

Key Allegro
Canal and Property Owners
Association
Bulkhead Guidelines



Rockport, TX

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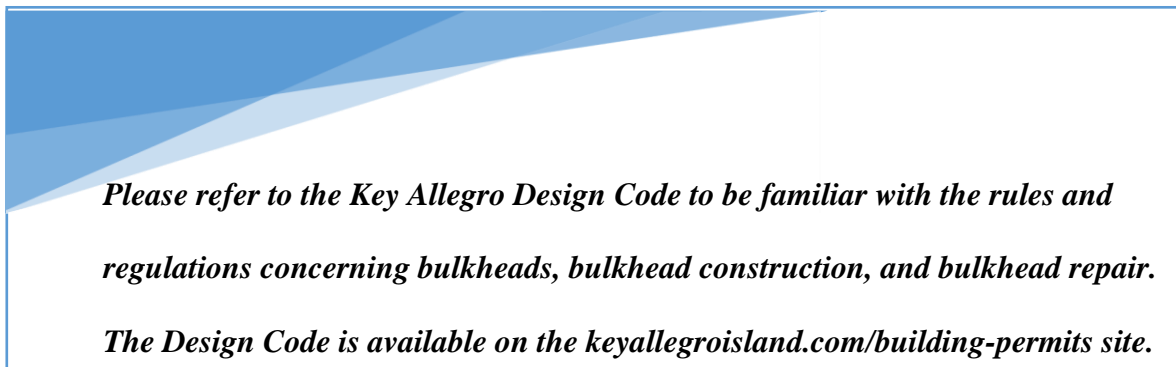
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Key Allegro Canal and Property Owners Association Bulkhead Guidelines

These guidelines are intended to provide an easily understood guide for owners and prospective owners of waterfront property located on Key Allegro Island in the city of Rockport. All of the waterfront properties in the KACPOA (canal-front or bay-front) are protected by bulkheads (or seawalls facing Aransas Bay) which were installed by the original developer. The original bulkheads were constructed between 1962 (Unit 1) and the 1990s (Unit 5).

The guidelines contain a summary of key responsibilities of lot owners to construct and maintain adequate bulkheads and waterways, an overview of the components and purpose of bulkheads, descriptions of common problems with bulkheads with potential remedies, and suggestions for maximizing the useful life of a bulkhead while stewarding the waterways. The typical life expectancy of well-constructed and well-maintained bulkheads can reach 50 years or more; depending upon the impact of storms in the area.

Key Responsibilities for Property Owners



KACPOA requirements provide for a continuous cohesive bulkhead system from lot to lot for protecting *adjacent lot owners* and the Association as a whole. Owners shall maintain their canal and bulkhead in *good condition*, and *with sufficient height to prevent saltwater from flowing onto any portion of the lot (or adjacent lots) during normal high tide.*

Before purchasing a property you should inspect the bulkhead above and below the waterline to evaluate its integrity and assess whether changes or repairs may be needed currently or in the near future. Bulkhead inspections typically are not included with the standard home inspection. You can request input from the KACPOA Property Manager for an assessment. Depending on the length of your property's waterfront, repairs can run into the tens of thousands of dollars or more; conducting a thorough inspection of the bulkhead will help avoid surprises.

Approvals for construction or significant remodeling (including pools, docks, and outbuildings) per the design code require building permits issued by the Key Allegro Architectural Control Committee (ACC). Prior to repairing an existing bulkhead or building a new one, engineered plans must be approved by the ACC.

Components and Purpose of Bulkheads

The purpose of bulkheads (straight walls) or seawalls (include collections of stones, termed "rip rap," placed outward in the water from the bulkhead) is to both keep the land in the property and the water from egressing into the property.

- Bulkheads are a safeguard from property erosion, current erosion, and wave action that will wash landmass into the water.
- Bulkheads help maintain proper near-shore water depth and the width of canals.
- Bulkheads help stabilize waterfront property and the structures built on the property as well as structures built on adjacent property.

There are five main components of bulkheads, plus another component of seawalls (use the reference numbers from the next page's picture for descriptions of each component).

1. Sheet panels or concrete slab

- Requires technical engineering to protect loads from the water (waves and tides) and

from the land (soil and structures)

- Panels need to be long enough to be embedded in the sand under the silt of the canal at a depth recommended by the engineer.

