs for a developed landscape along the northern channel given the developed Pier 32 Marina, Pepper Park and National City Marine Terminal with the marsh habitat along the south side of the channel.

The section of the Sweetwater Channel that is east of I-5, is not within the Port's jurisdiction. While that section may have similar applicability for living shoreline replacement, it cannot be included within this SEP with the Port. There is a section just outside and north of the Sweetwater Channel, that is within the Port's jurisdiction, however the slope and material required in that section are not aligned with the typical rock revetment that is found within the Sweetwater Channel and what is at the Harbor Island site. It would require additional planning, designs, and costs to accommodate for the site-specific slope and conditions. The proposed project could consider other Port jurisdictional hardened shoreline locations including Harbor Island and/or Shelter Island, but the Port is recommending Sweetwater Channel for this SEP given its unique location to better inform future planning efforts for similar areas in San Diego Bay.

Marine habitat and shoreline stabilization are important for the protection of San Diego Bay's natural resources, including threatened and endangered species, water quality improvements, and providing a buffer against rising sea levels. San Diego Bay is the third largest natural bay in California and is highly urbanized, with five cities surrounding it: Cities of San Diego, National City, Chula Vista, Imperial Beach, and Coronado.

The scope of this SEP will be a collaboration between the Port and City of San Diego Public Utilities Department to protect the shoreline and create and enhance marine natural habitats along the Sweetwater Channel. This proposed project has environmental, structural and community benefits including: promotion of marine organisms and improved local ecosystems, coastal protection from storm surge, creation of an active carbon sink to help reduce greenhouse gases, improved local water quality, and engagement with Disadvantaged Communities (DACs) through recreational and environmental education opportunities. The Port will act as the Lead Agency for CEQA and facilitate the design, permitting, and implementation of the project. PUD will provide oversight of SEP requirements as well as participate in outreach efforts.

**Brief work plan containing tasks, deliverables, milestones, and schedule. The deliverables must include quarterly progress reports and a final completion report**

The Port will issue a request for proposals, for the design and development of plans and specifications for habitat friendly shoreline structures within the Sweetwater Channel that also provides structural support. The production of any habitat friendly shoreline structures would be completed off-site in conjunction with a contracted marine construction consultant. The removal of the existing riprap stones and the installation of the new structures would likely be completed from waterside by use of crane, barge, and support vessels (Figure 3). Design, planning and permitting is anticipated to take 12 months. Construction, including fabrication and installation, would be subject to public bidding in response to a public works contract. Once a contractor is selected, the fabrication would take approximately 1-2 months and installation of the habitat friendly shoreline structures could occur over a 2-3-month period accounting for optimal tidal conditions. Casting and installation phases can be overlapped for efficiency.

The proposed project would remove and replace approximately 1,000 linear feet of existing armored shoreline along the north and/or south shoreline of Sweetwater Channel (Figure 4). The existing riprap stone within the project footprint would be removed with the exception of leaving a few stones in place to lock in and support the foundation of the interlocking tide pool armor system. Upon removal of the existing riprap stones, the habitat friendly shoreline structures would be placed at each site with the use of a lifting crane and would be secured in place. The removed riprap would either be disposed of at an approved location or potentially reused for other stabilization or emergency Port projects.

This scope of work includes planning, permitting and environmental review, construction installation, and monitoring efforts including pre- and post-construction biological and structural evaluations.

Task and Deliverables		Schedule	Budget Estimate*
1	<p><b><u>Planning &amp; Design</u></b> Includes Port staff time to obtain permits</p>	Year 1	\$500,000 (overall)**
2	<p><b><u>Contractor Procurement and Installation</u></b> Includes obtaining marine contractor, casting &amp; curing shoreline structures, demolding, installing units</p>	Year 2	\$1,900,000 (overall)**
3	<p><b><u>Monitoring</u></b> 3a. Biological Monitoring</p> <ul style="list-style-type: none"> <li>• <i>Pre-Construction: Eelgrass survey, baseline water quality data collection, baseline biological survey, and baseline trash/debris evaluation including photo documentation</i></li> <li>• <i>Construction: On-site visual biological and water quality monitoring including photo documentation</i></li> <li>• <i>Post-Construction: Biological surveys to be completed annually (see details in Monitoring and Success Criteria section of application)</i></li> </ul> <p>3b. <u>Structural Monitoring</u></p> <ul style="list-style-type: none"> <li>• <i>Conducted annually</i></li> </ul> <p>Cost includes Port staff time to implement monitoring program</p>	Years 3 & 4	\$200,000 (overall)**
Total		4 years	\$2,600,000

\*City shall shift costs between components as necessary to fulfil the terms of the settlement agreement and complete required deliverables. Expenditures required for successful completion of activity will be allowed prior to final settlement agreement. The City understands funds expended towards these activities prior to final settlement is at the City's risk.

\*\*This is a conservative approximate cost provided by the Port that includes: staff hours, initial technical assessment for preliminary and baseline environmental and slope structure, engineering drawings (performance specs and plans), environmental review, permitting, etc. Funds, if not all used for this task, will be redistributed to scale the physical project such as additional monitoring opportunities.

**Total project cost and amount of SEP money requested. If there are other funding sources, indicate if the funds have been committed and whether there are any restriction on the funds**

Total project cost for this SEP is \$2,600,000. There are no additional funding sources for this project. The totals provided are conservative approximate costs based on order of magnitude cost estimates. For example, Task 1: Planning & Design includes Port staff hours, creation of engineering drawings (performance specifications and plan sheets), environmental review, permitting, etc. The cost estimate

for contractor procurement and installation accounts for potential market fluctuations in costs for materials and labor which will define the total linear footage to be installed for this project.

**Project readiness, including status of CEQA, permits, and landowner agreements**

The proposed project consists of removing approximately 1,000 linear feet of existing riprap and replacing it with approximately 1,000 linear feet of habitat friendly shoreline structure along the existing armored shoreline of Sweetwater Flood Channel in San Diego Bay. The proposed project requires a US Army Corps of Engineers (USACE) pre-certified Nationwide Permit (NWP) and corresponding Regional Water Quality Control Board (RWQCB) Clean Water Act Section 401 Water Quality Certification as part of the entitlement process. Eelgrass is located within the Sweetwater Flood Channel, however as the project footprint will be entirely within existing riprap, no impacts are anticipated. All construction efforts will avoid impacts to potential eelgrass habitat in the area. A pre-construction eelgrass survey will be completed prior to commencement of construction activities to identify potential eelgrass and unvegetated areas present adjacent to the shoreline. This survey and on-site observations will be used to inform construction activities during installation in order to avoid impacts to existing eelgrass that may be present in the project area.

The Harbor Island Project was determined to be Categorical Exempt per the CEQA Guidelines Section 15301 (existing Facilities), 15302 (Replacement or Reconstruction), 15304 (Minor Alterations to Land), and 15306 (Information Collections) and Sections 3.a (1), 3.b (1), 3.d (1)(2), and 3.f of the Port's Guidelines for Compliance with CEQA because the project involves the removal and temporary storage of existing revetment stones to be replaced with the installation of habitat friendly shoreline structures. The Port will make a separate determination on the proposed project pursuant to the California Environmental Quality Act (CEQA).

