



## Frequently Asked Questions

### Background

In Sydney Harbour, over 50% of the shoreline has been modified by artificial structures such as seawalls. This is a significant problem for the sustainability of our shores because relative to the natural habitats they replace, the relatively flat and featureless surfaces of seawalls have lower biodiversity and reduced ecosystem services, including fisheries productivity. SIMS research has shown that biodiversity and ecosystem services of existing seawalls can be enhanced by increasing the surface area and diversity of microhabitats on the seawalls.

### What is the **Living Seawalls** project?

Living Seawalls provides an innovative solution to this growing problem of habitat loss from artificial structures in the marine environment. Using 3D printing technology, we have developed concrete tiles that mimic microhabitat features commonly found on natural shorelines. The tiles can be retrofitted onto existing seawalls or attached to seawalls during construction - transforming the seawalls into ecologically friendly structures.

### What are the benefits?

The complex microhabitat features on the tiles provide additional space for attachment by marine organisms. The tiles also provide moisture, shade and water retention that is critical for intertidal marine life. This promotes survival of additional marine life including filter feeding species such as oysters, which should improve water quality by increasing water filtration.

### How long does it take for the tiles to be colonised?

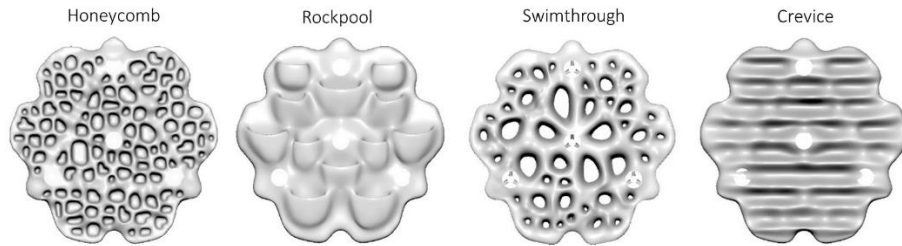
This will depend on site conditions, and the time of year at which the tiles are deployed. However, in Sydney Harbour we have observed seaweeds, oysters, limpets and marine snails on the tiles within a month of deployment. Some species take longer to colonise so biodiversity is likely to continue to increase over the period of a year.

### What are the tiles made of?

The tiles are made of concrete. This enables them to be cast into complex molds, mimicking the structure of natural habitat features. Concrete is resistant to the periodic wetting and drying that occurs in the intertidal zone. It releases chemical cues that encourage oysters, a key habitat-forming species, to settle. At present, concrete is the only material available.

### What tile designs are available?

To date, 4 tile designs have been developed, mimicking microhabitats provided by rockpools, crevices and weathered sandstone (honeycombing and swim-throughs). Each tile is 55 cm in diameter and weighs approximately 25 kg. The spatial arrangement of these can be customised to site conditions and goals. It may also be possible to develop new designs based on budget and goals.



Current designs of the Living Seawalls habitat panels.

### How are the habitat tiles installed?

Tiles are attached to seawalls using marine-grade stainless steel rods (16 mm diameter) and epoxy. The tiles are typically installed during low tide over a period of multiple days by a team of contractors. The tiles are designed to sit approximately 10 cm from the wall so that existing growth on the seawall does not have to be disturbed.

### How are the habitat tiles removed?

The tiles have been designed in consultation with engineers and are engineered to survive conditions that may be expected to occur over a 20-year period. However, the tiles can be removed at any time. Upon removal, the tiles are taken down individually and the stainless rods removed or cut. The cleared areas left by the steel rods are quickly colonised and grown over by species such as oysters and algae, leaving no evidence of the tiles.

### How many tiles and what site conditions are needed for tile installation?

The tiles are designed to be attached to seawalls in estuarine settings. Seawalls may be vertical or sloping. The key requirement is that the seawalls contain sufficient intertidal and/or shallow subtidal area to fit tiles. Some natural recruitment of marine species is required for the tiles to be a success. There is no minimum number of tiles required, however, the tiles have been designed to be attached in continuous or grouped mosaic patterns along a stretch of seawall. Approximately 70 panels are required to provide continuous intertidal zone coverage along a 10 m section of seawall.

### What are the risks of tile installation?

Our previous research has shown that when installed in the intertidal zone few non-native species colonise, and the tiles are effective at bolstering native biodiversity. Further, the tiles sit relatively flush (10 cm away) against the seawall and will not cause a navigational hazard. Hence risks are negligible.

## What are the maintenance and permission requirements?

Permission to install habitat panels should be obtained from owners and/or all relevant governing bodies (i.e. Council). Following installation, we recommend visual inspections for the first six months and biodiversity monitoring on the tiles every six months for the first two years.

## What are the costs?

The total cost depends on a variety of factors including location, number tiles, site conditions, and tile designs. Current tiles cost \$135-175 per tile, depending on the tile design (Rockpool, Honeycomb, Crevices, or Swimthrough). The cost of installation, which uses marine-grade stainless steel attachment hardware, depends on site conditions (i.e. site access, wave energy, number of tiles installed, etc.). Installation of the tiles can be arranged by SIMS, if required. However, Councils might choose to use contractors familiar with working on their seawalls. Detailed costs can be provided after a consultation with the Living Seawalls team.

## How can I get involved?

Living Seawalls is a major collaborative research program based at the Sydney Institute of Marine Science (SIMS). SIMS can also provide outreach and education partnerships alongside Living Seawalls installations. We encourage you to contact us if you would like to partner with Living Seawalls and install habitat tiles. Please contact us on [sydneylivingseawalls@gmail.com](mailto:sydneylivingseawalls@gmail.com) or 02 9435 4600.