

Living Seawalls

Overview

Living Sea Walls (LSWs) are an innovative way to utilise cutting-edge technology and apply it to degraded man-made marine habitats. LSWs are 3-D printed panels which help diversify the structural habitat of degraded man-made coastal structures. These urbanised shorelines are detrimental to marine life, providing a non-porous mono-textured environment and by diversifying the structural environment, it will boost marine biodiversity and benefit the Menai.

Goals and Objectives



Education and Awareness

- Work with several schools on both the Gwynedd and Ynys Mon side of the Menai to increase awareness of the species and issues the Menai face.
- Install a series of information boards highlighting species in the Menai.



Installation

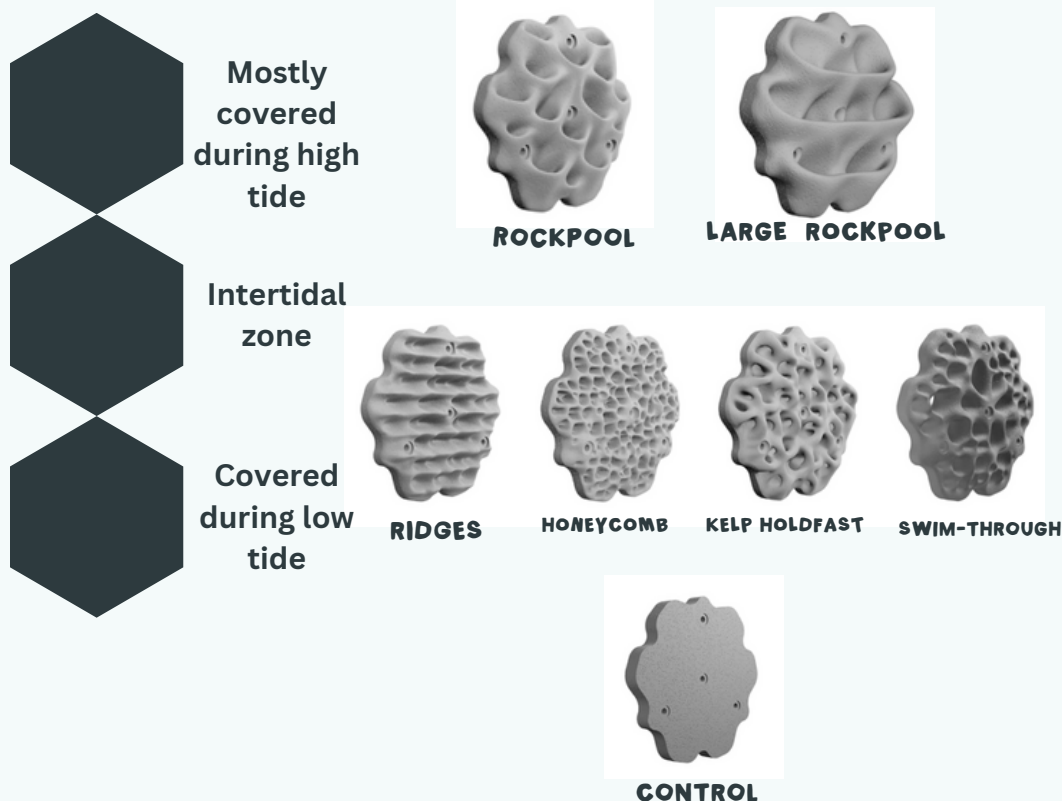
- Install living seawalls at x4 locations on Ynys Mon and x4 on Gwynedd
- Installation at a variety of sites to measure the effectiveness of living seawalls for Welsh Marine ecosystems.



Research

- Install the living seawalls at selected pilot sites to measure the impact of sunlight direction, intertidal zone and the role of different seawalls for habitat in Wales.