The Categorical Exemptions listed above are appropriate for the proposed project because the project involves the removal of existing revetment stones to be replaced with the installation of habitat friendly shoreline structure that would involve negligible or no expansion of use beyond that previously existing, would have substantially the same purpose and capacity as the structure being replaced, does not involve removal of mature or scenic trees, and does not result in a serious or major disturbance to environmental resources. The project would not result in any significant cumulative impacts from the installation or monitoring. The project will have no dredging or fill impacts and will not cause any disturbance to sensitive species or habitat.

The proposed project complies with Section 87 of the Port Act, which allows for the establishment, improvement, and conduct of a harbor, and for the construction, reconstruction, repair, maintenance, and operations of wharves, docks, piers, slips, quays, and all other works, buildings, facilities, utilities, structures, and appliances incidental, necessary, or convenient, for the promotion and accommodation of commerce and navigation. The Port Act was established by the California Legislature and is consistent with the Public Trust Doctrine. Consequently, the proposed project is consistent with the Public Trust Doctrine.

**Expected benefits or improvements to water quality or beneficial uses**

The Port of San Diego is actively pursuing innovative alternatives to traditional armored shorelines that improve local water quality, create diverse habitat with additional ecosystem services, and enhance resiliency to climate change and flooding associated with sea level rise. In March 2021, the Port of San Diego launched a pilot project along the shoreline of Harbor Island that replaced existing riprap with EConcrete COASTALOCK tide pool armor units to determine if this alternative to hardened shoreline would create additional habitat within the Bay. Relying on lessons learned from the EConcrete project at Harbor Island, this SEP will use similar planning, implementation, and monitoring to improve habitat and local biodiversity, water quality, and resiliency while maintaining the existing structural requirements within the Sweetwater Channel.

Traditional riprap and hardened shoreline structures have historically prioritized structural integrity only. This proposed project will demonstrate an alternative solution that provides equal to or greater structural integrity while creating and enhancing local habitat value and resiliency. The proposed project would provide increased or similar shoreline stabilization compared to existing riprap while simultaneously creating a well-defined local ecosystem. The biological growth on the project over time creates an exoskeleton that protects the shoreline, leading to increased strength and land longevity in comparison to traditional riprap.

The proposed habitat friendly shoreline structures will provide stabilization, while simultaneously creating a well-defined local ecosystem that mimics natural rocky intertidal habitat, as well as increase local biodiversity and biological productivity. Any proposed shoreline replacement system should add water retaining features which are absent in most urban waterfronts. Water retention mimics natural rock pools and increases local biodiversity and biological productivity. The proposed shoreline structures would contribute to a structurally sound waterfront that provides interactive public spaces and promotes growth of marine organisms that enhance durability, restore local ecosystems, boost local habitat value, and perform as an active carbon sink.

Habitat friendly shoreline structures will install hardscape structures that will encourage the establishment of plants and animals. Bank stabilization, erosion prevention, and boating & fishing activities would benefit from the habitat friendly shoreline structures in addition to the structures encouraging the establishment of softscape elements that are fluid and change as they mature which would create new local biodiversity and productivity where it wasn't before.

Any habitat friendly shoreline structures will be required to be tailored to the environment which they are installed. Features in the design structure will provide a favorable environment in which to grow a rich diversity of species beneficial to the Bay.

The location of the project supports the goals of the San Diego Bay Integrated Natural Resources Management Plan ([INRMP, Port of San Diego & Naval Facilities Engineering Command, 2013](#)). INRMP is a long-term, collaborative strategy for managing the bay's natural resources, and the primary means by which the US Navy and Port jointly plan natural resources work in San Diego Bay. Habitat friendly shoreline structures support the INRMP objectives by:

- Improving habitat value of developed shorelines and marine structures and their functional contribution to the ecosystem.
- Providing data on habitat friendly shoreline structures while meeting engineering requirements.
- Refitting developed shorelines and existing structures to enhance habitat value.

**Is the project located within, or does it benefit, an Environmental Justice community, a Disadvantaged Community, or a community that has a financial hardship? If yes, describe**

Sweetwater River and San Diego Bay have within a 5-mile radius approximately 70 disadvantaged communities and approximately 70 severely disadvantaged communities (see Figure 5; cited from the California Department of Water Resources DAC Mapping Tool).

San Diego Bay provides free public access and free parking year-round for many uses including fishing, water sports, picnicking, paths and trails, and boat ramps. Uses are supported with maintained landscaping and lawns, trash removal, boat docks and launching facilities, restrooms, and developed play areas. The north shoreline of Sweetwater Channel abuts Pepper Park, which is a 5.5-acre bayside park that includes a public fishing pier, playground, and a public boat ramp, as well as the National City Aquatics Center. Pier 32 Marina is also located on the north side of Sweetwater Channel and provides boat docking and other boater amenities. The south side of Sweetwater Channel abuts salt marsh habitat and upland terrain used by several threatened and endangered species including annual nesting site for the endangered California least tern. Replacing portions of riprap along Sweetwater Channel will provide direct benefits to local habitat, add resiliency, and create opportunities for engagement adjacent to publicly used areas.

**Will this project further the State Water Board's core value of the human right to water? If yes, describe**

Not applicable to this project.

**Optional Information provided below**

**Whether this project is resilient to climate change and conforms with State Water Board Resolution No. 2017-0012, Comprehensive Response to Climate Change**

The project is located in a vulnerable area, exposed to future sea level rise. Climate models project that sea level in the San Diego region will rise 5 to 14 times faster over the course of this century than it did during the previous 100 years, increasing the risks of flooding and erosion. Impacts will be greatest during coastal storms, when storm surge occurs on top of higher sea levels (State Land Vulnerability Assessment, City of San Diego 2019). The proposed project consists of removing approximately 1,000 linear feet of existing riprap and replacing it with habitat friendly shoreline structures along the existing armored shoreline of Sweetwater Flood Channel in San Diego Bay.

The INRMP sets forth a long-term vision and strategy sponsored by two of the major managers of the San Diego Bay: the U.S. Navy and Port. Its intent is to provide direction for the good stewardship that natural resources require, while supporting the ability of the Navy and Port to achieve their missions and continue functioning within San Diego Bay. The ecosystem approach reflected in the INRMP looks at the interconnections among all the natural resources and human uses of the Bay and across ownership and



jurisdictional boundaries. San Diego Bay is viewed as an ecosystem rather than as a collection of individual species or sites or projects. The INRMP Top Nine Highest Priority Projects, a Technical Advisory Committee identified by consensus, includes sustainable shoreline structures and habitat enhancement with the goal of improving the habitat value of shoreline infrastructure through innovation in construction, experimentation, demonstration projects, education, and interdisciplinary design criteria. The Port has already completed two living shoreline/habitat enhancement projects including the installation of EConcrete along Harbor Island and Native Oyster Living Shoreline along the Chula Vista Wildlife Reserve. The Port is actively pursuing additional innovative shoreline solutions throughout the Bay that respond to existing site conditions, opportunities, and constraints.

Approximately 80% of existing shorelines around San Diego Bay are armored and hardened. While there are other locations within the San Diego Bay that this project could address, the proximity to the marsh along the south channel shoreline, including nesting areas for endangered and protected species, creates a unique opportunity to bridge the needs for a developed landscape along the northern channel (Pier 32 Marina, Pepper Park, and National City Marine Terminal) with the marsh habitat along the south side of the channel.