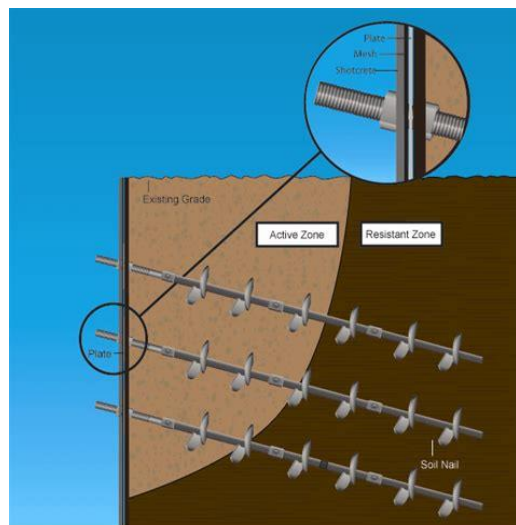


2. Tiebacks

- Steel rod preferably with vinyl sleeve packed with grease to protect from corrosion.
- Tied through sheet panels and anchors for protecting against loads from the land.

3. Anchors

- Embedded into the ground 6-12 feet behind the bulkhead into which the tiebacks are secured. These may be embedded with concrete.
- Optionally, helical tieback systems (pictured on right) may be used in place of conventional tiebacks and anchors in situations where there is a no-load zone adjacent to the bulkhead.



4. Wing walls

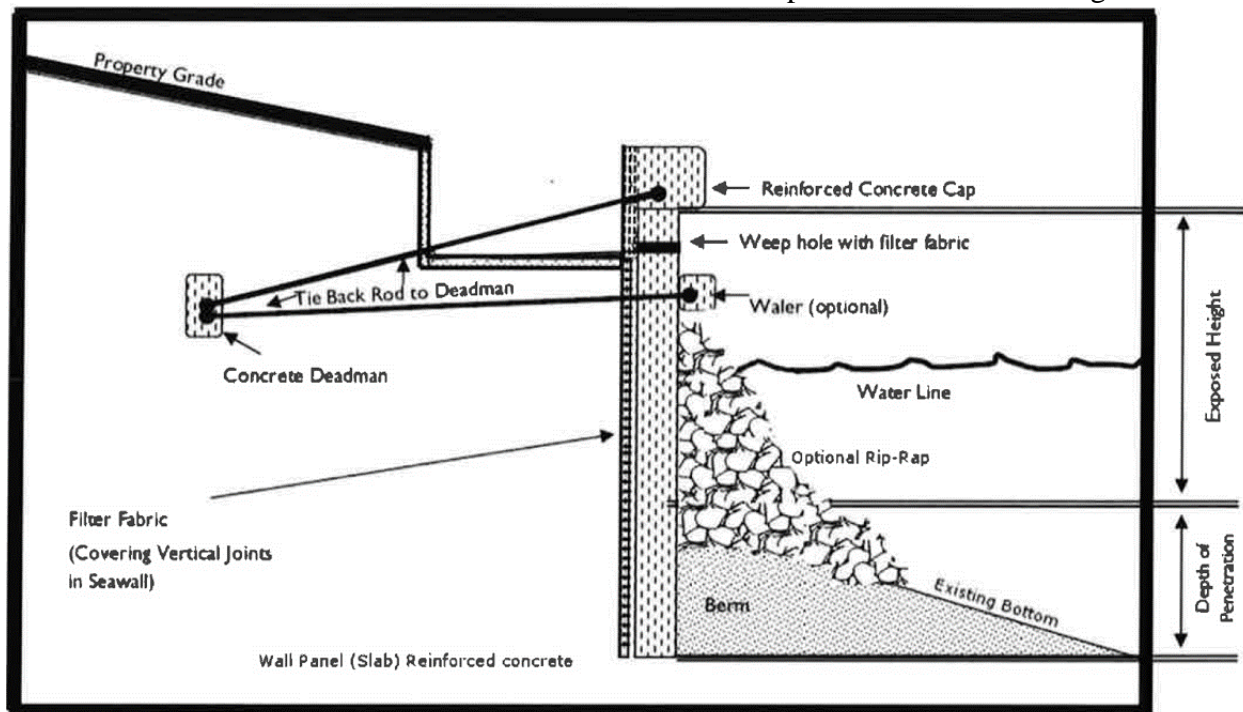
- 5-15 feet back from the bulkhead on each edge of the property to protect from seawater crossing property lines.