Design



Contract Summary

- 78 pannells to be intsalled

Site 1 – Bangor sea defence wall

Number of pannells to be installed:

- 18 Pannels
 - 3 large rockpool
 - 3 rockpool
 - 3 Honeycomb
 - 3 Swimthrough
 - 3 ridges
 - 3 control

-4.1192358, 53.2341228

-4.1192679, 53.2340810

-4.1182165, 53.2334546

-4.1179215, 53.2335156

-4.1192411, 53.2341324



This easterly facing wall newly built in Bangor offers extensive surface area at the high tide range for panels to be attached directly. Due to the new structure there is currently no life on the wall however other sites across Gwynedd with large walls have showcased extremely low biodiversity which will likely also be representative of this sight.



Images are an artistic impression and not to scale.

Gwynedd

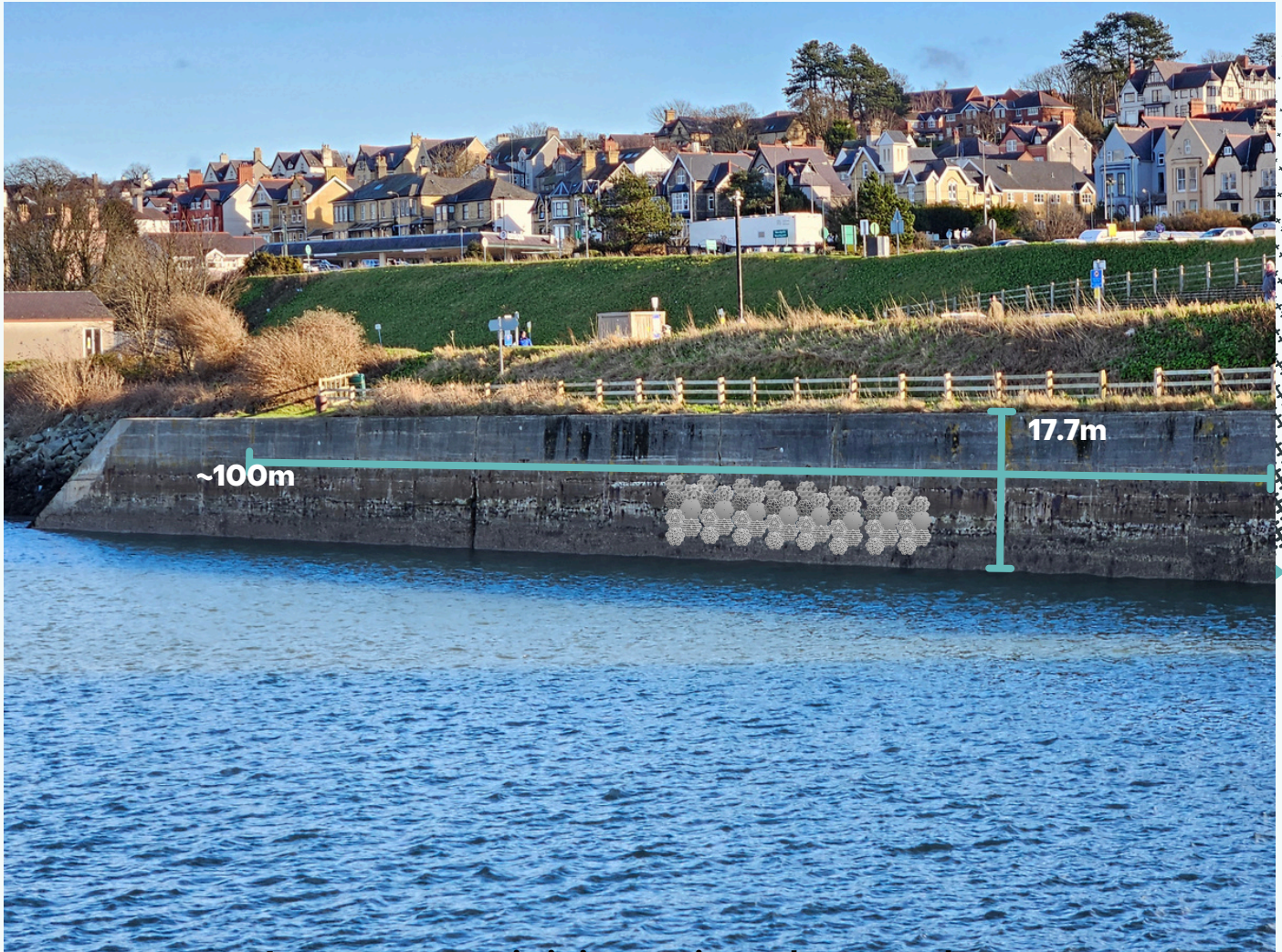
Site 2- Shell site car park, Caernarfon

Number of panels to be installed offset from the wall:

