

I. DESIGN FAQ

Please contact the NYS Governor's Office of Storm Recovery (GOSR) for any questions about the implementation of Living Breakwaters: info@stormrecovery.ny.gov

1. What are "breakwaters?"

"Breakwaters" are physical structures partially submerged in water. They are designed to break waves, dissipate wave energy, and slow the movement of water in order to reduce shoreline erosion and prevent wave damage onshore.

2. Why are these breakwaters called "living" breakwaters? How do the breakwaters provide habitat?

In addition to breaking waves and reducing shoreline erosion, the breakwaters have been designed to include features that will increase habitat and enhance the aquatic ecosystem.

These features include "reef ridges"—rocky protrusions on the ocean-facing sides of the breakwaters—and "reef streets"—the narrow spaces between the reef ridges—that create opportunities for refuge (hiding) and foraging (feeding) for a variety of fish and other aquatic species. This habitat diversity is further enhanced on the reef ridges through greater variation in rock sizes and the spaces between them, as well as ecologically enhanced concrete armor units and tidepools.

The ecologically enhanced concrete armor units are included on the reef ridges and other portions of the breakwaters below high tide and are specially designed to promote biological activity and recruitment of marine species. This is achieved through both the specialized concrete mixture and the design of the textured surfaces of the units. The State is developing plans for oyster restoration with the [Billion Oyster Project](#) (BOP) after construction is complete.

Together, all of these features will help the breakwaters provide the kind of "structured" habitat for marine species that was historically provided by features like oyster reefs in this area of Raritan Bay—reefs that are no longer present.

3. How will the breakwaters incorporate oyster restoration?

Once the construction of the breakwaters is complete, the Billion Oyster Project (BOP) would install live oysters on the structures. Techniques for this may include placing spat (baby oysters) on some of the ecologically-enhanced concrete armor units; installing oyster gabions (wirework cages filled with seeded oyster shells); placing spat on oyster shell in the "reef streets;" and in-situ setting pilots.

4. What are the living breakwaters made of?

These breakwaters are rubble mound structures made largely of stone. They have a base layer consisting of bedding stone to prevent scour; a stone core; and a two-layer-thick outer armor layer consisting of a combination of armor stones and ecologically-enhanced concrete armor units.

The ecologically-enhanced armor units are located in the intertidal and subtidal areas of the breakwaters and are specifically designed to create a range of habitat spaces for oysters, fin fish and other marine species, achieved through a specialized concrete mixture and the textured surface of the units.

In addition to the main breakwater segment, the structures will also include “reef ridges” (rocky protrusions on the ocean-facing side of the breakwaters) and “reef streets” (the narrow spaces between the reef ridges). These features diffuse wave energy while also creating a diversity of habitat conditions for a range of marine species.

5. Why Staten Island?

The community of Tottenville, NY was hit particularly hard by Superstorm Sandy in 2012—taking lives and damaging homes, businesses and accelerating existing shoreline erosion. Due to its location at the Southern point of Staten Island, it is particularly at risk from future events intensified by climate change—including sea-level rise, storm surge and coastal erosion.

Tottenville was once protected by a wide coastal shelf and series of near-shore oyster reefs that, in turn, supported a thriving oyster farming industry, dubbed “The Town the Oyster Built.” Over time, the oyster reefs collapsed due to siltation, overharvesting, channel dredging and human pathogens in the water. As a result of this reef collapse, Staten Island is now exposed to wave action and coastal erosion, lacking the protective buffer the reefs provided and the rich, biodiverse habitat space they offered to marine species.

6. What is “social resilience?”

“Resilience” is the ability of a system to cope with and adapt to sudden shocks and persistent stressors—often used in the context of the impact climate change and climate-intensified storms have on human and natural systems. “Social resilience,” by extension, is the same concept applied to communities. (i.e.,....).

7. How did the concept of “social resilience” tie into the engagement process?

As a core part of the Living Breakwaters project, GOSR and the SCAPE team developed an approach to social resilience across the South shore communities of Staten Island. This meant engaging and working with partners through the design process, but also ensuring that the breakwaters provide opportunities for education and raise awareness of coastal risk and resilience and harbor ecosystem health once constructed.

This has informed traditional engagement as part of the project—open houses, informational sessions, community meetings, focus groups, charrettes and more—as well as less traditional engagement methods such as shore tours, pop-up engagement booths, site-specific installations, exhibitions, virtual reality (VR) experiences and digital outreach.

In 2015, GOSR assembled a [Citizens’ Advisory Committee](#) (CAC) to provide regular input on the Living Breakwaters project as it advanced. The CAC is comprised of local and regional stakeholders representing the diverse communities of Staten Island; all meetings were open to the public. This committee was intended to serve in an advisory role, not replace direct public engagement events and workshops, which also occurred in parallel throughout the duration of the project.