The habitat friendly living shoreline units proposed for this project rely on a bio-additive combined with supplementary cementitious materials that balances the pH and reduces the amount of cement normally used in marine engineering construction, which in turn reduces the carbon footprint. Other advantages include increasing the micro and macro surface roughness of the units to allow for higher biological recruitment by mimicking the design to natural tidepools to allow for habitats to be established where there were none before. By enhancing the biological productivity and ecological value of the current hardened shoreline of Sweetwater Channel, we can reduce its ecological footprint and utilize it as an urban nature zone as opposed to an urbanized-industrial area and still maintain the structural stability of the slopes and the channels purpose as a flood control channel.

This is a nature-based innovative solution to an existing armored shoreline. With the growing trends of coastal hardening and expansion of coastal cities as well as global climate change and increases in sea-level rise, revisions to the current coastal defense measures need to be implemented. The modifications to the composition and surface texture of concrete used in the proposed coastal armor units aim to facilitate marine growth and enhance biogenic buildup. The project will result in improved local habitat and biodiversity, enhanced opportunity for carbon sequestration, added resiliency, and additional ecosystem services while retaining the necessary structural stabilization.

**Whether this project can be the basis for additional funding from other sources**

Local and regional funds can be used as a match source for other sources of funding, dependent on the criteria of those funders. The INRMP, sets forth a long-term vision and strategy sponsored by two of the major managers of the San Diego Bay: the U.S. Navy and Port of San Diego (Port). Its intent is to provide direction for the good stewardship that natural resources require, while supporting the ability of the Navy and Port to achieve their missions and continue functioning within San Diego Bay. The ecosystem approach reflected in the INRMP looks at the interconnections among all of the natural resources and human uses of the Bay and across ownership and jurisdictional boundaries. San Diego Bay is viewed as an ecosystem rather than as a collection of individual species or sites or projects. The INRMP Top Nine

Highest Priority Projects, a Technical Advisory Committee identified by consensus, includes Sustainable Shoreline Structures and Habitat Enhancement with the goal of improving the habitat value of shoreline infrastructures through innovation in construction, experimentation, demonstration projects, education, and interdisciplinary design criteria. Approximately 80% of existing shorelines around San Diego Bay are armored with hardened shoreline and this pilot project will assist the Port in identifying the success of nature-based solutions in future development projects throughout the San Diego Bay.

**Whether this project is required by another entity or agency**

The proposed project is not work required by any other entity. This project aligns with the intent of the jointly developed Integrated Natural Resource Management Plan and aims to create a living shoreline that will improve the health and resiliency of San Diego Bay.

The goal of the supplemental planning effort proposed by this SEP is to further the restoration goals for the Port of San Diego.

**Whether this project has monitoring, success criteria, or other tools to track long-term success**

Prior to installation, a baseline biological survey will be conducted that will document native & non-native species coverage and baseline water quality parameters. An Eelgrass survey will also be conducted prior to work beginning. Once installation is completed, post-construction biological, structural, and water quality monitoring will be conducted annually. If funding and scheduling needs shift after year 1, and additional monitoring can be covered, the project will include additional monitoring efforts (e.g. every 6 months or annually for an additional year). Each sampling event will include dive surveys to evaluate the structures. Biological productivity monitoring success criteria will include species richness, biodiversity, recruitment, and biological build up. Standardized ecological surveying techniques will be used to monitor indicators and track growth (Figures 6, 7, and 8). Data collection during each monitoring event will include the entire exposed surface area of the structures. The following data will be collected which includes:

- Percent of overall cover – this includes listing recruitment of native species vs non-native species vs invasive species.
- Percent cover of encrusting species (sponges, tunicates, bryozoans, etc.).
- Count of solitary organisms of taxonomic groups which cannot be qualified by the above methods (turf algae cover, coralline algae, Serpullidae, and Sabellidae worms, etc.) following an index of:
  - o 0 – absent
  - o 1 – sparsely scattered
  - o 2 – densely scattered
  - o 3 – densely uniform.

Species will be identified to the lowest taxonomic level possible in the field and, if necessary, samples will be taken for laboratory identification. All samples will be photographed using underwater cameras to assist in the identification process. Species will be classified by status as follows:

- Native Species – a species or lower taxon living within its natural range (past or present), including the area it can reach and occupy using its natural dispersal systems.

- Non-Native Species – a species that has been introduced into an area where it does not occur naturally but may not cause ecological or economic harm to the ecosystem.
- Invasive Species – a species that causes ecological or economic harm in a new environment where it is not native.
- Cryptogenic Species – a species whose origins are unknown.
- Mobile Species – a species that move across wide areas and is not settled on the substrate.
- Calcifying Species – a species that deposit calcium carbonate skeleton in its subsurface.

Water quality will be monitored within the sample structures and control site on existing riprap, one (1) foot below the water surface at low tide. Water quality measurements, using hand-held probes, include pH, dissolved oxygen, turbidity, temperature, salinity, conductivity, and trash/debris. While trash/debris is not a large concern on the project due to tidal flushing, a visual survey will be conducted along with the water quality monitoring to note presence/absence of trash/debris.

Sampling methods for the data collection include rows (upper, middle, lower), randomly selecting representative structures, and taking samples from the outer and inner surfaces using a sampling sheet (Figure 9), as well as capturing images. Both control and sample structures will be sampled at the same corresponding tidal height

Structural performance will be monitored and evaluated on an annual basis. Monitoring of the structural performance will include:

- The physical condition
- The condition of the structure as a whole (i.e., sliding, sinking, or displacement)
- The surrounding project area (toe, left and right flank, and upland areas)

The results from each monitoring effort will be summarized in a report that will include photo documentation.

To detect spatial and temporal differences over the post-construction monitoring period, as well as differences between the structures and the control sites, a statistical examination of the gathered data will be conducted to determine whether there is an observed “significant statistical difference”. This will include similarity and diversity indices as well as permutational tests using statistical software (PRIMER).

The six main parameters that will be evaluated are:

1. Species diversity
2. Species abundance
3. Species richness
4. Biogenic build-up
5. Community structure
6. Native Species Recruitment

Due to this project being a pilot project, it will be considered successful in that the data collected and lessons learned on the project will be utilized in guiding and advising future shoreline projects for the Port.

Using the Harbor Island project as a baseline for this project, it should be noted that the proposed SEP site differs in location, orientation, wave impacts, water depths, and other environmental conditions compared to Harbor Island that could possibly lead to varying recruitment, establishment, and habitat value over time. However, an alternative habitat-friendly shoreline such as EConcrete or equivalent would almost certainly improve habitat value, boost resiliency, and support additional ecosystem services that are not currently present with the existing rock revetment.