- 18 total panels
 - 3 large rockpool
 - 3 rockpool
 - 3 Honeycomb
 - 3 Swimthrough
 - 3 ridges
 - 3 control

Polygon of coordinates:

- -4.2731248, 53.1457022
- -4.2740904, 53.1449198
- -4.2740046, 53.1448715
- -4.2730631, 53.1456699
- -4.2731248, 53.1457022



Images are an artistic impression and not to scale.

This North, West facing seawall is an ideal location for installing living seawalls. Currently, there is limited habitat on the artificial seawall with seaweeds trying to establish in the surrounding areas. The area can be accessed at low tide in addition to being able to be seen from the nearby footpath for monitoring. This site will pilot a series of different types of seawall in the intertidal zone to establish the most effective panel for a variety of species.

Gwynedd

Site 2- Shell site car park, Caernarfon

Habitat



NWRT conducted a survey of the car park wall surveying for presence and abundance of species. The primary species present was barnacles, interspersed with common limpets (*Patella vulgata*). The overall diversity of the location was extremely low with no algal growth and limited mobile organisms.

Gwynedd

Site 4 - Garth Pier Carpark (midpoint: SH 58419 73209)

Number of panels to be installed:

- 18 total panels
 - 3 large rockpool
 - 3 rockpool
 - 3 Honeycomb
 - 3 Swimthrough
 - 3 ridges
 - 3 control

Polygon of coordinates:

-4.1226518, 53.2370088
-4.1236657, 53.2366841
-4.1236067, 53.2366183
-4.1225874, 53.2369315
-4.1226518, 53.2370088



Similar to the carpark in Caernarfon, this ~70m length modern wall is the front of a council-owned carpark and would be a good site to install LSWs to boost biodiversity, improve the aesthetic of the wall and boost community engagement. The panels would be offset from the wall for installation.

Gwynedd

Site 4 - Garth Pier Carpark

Habitat



Images are an artistic impression and not to scale.

Utilising photos NWRT conducted a survey of this wall to identify species presence and abundance. Access is difficult to this site however no algae's or mobile organisms were identified on the wall

Gwynedd

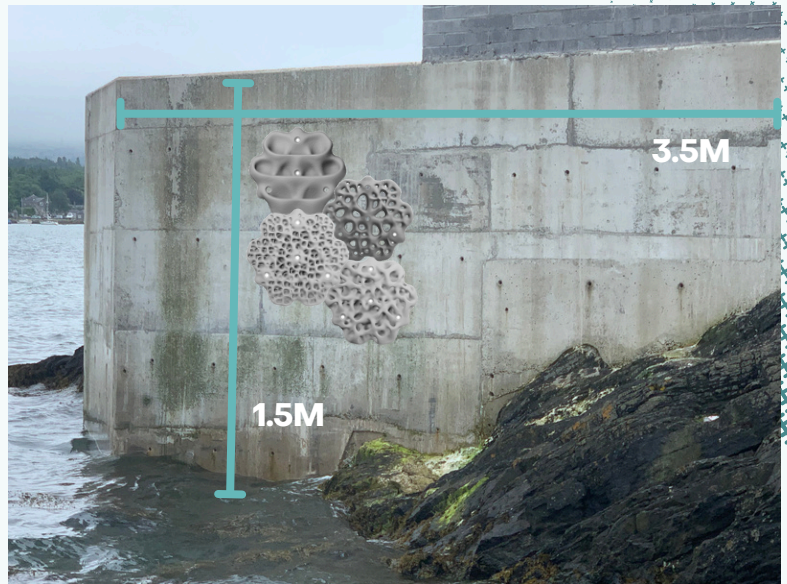
Site 5 - Modern Seawall by garth Pier Carpark

Number of panels to be installed:

- 6 total panels
 - 1 large rockpool
 - 1 rockpool
 - 1 Honeycomb
 - 1 Swimthrough
 - 1 ridges
 - 1 control

Polygon of coordinates:

-4.1224104, 53.2370664
-4.1222173, 53.2368768
-4.1219115, 53.2369186
-4.1221744, 53.2371114
-4.1224158, 53.2370728



Images are an artistic impression and not to scale.