Over several years, GOSR and the SCAPE team also collaborated with the Billion Oyster Project (BOP) to develop classes and field trips for Staten Island schools, educating local students about 101 concepts related to coastal resilience, climate change and the Living Breakwaters project. One outcome of this process is an open-access STEAM curriculum jointly developed by SCAPE and BOP that can be used by teachers in their classes for years to come. [The Living Breakwaters Curriculum can be accessed here.](#)

8. How did GOSR arrive at the final configuration of breakwaters?

The team of engineers and architects on the SCAPE team undertook a design process, studying various scenarios for the dimensions, location, and number of the breakwaters along the Tottenville shoreline.

This process included extensive hydrodynamic modeling and engineering analysis by Arcadis and COWI that included computer modeling of shoreline change, wave movement, water circulation, and localized water circulation around the breakwaters, as well as physical modeling of scaled models of the breakwaters to confirm their structural stability under different conditions. The configuration was also informed by detailed data collection on site conditions; existing resources; and the environmental impact analysis prepared by GOSR.

These analyses and the related project design iterations were shared at Citizens' Advisory Committee meetings and on the project website for community input; city, state, and federal agencies reviewed the design through the environmental review and permitting process.

9. How is GOSR sure that the breakwaters would not have negative effects on the hydrology and habitat that already exists in Raritan Bay?

The design process included extensive hydrodynamic modeling that included computer modeling of shoreline change, wave movement, sediment movement, water circulation, and localized water circulation around the breakwaters.

The results of this modeling indicate that the breakwaters will not adversely impact water circulation and flushing in the area nor have significant impacts on sediment movement beyond the shoreline area (where they are being designed to reduce or reverse erosion).

While the breakwaters will displace some existing bottom habitat, they will be diversifying the aquatic habitat available within the project site and construction is being timed to avoid any bottom disturbance to the harbor during seasons where critical species sensitive to bottom disturbance might be impacted.

10. Is armor stone a special type of stone?

"Armor stone" is a general term used to refer to a range of natural (and sometimes artificial) stone applications used for the protection of shorelines and other structures from the eroding action of waves and flowing water.

11. Why is concrete being used?

In several locations throughout the breakwaters, ecologically-enhanced concrete units will be deployed to enhance the habitat function of the breakwaters and overall ecological benefit to the surrounding water body. These units are engineered to provide the same protective benefits of stone units, but are manufactured with a unique, marine-grade mixture that promotes biological growth on its surface. Additionally, these units are cast with high surface complexity, which further promotes the growth of marine life and creates a higher diversity of potential habitat spaces.

12. What are the black mats being placed beneath the breakwaters?

The breakwaters require a base layer of stone. These black mats comprise geogrid and geotextile bags filled with stone. This is a common practice in marine construction to ensure stability of the installed structures.

13. Will surveyors have to come on to my property? What are they monitoring? Do I have to give them access to my property? How often will they come?

Surveyors may need to access properties when conducting the beach transect survey, which is performed twice per year. They are monitoring any changes to the topography of the beach and immediate vicinity throughout the construction activities. Surveyors will attempt to notify the property owner and request permission prior to entering private property.

14. Will the breakwaters change my beach? How do you know?

Historical analysis has shown that the Tottenville shoreline has dramatically eroded in several places over the years. The breakwaters are designed to reduce or even reverse erosion, slowing the movement of sediment and allowing it to settle, accrete, and rebuild certain areas along the shoreline. The final configuration of breakwaters was designed to maximize this effect, supported by extensive hydrodynamic modeling.

15. Why are the breakwaters different shapes?

Each breakwater was individually designed based on its location. Different parts of the shoreline have higher levels of risk; in turn, some of the breakwaters have been designed to attenuate more intense waves (and are taller), while others have been designed to modify wave behavior and reduce erosion (and are shorter). Additionally, each breakwater has been individually designed to enhance habitat in its unique surroundings, including “reef streets” that change the shape of the breakwaters in order to create space for marine life.

II. CONSTRUCTION FAQ

Please contact the NYS Governor’s Office of Storm Recovery (GOSR) for any questions about the implementation of Living Breakwaters: info@stormrecovery.ny.gov

1. When does the office expect work to start on the project?

In-water construction began in August 2021.

2. What is the construction timeline for the project?

Breakwater construction is expected to proceed from Summer 2021 to the end of 2024. The shoreline restoration phase will be done concurrently with construction of the final breakwater.

3. Has the design changed since final design was presented in 2018?

As part of the effort to reduce costs, the team revisited the design looking for opportunities to reduce materials without significantly impacting performance. This resulted in lowering the crest elevation of some breakwaters and reducing the overall length of the breakwaters. This optimization effort resulted in significant cost savings with minimal performance trade-offs.

The revised design meets all original performance criteria, with the exception of storm wave performance under future sea-level rise (SLR) conditions exceeding 18 inches (mid-range SLR estimate for 2050). The

revised design will continue to provide most, but not all, of the original storm wave performance for SLR scenarios between 18 and 30 inches (the original design scenario).

The revised design is anticipated to improve erosion protection over the original design, as it is more effective in building the beach in the most vulnerable areas. For ecological benefits, while there is some reduction in the total surface area available for habitat, the main ecological uplift features remain intact and are expected to provide significant ecological benefits. The ecological design maintains the ability to test the benefits of the innovative ecological features.

