

Breakwaters

Breakwaters are concrete block or rock structures that reduce the energy of approaching waves, creating a calm environment landward of the structure. Breakwaters are often attached to and built at an angle from the shore, but may also be built in the nearshore (see “Breakwaters, Detached”). Most commonly found around harbors, breakwaters allow for safer ship passage and cargo handling while providing overall protection of the harbor facilities. Breakwaters may also be used at a harbor to direct



*Breakwater:
Sheffield Lake*

currents and reduce the build up of sediment within the shipping channel. These structures may also be found around the water intake facilities of energy plants.

Breakwaters around harbors are large structures constructed of armor stone or pre-cast concrete modules. Usually navigational safety items are located at the lakeward end. Sometimes the navigational item is a small lighthouse to warn of the structure’s location or a more simplified guidance buoy directing

ships into the harbor. When located around the water intake and discharge of energy facilities, breakwaters are constructed of the same materials, armor stone or pre-cast concrete modules.

Due to their size and angle from the shore, breakwaters can have a significant effect on the transportation of sediment along the shore. At many harbors, there is a build up of sediment on the updrift side of the structures and an absence of sediment on the downdrift side. To counter these effects, bypassing of sediment trapped by the structure is necessary.

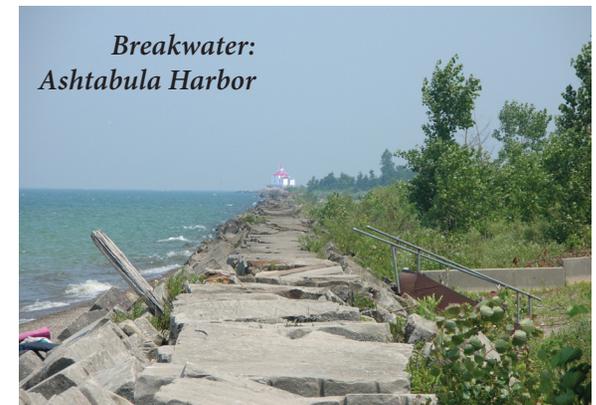
Maintaining a breakwater requires monitoring of any movement of the materials with the re-positioning and replacement of armor stone units when necessary. If an excess of sediment is located updrift of the structures, or within channels protected by the structures, dredging and/or bypassing may also be necessary.

The design and construction of breakwaters requires the services of a professional engineer and contractor.

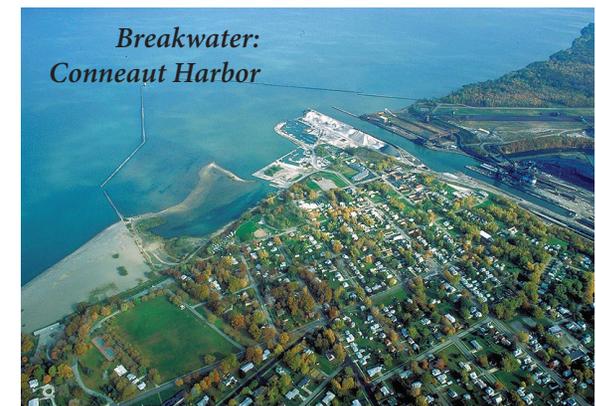
At first glance, breakwaters, jetties and groins appear to be similar structures, but they are each unique in their location and function. In comparison to a breakwater, jetties are considerably smaller and are not primarily used to reduce wave action. Jetties are designed primarily for sediment management and are typically located at the mouth of a river. Breakwaters are typically found surrounding a harbor facility as they are primarily designed for limiting wave action. Groins are shore-perpendicular structures, often smaller than jetties, and are intended to trap sediment as a means of erosion control, and are therefore not found at harbors or river mouths.



*Breakwaters:
Lorain Harbor*



*Breakwater:
Ashtabula Harbor*



*Breakwater:
Conneaut Harbor*