This newly constructed sea wall is an ideal location for Living Seawalls. Due to the new structure there is currently no life on the wall however other sites across Gwynedd with large walls have showcased extremely low biodiversity which will likely also be representative of this sight.

Ynys Môn

Contract Summary

- 82 panels to be installed

Site 1 - Beaumaris outdoor swimming pool (midpoint: Needed)

number of panels to be installed offset from the wall:

- 15 total panels
 - 5 large rockpool
 - 5 rockpool
 - 5 control

Polygon of coordinates:

-4.0859297, 53.2652426
-4.0858305, 53.2652426
-4.0858224, 53.2655363
-4.0859297, 53.2655527
-4.0859377, 53.2652494



Images are an artistic impression and not to scale.



This west facing seawall is an ideal location for installing living seawalls. This now abandoned outdoor swimming pool provides a great surface for living seawalls with easy access at low tide to Beaumaris beach.

Ynys Môn

Site 1 - Beaumaris outdoor swimming pool (midpoint: Needed)

Habitat



NWRT conducted a walk over survey of both walls of the outdoor swimming pool to surveying for presence and abundance of species. The primary species which dominated the surface was bladder wrack (*Fucus vesiculosus*) interspersed with gutweed (*Ulva intestinalis*), channelled wrack (*Pelvetia canaliculata*), and barnacles growing beneath. Mobile organisms inhabiting the area including common limpets (*Patella vulgata*), flat topshells (*Steromphala umbilicalis*), and shore crab (*Carcinus maenas*). The overall diversity of the location was limited primarily dominated by algae with low levels of mobile organisms inhabiting the algae.

Site 2 – Seawall Penmon

number of panels to be installed offset from the wall.:

- 30 total panels
 - 10 Rockpool
 - 10 Large rockpool
 - 10 Control

Polygon of coordinates:

-4.0637709, 53.2947561
-4.0635349, 53.2944770
-4.0631486, 53.2944160
-4.0608795, 53.2948908
-4.0608848, 53.2950833
-4.0610458, 53.2951603
-4.0612818, 53.2950063
-4.0622903, 53.2947753
-4.0631593, 53.2946374
-4.0635134, 53.2949004
-4.0638567, 53.2948651
-4.0637816, 53.2947753
-4.0637709, 53.2947561



Site 2 - Seawall Penmon (midpoint: SH 62649 79510)



Images are an artistic impression and not to scale.

Habitat



NWRT conducted a walk over survey of the Penmon seawall to identify species presence and abundance. The primary species which dominated the surface was bladder wrack (*Fucus vesiculosus*) interspersed with gutweed (*Ulva intestinalis*), eggwrack (*Ascophyllum nodosum*) and barnacles growing beneath. Mobile organisms inhabiting the area including common limpets (*Patella vulgata*), flat topshells (*Steromphala umbilicalis*), shore crab (*Carcinus maenas*), and Dog whelks (*Nucella lapillus*). The overall diversity of the location was limited primarily dominated by algae with low levels of mobile organisms inhabiting the algae.

Ynys Môn

Site 3 - Moel y Don

Number of panels to be installed offset from the wall:

- 12 Panels
 - 3 large rockpool
 - 3 rockpool
 - 3 Swimthrough
 - 3 control

Polygon of coordinates:

-4.2179250, 53.1864015
-4.2179679, 53.1863115
-4.2175307, 53.1862182
-4.2174743, 53.1863308
-4.2179196, 53.1864015



The slipway at Moel y don offers an extended wall on both west and east sides of the slipway which extends to both high and mid tides.