The INRMP Section 2.3.2 Hydrology states that construction of dams and extensive groundwater use in the Sweetwater and Otay drainages has reduced the already ephemeral input from the Otay and Sweetwater rivers by 76%. Freshwater input is now limited to surface runoff from urban areas. The INRMP also states that San Diego Bay receives no significant amount of fresh water for approximately nine months of the year. Evaporation approximately balances the freshwater input from all sources over the course of the entire year. During the summer, evaporation rates are higher than precipitation and freshwater inflow, which can cause the South Bay to become hypersaline (which the Sweetwater Marsh unit of the NWR is both a seasonally hypersaline region and seasonally estuarine region). Due to the Sweetwater Marsh unit of the NWR being permanently open to tidal flushing, this area can support a high diversity of salt marsh plant species (such as cordgrass, annual pickleweed, and saltwort) that are generally absent from nontidal wetland systems. In conducting due diligence, Port staff recently conducted water quality measurements at the existing EConcrete Harbor Island location, the mouth of the Sweetwater Channel, and two locations within the Sweetwater Channel adjacent to where the proposed SEP footprint would be. Measurements were collected for temperature, pH, conductivity, turbidity, salinity, density, and total dissolved solids. All water quality parameters were found to be similar between the locations. Salinity (measured in ppt) readings ranged between 29.8 ppt and 31.1 ppt, indicating that baseline water quality in the proposed SEP location is similar to water quality measured at the existing Harbor Island location. Data collected can be provided upon request.

The INRMP is a long-term, collaborative strategy for managing San Diego Bay’s natural resources, and the primary means by which the US Navy and Port jointly plan natural resources work within the bay. In the INRMP, seven major initiatives are laid out to help attain the plan’s goals and objectives, one of which is invasive species detention and response. The basic framework for management strategy within San Diego Bay regarding invasive species is prevention, monitoring & early detection, rapid response & eradication, long-term control & management, education & outreach, restore high-value ecosystems across scales, and organizational collaboration. These form the foundation of management actions described in the INRMP. INRMP also contains a comprehensive species list of what species are found within San Diego Bay (Appendix C of INRMP) and expected recruitment within the channel can be found in this Appendix. Below is a table (Table 2-47) from INRMP that lists the invasive aquatic species found in San Diego Bay that will be carefully monitored as part of this pilot project.

<b>Marine Alga</b>	
<i>Caulacanthus ustulatus</i> red algae	<i>Sargassum muticum</i>
<i>Lomentaria hakodatensis</i> red algae	<i>Undaria pinnatifida</i> wakame-brown kelp
<b>Protozoans</b>	
<i>Lobochona prorates</i>	

Cnidaria	
<i>Bunodeopsis</i> sp. anemone	<i>Obelia</i> sp.
<i>Diadumene lineata</i> anemone	<i>Tubularia crocea</i> naked hydroid
<i>Gonothyrea clarki</i>	
<b>Ectoprocta: Moss Animals</b>	
<i>Amathia convoluta</i> wool bryozoan	<i>Tricellaria gracilis</i>
<i>Bowerbankia imbricata</i>	<i>Watersipora arcuata</i>
<i>Bugula stolonifera</i>	<i>Watersipora</i> sp. A
<i>Cryptosula pallasiana</i>	<i>Watersipora subtorquata</i>
<i>Rhynchozoon bispinosum</i>	<i>Zoobotryon verticillatum</i>
<i>Schizoporella unicornis</i>	
<b>Polychaetes</b>	
<i>Branchiosyllis exilis</i>	<i>Nicolea</i> sp. A Harris
capitellid ( <i>Capitella</i> "capitata")	<i>Polydora ligni</i> spionid
<i>Eteone aestuarina</i>	<i>Pseudopolydora</i> spionid worm
<i>Marphysa sanguinea</i> eunicid	<i>Seudopolydora paucibranchiata</i> spionid
<i>Myrianida pachycera</i>	<i>Typosyllis nipponica</i> syllid worm
<i>Neanthes acuminata</i> nereid	<i>Vermiliopsis infundibulum</i>
<b>Sponges</b>	
<i>Haliclona</i> sp.	
<b>Crustaceans: Cirripeds</b>	
<i>Amphibalanus amphitrite</i> acorn barnacle	
<b>Crustaceans: Maxillopods</b>	
<i>Oithona davisae</i>	<i>Pseudodiaptomus marinus</i>
<i>Oithona similis</i>	
<b>Crustaceans: Ostracods</b>	
<i>Aspidoconcha limnorica</i>	<i>Redekea californica</i>
<b>Crustaceans: Amphipods</b>	
<i>Ampithoe valida</i>	<i>Eochelidium</i> sp. A
<i>Aoroides secundus</i>	<i>Grandidierella japonica</i>
<i>Caprella acanthogaster</i> skeleton shrimp	<i>Jassa marmorata (falcata)</i>
<i>Caprella scaura</i> skeleton shrimp	<i>Monocorophium</i> gammarid amphipod
<i>Chelura terebrans</i> gammarid amphipod	<i>Podocerus brasiliensis</i>
<i>Corophium acherusicum</i>	<i>Pontogeneia rostrata</i> gammarid amphipod
<i>Corophium heteroceratum</i>	<i>Stenothoe valida</i>
<i>Corophium uenoi</i>	
<b>Crustaceans: Isopods</b>	
<i>Iais californica</i>	<i>Paranthura japonica</i>
<i>Limnoria tripunctata</i> gribble	<i>Sphaeroma quoyanum</i>
<i>Limnoria quadripunctata</i> gribble	<i>Sphaeroma walkeri</i>
<i>Munnogonium wilsoni</i>	
<b>Crustaceans: Decapods</b>	
<i>Palaemon macrodactylus</i> Oriental shrimp	
<b>Crustaceans: Tanaidacea</b>	
<i>Sinelobus stanfordi</i>	<i>Tanais</i> sp.

<b>Molluscs</b>	
<i>Arca transversa</i>	<i>Tapes semidecussata</i> Japanese littleneck
<i>Catrina rickettsi</i> nudibranch	<i>Geukensia (Modiolus) Ischadium demissum</i> * Atlantic ribbed mussel
<i>Lyrodus pedicellatus</i> southern shipworm	<i>Mytilus galloprovincialis</i> common mussel
<i>Musculista senhousia</i> Japanese mussel	<i>Teredo navalis</i> shipworm
<i>Ostrea edulis</i> European flat oyster	<i>Theora fragilis (lubrica)</i>
<b>Tunicates</b>	
<i>Ascidia</i> sp.	<i>Microcosmus squamiger</i>
<i>Ascidia zara</i>	<i>Molgula ficus</i>
<i>Botrylloides diegensis</i>	<i>Polyandrocarpa zorritensis</i>
<i>Botrylloides perspicuum</i>	<i>Styela canopus</i>
<i>Botrylloides violaceus</i>	<i>Styela clava</i>
<i>Botryllus schlosseri</i>	<i>Styela plicata</i>
<i>Ciona intestinalis</i>	<i>Symplegma brakenhielmi</i>
<i>Ciona savignyi</i>	<i>Symplegma reptans</i>
<i>Diplosoma listerianum</i>	
<b>Marine Fish</b>	
<i>Acanthogobius flavimanus</i> yellowfin goby	<i>Poecilia latipinna</i> sailfin molly
<i>Lucania parva</i> rainwater killifish	<i>Morone saxatilis</i> striped sea bass
<i>Tridentiger trionocephalus</i> chameleon goby	<i>Dorosoma petenense</i> threadfin shad

**Applicant's ability/authority to receive and distribute funds:**

If funded, the Board of Port Commissioners will need to adopt a resolution agreeing to enter into an agreement with the City of San Diego to implement the proposed project and accept funds. Both the City of San Diego and Port of San Diego have been recipients of SEP and grant funds and have successfully completed their projects, as proposed.