5. Concrete cap

- Helps support sheet panels from horizontal loads and vertical loads (weight of the cap itself and nearby structures such as pools).
- The height of the cap provides protection against seawater invading the soil and potentially causing corrosion or other damage.
- The cap is designed with weep holes to allow water from behind the sheet panels to drain and relieve hydrostatic pressure.

6. Rip Rap (see diagram below)

- Provides additional protection from wave action in seawalls. Boulders may also be placed on the land-side of the wall above the tieback rods to provide additional strength.



- Rip Rap is typically not conducive to areas where docks are used.

Common Bulkhead Problems

Many tell-tale signs suggest problems exist with a bulkhead. The one sign most noticeable is when the water level during a normal high tide rises above the cap and over the property. A simple cruise up and down the Key Allegro canals during high tide events in the summer will reveal properties where this occurs. In those situations it would be wise to hire qualified divers to inspect the integrity of the cap and bulkhead below the waterline. If the existing bulkhead can bear additional weight, adding additional height over the existing cap may be all that is needed – but an engineer should evaluate the situation before proceeding. The additional weight of a higher cap may, in and of itself, cause bulkhead failure.

Sinkholes. One common indicator of issues in the absence of a water incursion is one or more sinkholes on the property behind the bulkhead, visible mounds in the water near bulkhead joints observed during low tied, or other changes to the level of ground next to the bulkhead (such as concrete pavement cracking or becoming unlevelled). This is caused by settling, structural failure, insufficient berm at the panel toe of the wall, or panel separation. As a result,

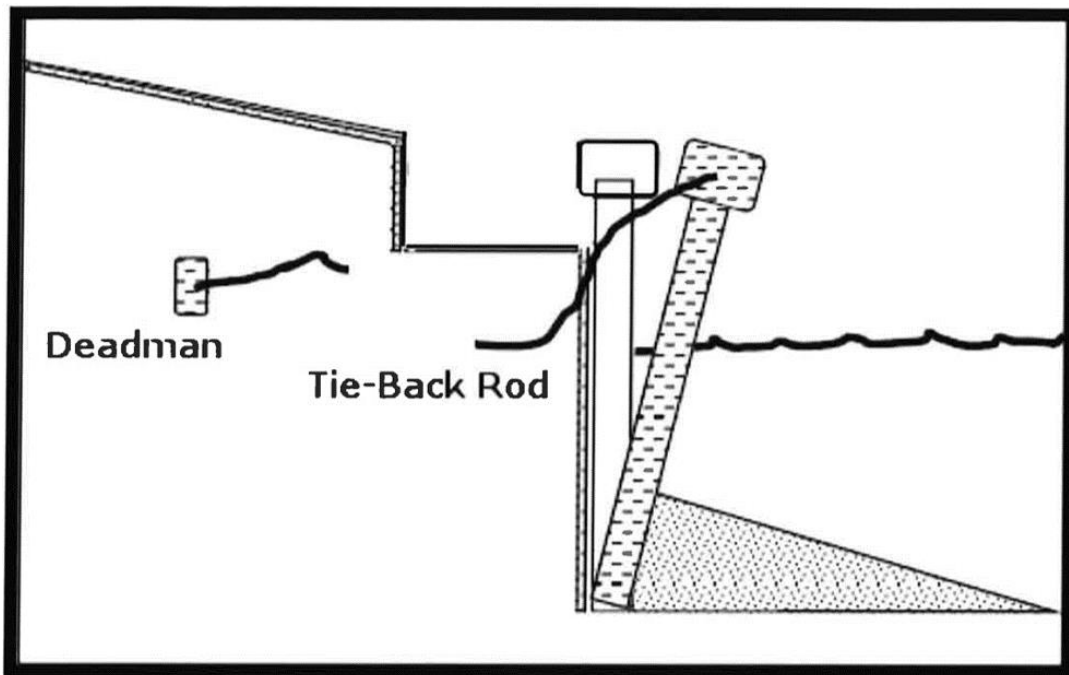


backfill can migrate through openings into the water; frequently occurring after heavy rains.

Remedies may include:

- adding a French Drain that facilitates water passage through weep holes or adding other supplemental drainage;
- adding filter fabric to vertical panel joints; or
- replenishing the berm at the panel bottom.