Ynys Môn

Site 3 - Moel y Don

Habitat



NWRT conducted a walk over survey of the Moel y Don slipway to identify species presence and abundance. The primary species which dominated the surface was eggwrack (*Ascophyllum nodosum*), interspersed with bladder wrack (*Fucus vesiculosus*). No mobile organisms were identified inhabiting the algae. The overall diversity of the location was low primarily dominated by algae.

Ynys Môn

Site 4 -Ramp in Y Borth (midpoint: SH 55846 71826)

Number of panels to be installed :

- 6 Panels
 - 1 large rockpool
 - 1 rockpool
 - 1 Honeycomb
 - 1 Swimthrough
 - 1 ridges
 - 1 control

Polygon of coordinates:

-4.1609205, 53.2239175
 -4.1609125, 53.2238532
 -4.1607596, 53.2238098
 -4.1606737, 53.2238146
 -4.1606045, 53.2238801
 -4.1606979, 53.2238966
 -4.1609125, 53.2239110
 -4.1609205, 53.2239175



This area will be tagged as a key for school and used as an education and awareness point.

Ynys Môn

Site 4 -Ramp in Y Borth

Number of panels to be installed offset from the wall:

- 6 Panels
 - 1 large rockpool
 - 1 rockpool
 - 1 Honeycomb
 - 1 Swimthrough
 - 1 ridges
 - 1 control

Polygon of Coordinates::

-4.161163, 53.2237172
-4.161163, 53.2237011
-4.1608615, 53.2235533
-4.1607247, 53.2236015
-4.1610519, 53.2237124
-4.1611136, 53.2237236
-4.1611136, 53.2237236



This slipway enters the Menai Strait and it quite a small site but with enough surface area to fit one row panels along the east facing wall of the slip way.

Ynys Môn

Site 4 -Ramp in Y Borth



Images are an artistic impression and not to scale.

Habitat



NWRT conducted a walkover survey of the east facing wall of the slipway. The primary species which dominated the surface was gutweed (*Ulva intestinalis*) interspersed with bladder wrack (*Fucus vesiculosus*), eggwrack (*Ascophyllum nodosum*) and barnacles growing beneath. The primary mobile organisms inhabiting the area were common limpets (*Patella vulgata*). There were extremely limited mobile organisms inhabiting the substrate and the habitat overall was low in biodiversity.

Ynys Môn

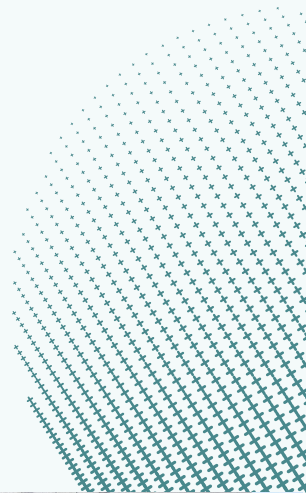
Site 5 – School of ocean sciences exterior wall

Number of panels to be installed:

- 18 total panels (1.8m x 12m)
 - 3 large rockpool
 - 3 rockpool
 - 3 Honeycomb
 - 3 Swimthrough
 - 3 ridges
 - 3 control

Polygon of Coordinates::

-4.1601437, 53.2260299
 -4.1603369, 53.2257375
 -4.1602510, 53.2257150
 -4.1600740, 53.2260170
 -4.1601437, 53.2260331

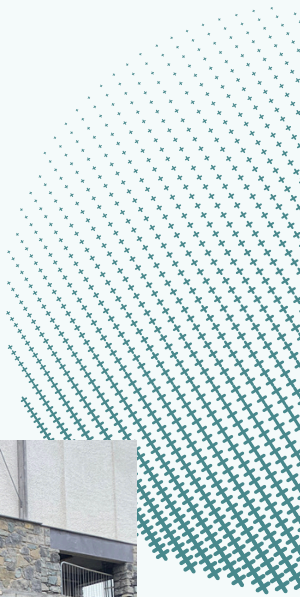


The School of Ocean Sciences wall offers a large surface area in both the high and mid tidal range. The wooden beams in front of the wall offer some insight into the potential biodiversity improvements living sea walls could provide along this wall.