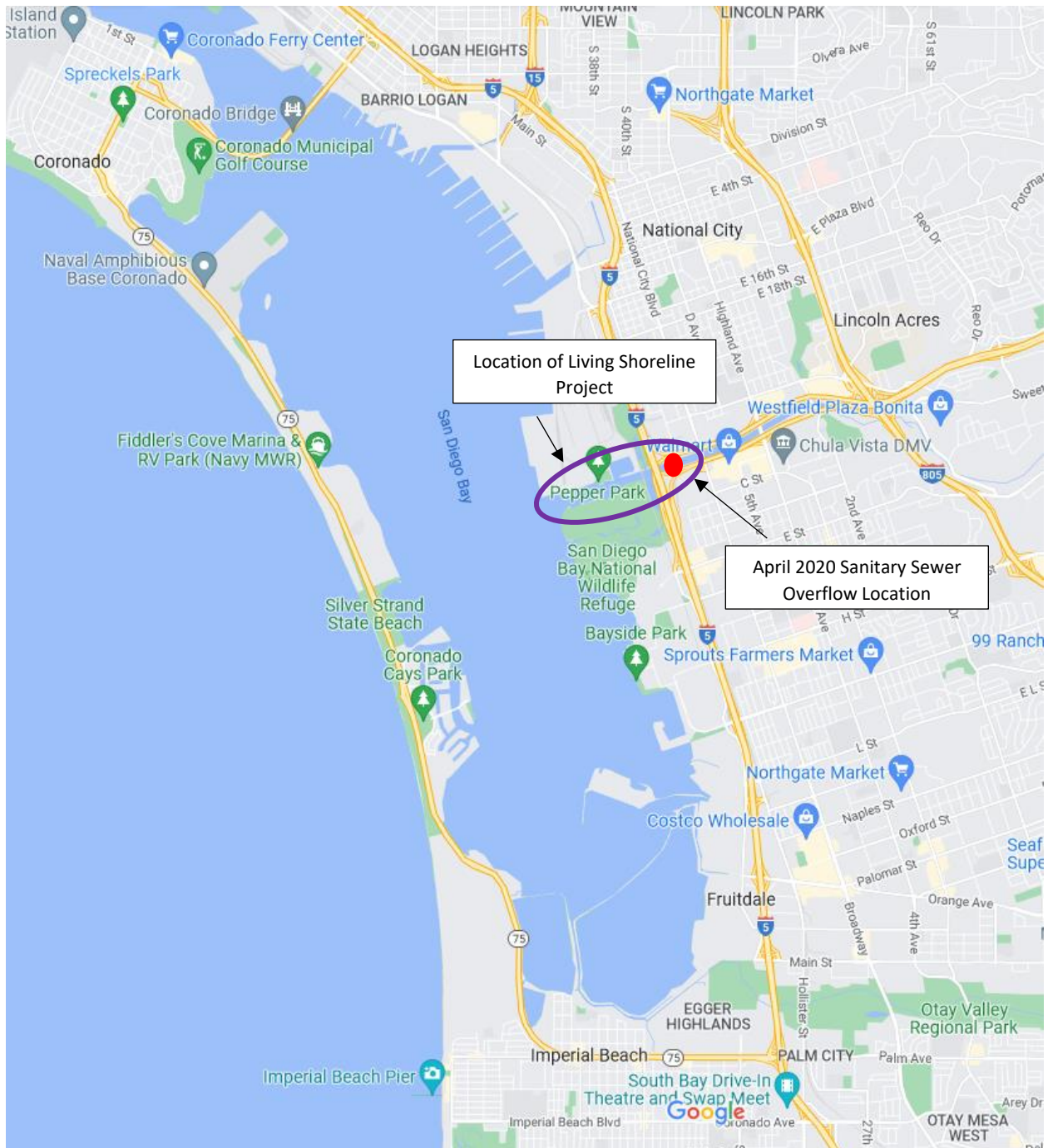
The City has the ability to receive and distribute funds that are necessary to operate and conduct business. The City Charter states: *"The Treasurer shall receive, have the custody of, and disburse City moneys upon the warrant or check-warrant of the Chief Financial Officer under the provisions of section 53911 of the Government Code of the State of California."* Per the San Diego City Charter, the City has the power to assess taxes, make appropriations, set budgets, and distribute funds, including the power to appropriate and distribute funds to cover the costs of the proposed project.

The Public Utilities Department provides water, wastewater, and recycled water services to approximately 1.4 million water customers and 2.3 million wastewater customers within the San Diego region. The Department's Capital Improvement Program (CIP) supports the infrastructure for reliable water supply and wastewater collection and treatment. These efforts are supported through an annual budget for operating funds and Capital Improvement Program funds for the current year.

## ATTACHMENT C

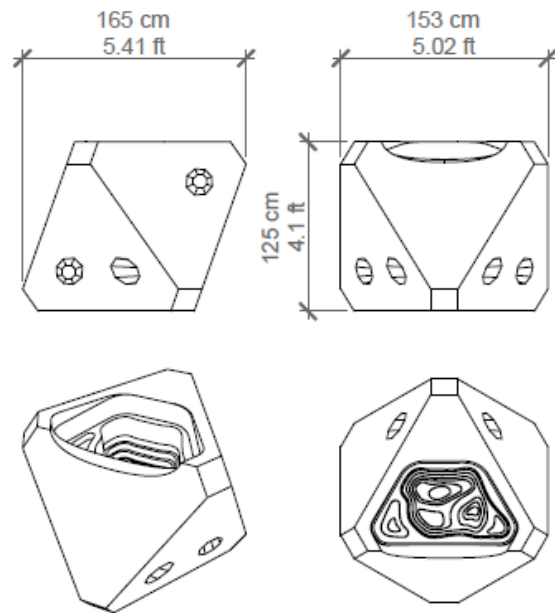
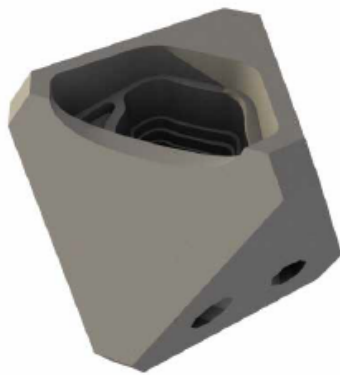
The Sewer System holds AA and AA+ ratings and stable outlooks from Fitch and S&P, respectively, and has a strong liquidity position with an estimated 468 Days of Cash as of June 3, 2020. The Sewer System rating reports also confirm that the system's risk profile is extremely strong and *"has ample capacity for average and peak demand, stable and predictable revenue from the Municipal collection service, comprehensive asset management practices, and a good operations management framework"*.

The Port has an established record of completing wetlands and other water quality improvement projects in coordination with the San Diego Regional Water Quality Control Board including the installation of the Native Oyster Living Shoreline Project, removal of over 350 tons of debris from the former A-8 Anchorage; restoration and enhancement of 280 acres of wetlands at the Chula Vista Wildlife Reserve and Ponds 10, 10A and 11 in the South Bay Refuge, creation of 11 acres of mitigation wetlands at the D Street Fill, and the construction of the Sweetwater Bike and Pedestrian Path, to name a few.