Tieback Failure. Saltwater corrosion and oxidation in the cap reinforcement or tieback rods can cause tieback failure. So can movement of the structure. Observable symptoms may



include a deteriorating cap with cracks or spalling, wavy or sagging panels, and backfill settlement. The results include rotation of the cap away from the land and toward the water, crumbling of the cap and loss of its ability to keep panels aligned or vertical. Remedies may include:

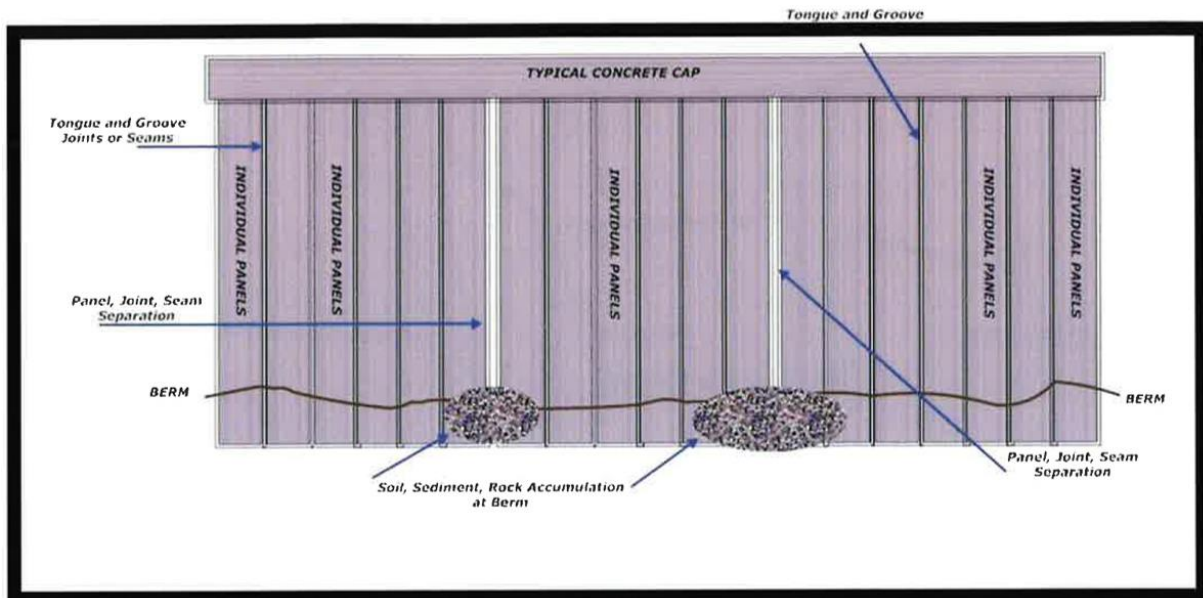
- excavating the area for the tiebacks, replacing and integrating them into a new bulkhead cap;

- installing a new set of tieback rods and a waler (see p. 6 diagram); or
- installing supplemental helical tiebacks.

The picture to the right provides an example of helical tiebacks where a tieback is installed at a corner point of the bulkhead with a vertical flange.



Panel Joint (Seam) Separation. Age, uneven exertion of hydrostatic pressure (especially during low tide), or tieback failure can lead to separation between the sheet panel sections.