Ynys Môn

Site 5 – School of ocean sciences exterior wall

Habitat

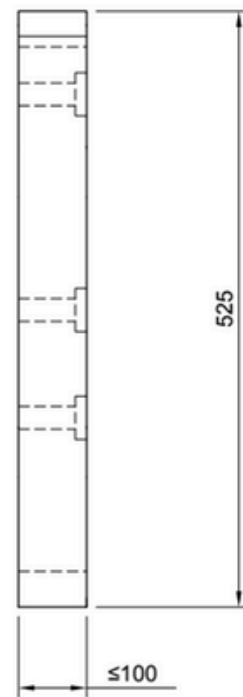
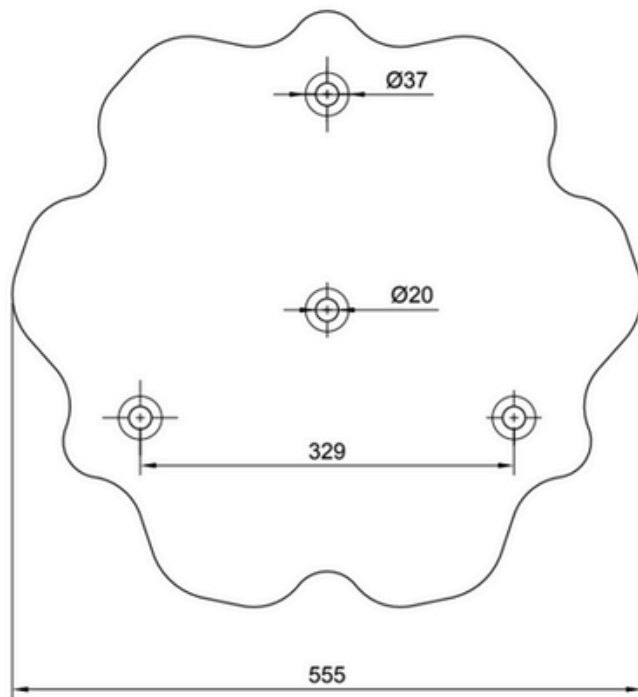


NWRT conducted a walkover survey of the Bangor University School of Ocean Sciences exterior wall. The primary species which dominated the surface was eggwrack (*Ascophyllum nodosum*) interspersed with bladder wrack (*Fucus vesiculosus*), gutweed (*Ulva intestinalis*) and barnacles growing beneath. The primary mobile organisms inhabiting the area were common limpets (*Patella vulgata*). There were extremely limited mobile organisms inhabiting the substrate and the habitat overall was low in biodiversity.

Living Seawalls

Installation Methodology

Living Seawall panels are attached to sandstone or concrete walls using M16 SS 316 threaded rod. There are 4 connection points per panel; the recommended number will depend on the wave energy at the installation site. For high energy sites, all 4 connection points can be used with the panel positioned flush to the seawall. For low energy sites 3 connection points can be used with a maximum of 100mm gap between the back of panel and seawall. Panels can also be glued to a flat seawall with a marine grouting system and a single centre connection point. We recommend consultation with the Living Seawalls team before installation. *Bolt holes for securing the threaded rod must be cleaned prior to inserting adhesive. *It is the discretion of the client and installation contractor to determine if the sea wall is of sound structural quality.



Living Seawalls

Fastening Options.