4. Who will be responsible for the breakwaters after construction is complete?

The New York State Department of Environmental Conservation (DEC) will be responsible for the breakwaters after construction is completed.

5. Has the contract for the Living Breakwaters Project been executed yet? Who is the contractor?

The primary contractor is Weeks Marine, Inc.

Subcontractors include Walker Diving; Yerkes South/H2H JV, LLC; Wetlands, Inc.; and Hirani Engineering and Land Surveying, PC.

6. Will the breakwaters block my view of Raritan Bay from the South shore?

At a height of approximately 3 feet above mean high water for the four Southwestern breakwaters and 7.5 feet above mean high water for the four Northeastern breakwaters and with gaps between them, the breakwaters will be visible from shore, but will not block views of the horizon and of Raritan Bay from the shore. Visualizations of what the breakwaters will look like from shore can be found [on the project website](#).

7. What times of the year will construction occur?

Construction may take place year-round, although it will likely halt for inclement weather. Construction that impacts the bay bottom will only take place between June 1st and December 31st of each year to avoid Winter Flounder mating season. The shoreline restoration will take place during the final season of construction will occur outside of April 15 to July 15 to avoid horseshoe crab mating season.

8. What are the hours of construction?

Breakwater Construction (offshore work): The contractor is allowed to work between the hours of 5:00 AM to 5:00 PM, Monday to Saturday.

The Western breakwaters will likely be constructed for 10 hours a day (within the allowable working hours), Monday to Friday. The working hours will correspond to the high tide cycles, as these breakwaters are located in shallow water.

The Eastern breakwaters will likely be constructed during the hours of 6:00 AM to 4:00 PM, Monday to Friday.

9. How much does this project cost?

The total project cost is \$107 million—including funds for planning, design, permitting, construction, administration and social resilience programs.

10. Will GOSR run the project through project completion?

GOSR will oversee all construction activities through 2024.

11. How will you keep boaters and kayakers safe during construction?

The construction work zone, which will include partially constructed breakwaters that may or may not be visible above water, will be marked with lighted buoys and lighted range posts. Construction barges will also be moored in the vicinity of the construction zone, including an anchor spread. All anchors will be marked with lighted buoys, and all barges will be marked with lights on four corners. Partially submerged anchor wires will be present, running from the anchors to the construction barges. During work hours, divers will be present in the water. Recreational craft should avoid this area and stay clear (request 0.5 nautical mile CPA). Please refer to the [Local Notice to Mariners](#) for more information.

12. How will hazards to navigation and construction areas be marked during construction?

Partially constructed breakwaters will be marked with lighted range posts every 50 feet and lighted buoys located at the ends and middle of the structure(s). Anchor spreads will be marked with lighted buoys at all anchors and construction barges will be lit at four corners.

13. Have all permit agencies approved this project?

The project has been reviewed and approved by:

- The U.S. Army Corps of Engineers (USACE)
- The National Marine Fisheries Service (NMFS) / NOAA Fisheries
- The New York State Department of Environmental Conservation (NYSDEC)
- The New York Department of State (NYSDOS)
- The U.S. Fish and Wildlife Service (USFWS)
- The U.S. Coast Guard
- New York City Department of City Planning
- New York City Small Business Services

14. Will construction cause a noise disturbance if I live close to Conference House Park?

Offshore construction of the breakwaters is not anticipated to cause significant noise disturbance to those living close to Conference House Park. The work will be conducted at a minimum of 700 feet offshore; any noise caused by construction activities will be at a reduced level.

Shoreline restoration will be constructed with land-based equipment and require the trucking of sand. Noise levels along the shoreline can be expected to be at normal construction levels. The shoreline restoration component is not beginning until 2023 or 2024.

15. What is an E-crane?

The “E” in E-crane stands for “equilibrium” (or balance) crane. The machine uses a unique parallelogram-style boom that gives a direct mechanical connection between the counterweight and the load. This ensures that the crane remains in balance throughout its entire working range with reduced power consumption.

The barge-mounted E-Crane that will be used for this project was purpose-built for Living Breakwaters for Weeks Marine, Inc. It features exceptional reach, lifting capacities and push down force; and it should generally increase the production efficiency for the construction of the breakwaters.

16. How are the excavators floating?

The amphibious excavator (or floating excavator) can walk or work in water because the excavator floats on sealed pontoons.

17. If I see any debris or evidence of a fuel spill, who do I contact?

Debris resulting from construction activities or evidence of a fuel spill should be immediately reported to O'Brien's Response Management Qualified Individual (QI) at: 1-281-606-4818. If for any reason the QI cannot be reached, call the New York State Spill Hotline at (800) 457-7362 or the U.S. Coast Guard National Response Center at: 1-800-424-8802.

18. Can I fly my drone over the site to get a better look?

Please refer to FAA guidelines for operating Unmanned Aircraft Systems. In any event, drones should not be flown directly above an active construction site, as they may pose a danger to personnel.

19. If I have questions or concerns, who do I talk to?

GOSR can be reached by email for any questions at info@stormrecovery.ny.gov; or reached by phone at: 212-480-2321.