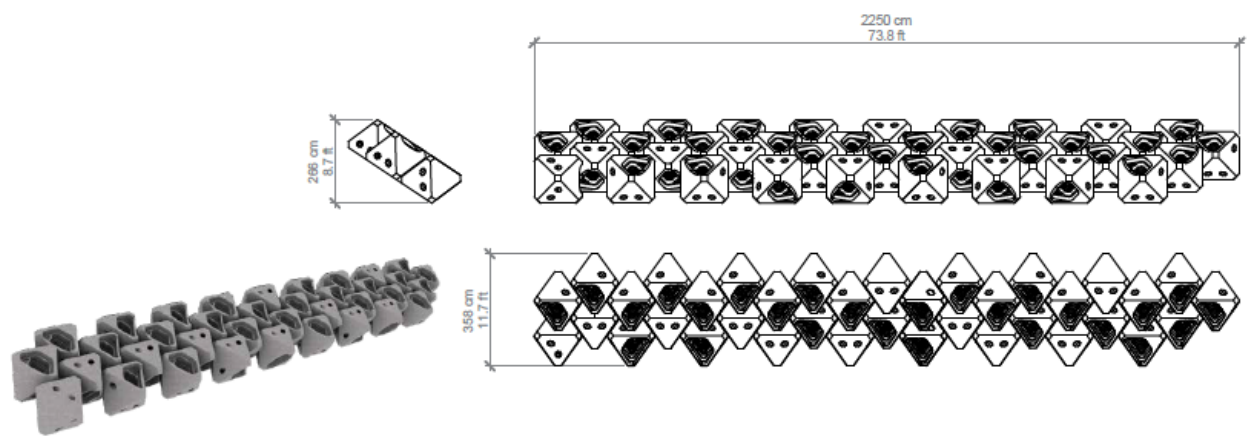
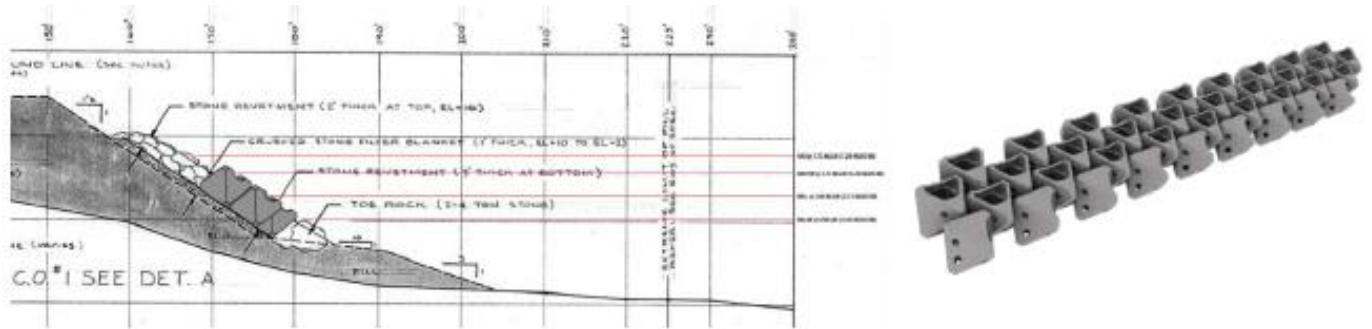
**FIGURE 1: Vicinity Map**



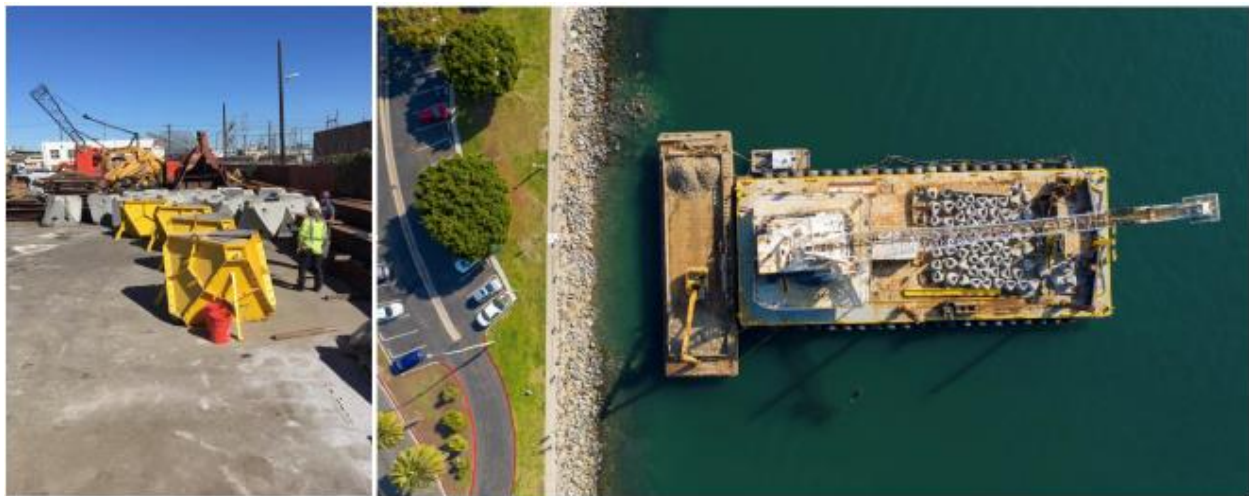


Unit Volume (liters)	Unit Volume (cubic yard)	Unit Mass (lb)	Unit Mass (kg)
1420	1.85	7200	3266