ARRANGEMENT DEPENDS ON INSTALLATION
SITE WAVE ENERGY

— EPOXY: HILTRI HITRE 500 OR CHEMSET 101

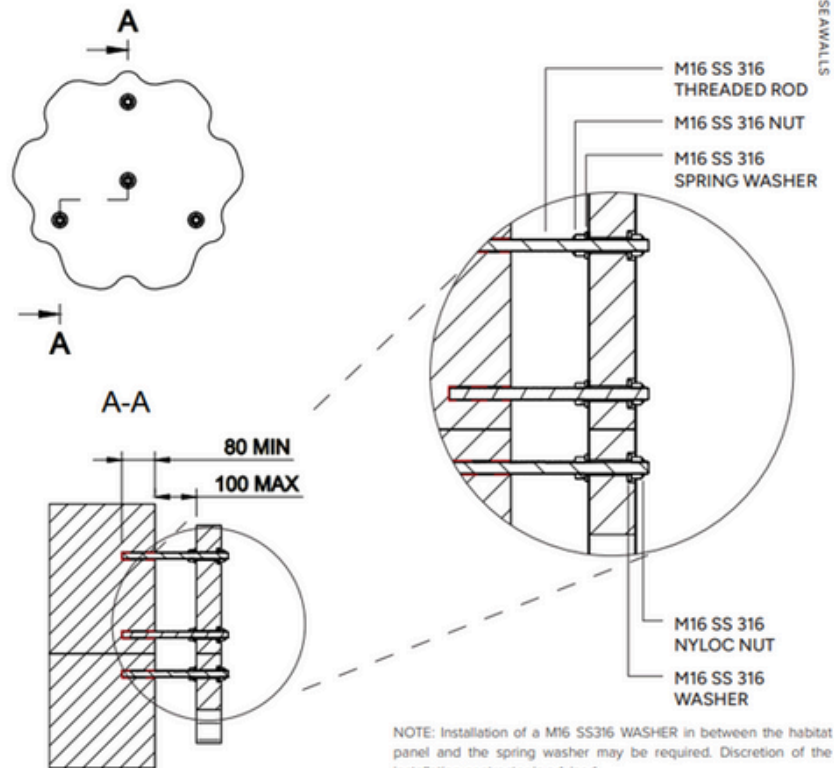
Option A is suitable for sites that have high wave energy because they are close to harbour/estuarine mouths or have high exposure to boat traffic. Panels should be installed using all four bolting holes and offset from the seawall to mitigate disturbing established local marine habitat.

Option B is suitable for sites where seawalls experience moderate to low to high wave energy. Panels should be installed using at least three bolting holes and offset from the seawall to enhance habitat potential.

Option C is suitable for sites where high wave energy is experienced and the seawall surface is flat. Panels should be secured with at least one bolt and thread and a generous coating of epoxy on the backside of each panel.

DIMENSIONS IN mm UNLESS OTHERWISE STATED

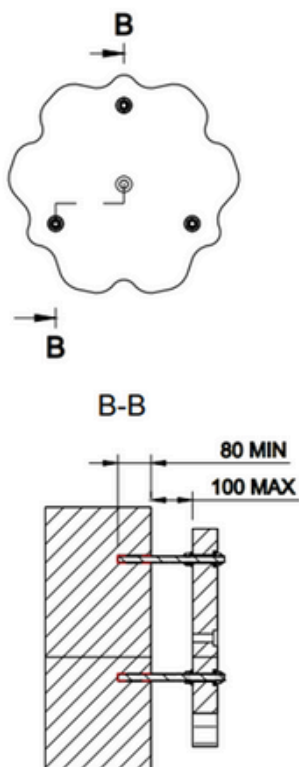
OPTION A: FOUR-BOLT ARRANGEMENT OFFSET FROM SEAWALL



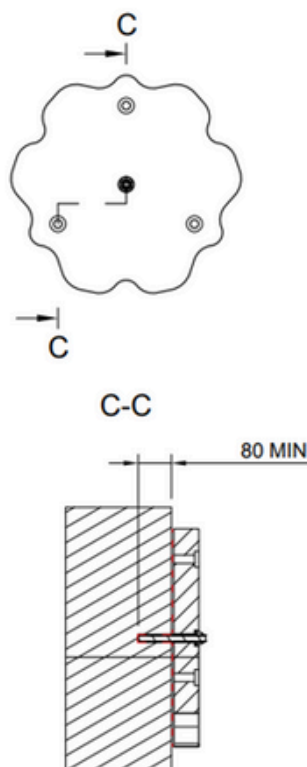
NOTE: Installation of a M16 SS316 WASHER in between the habitat panel and the spring washer may be required. Discretion of the installation contractor is advised.

LIVING SEAWALLS

OPTION C: ONE-BOLT ARRANGEMENT FLUSH WITH SEAWALL



OPTION C: ONE-BOLT ARRANGEMENT FLUSH WITH SEAWALL



LIVING SEAWALLS