**FIGURE 2: COASTALOCK Units**

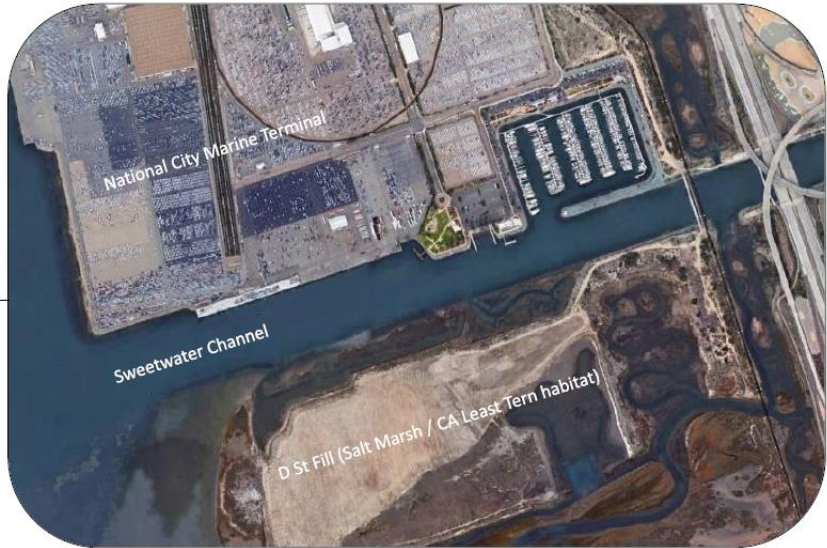


Cluster Volume (cubic yard)	Cluster Area (ft <sup>2</sup> )
64.56	863.4

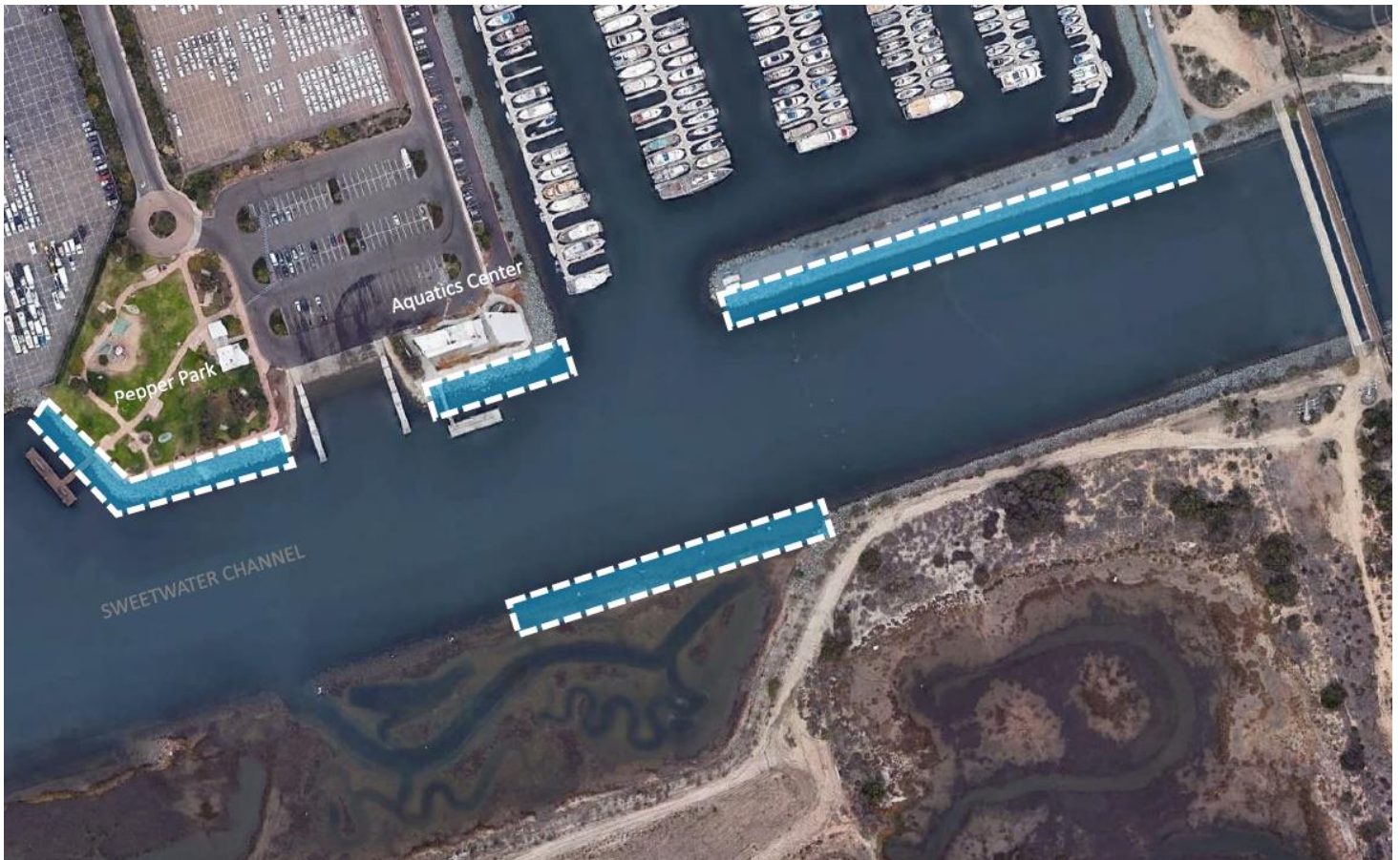


**FIGURE 3: COASTALOCK Installation Example**





Proposed location: Sweetwater Channel in South San Diego Bay





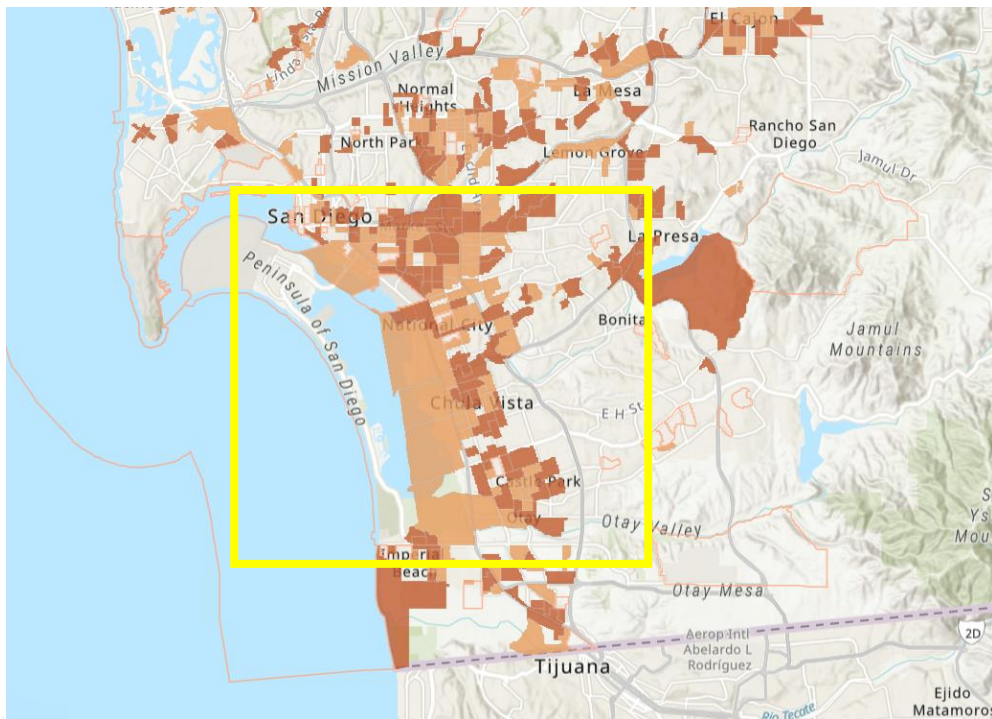
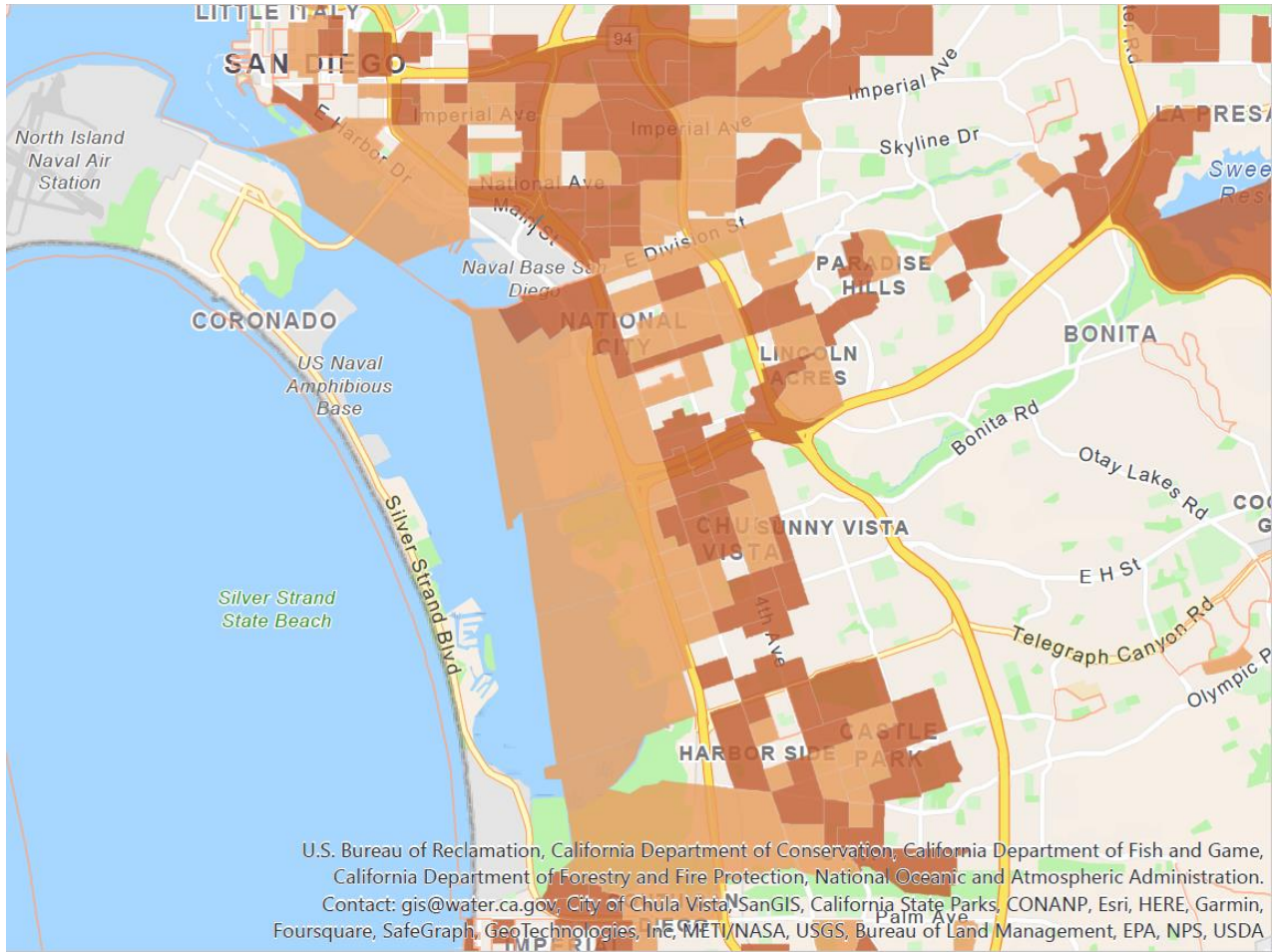
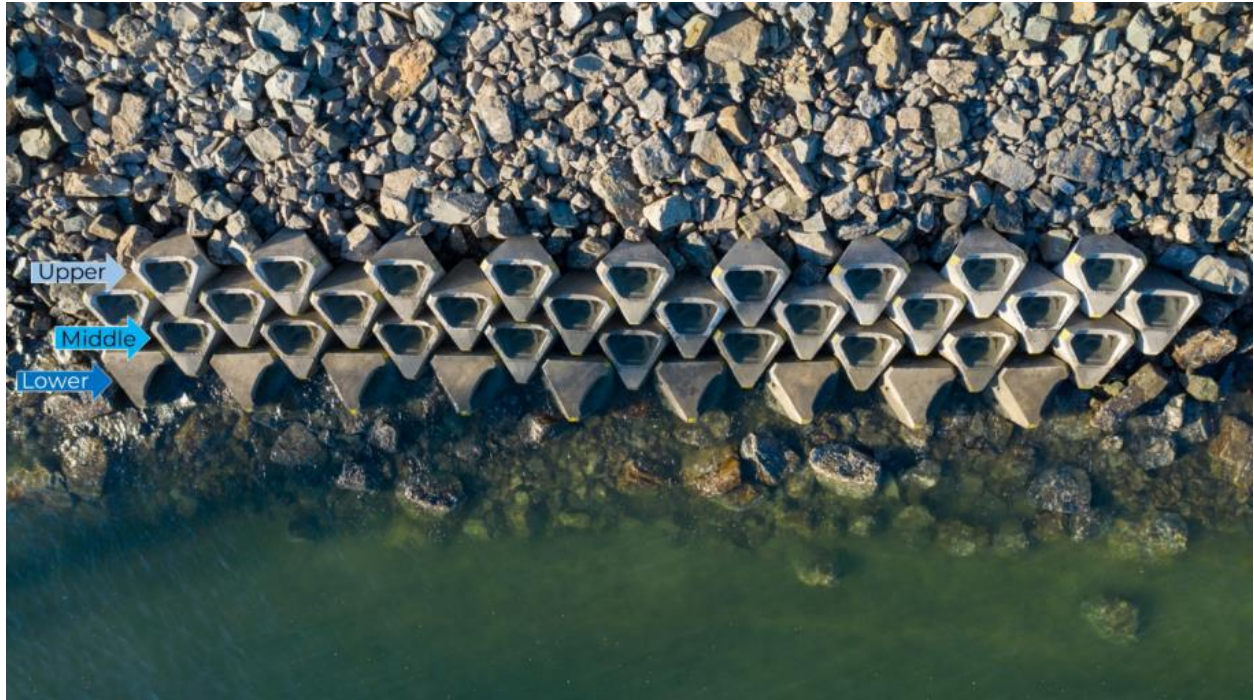


FIGURE 5: DAC Map







**FIGURE 7: Harbor Island – 8 Month Biological Growth (First Monitoring Report)**





Before  
Deployment

12 Months  
Post Deployment



FIGURE 8: 12 Month Growth Example



Project Location: Port of San Diego		Survey Type:		Site #: 1 / 2 / Control	Rep #: 1 / 2 / 3
Date: 11/18/21	Time:	Tidal Height: Upper / Middle / Lower		Surveyor: TTT	

TAXA	Outer ✓	Cavity ✓	Lifting Holes ✓	Notes
Green Algae [I]	2	1	1	VLVA
Brown Algae [I]	3	3	2	BUSH SARA RVR
Red Algae [I]				
Turf algae [I]				
Coralline algae [I]		1	1	BRACE PLAT
Sponges [I]	1	2	2	ORANGE YELLOW white
Bryozoans - Enc [%]	5	10		
Bryozoans - Bran [I]				
Tunicates - Col [%]	3			ORANGE YELLOW
Tunicates - Sol [#]	3	2	3	TEST
Spirorbid [I]	2	1	1	
Serpulidae [I]	1	1	1	
Dasychone [#]				
Sabellidae [#]				
Oysters [#]	46	20	10	ALGAE COVERS THE OYSTER
Bivalves [#]	1	1	1	
Barnacles [M]	1	1	1	
Hydrozoa [#]				
Anemone [#]				
Limpet [#]				
Gastropods [#]		1	1	
Fish [#]				
Decapoda [#]				
HR collection	1	3	11	11/18/21 SARA

Additional Notes:

18 Nov 2021