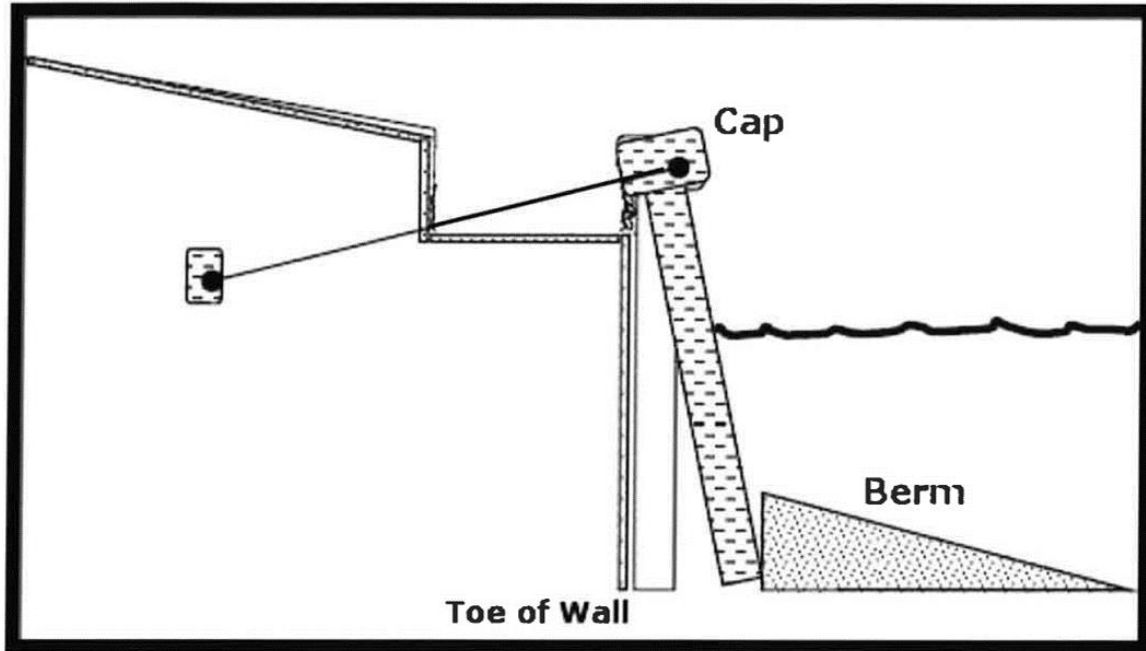


Observable symptoms include sinkholes, visible separation in seams (found by a diver), or sediment underwater at the base of an affected joint. Remedies may include:

- sealing seams and cracks;
- installing filter fabric;
- supplementing tiebacks for additional support;
- relieving hydrostatic pressure with proper drainage;
- routing stormwater away from the bulkhead; or

- excavating the area for the tiebacks, replacing and integrating them into a new cap.

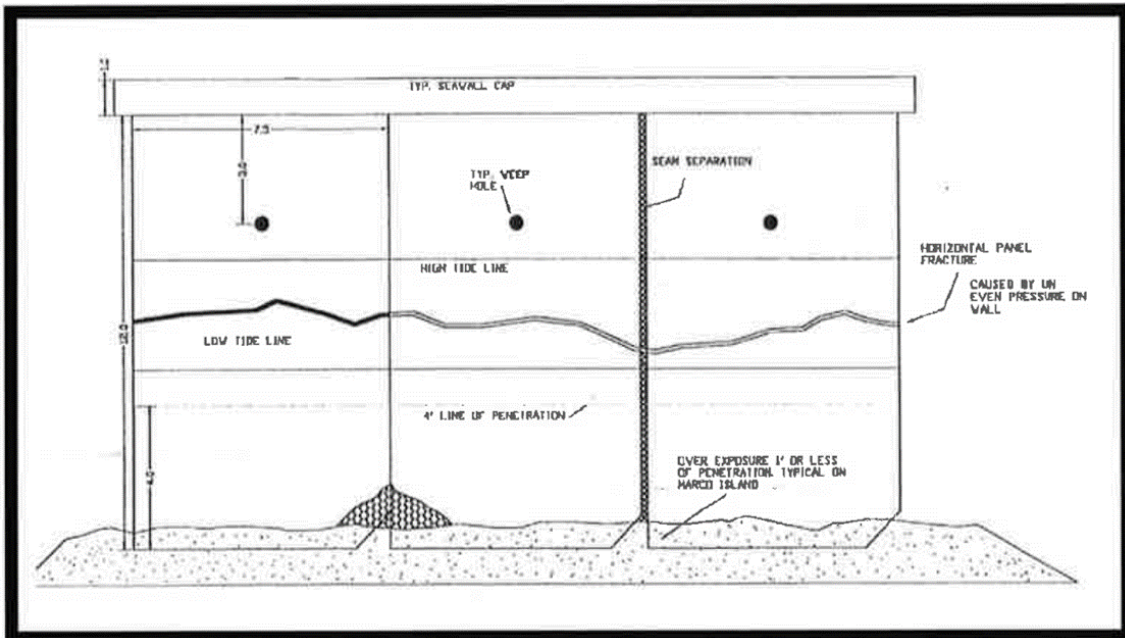
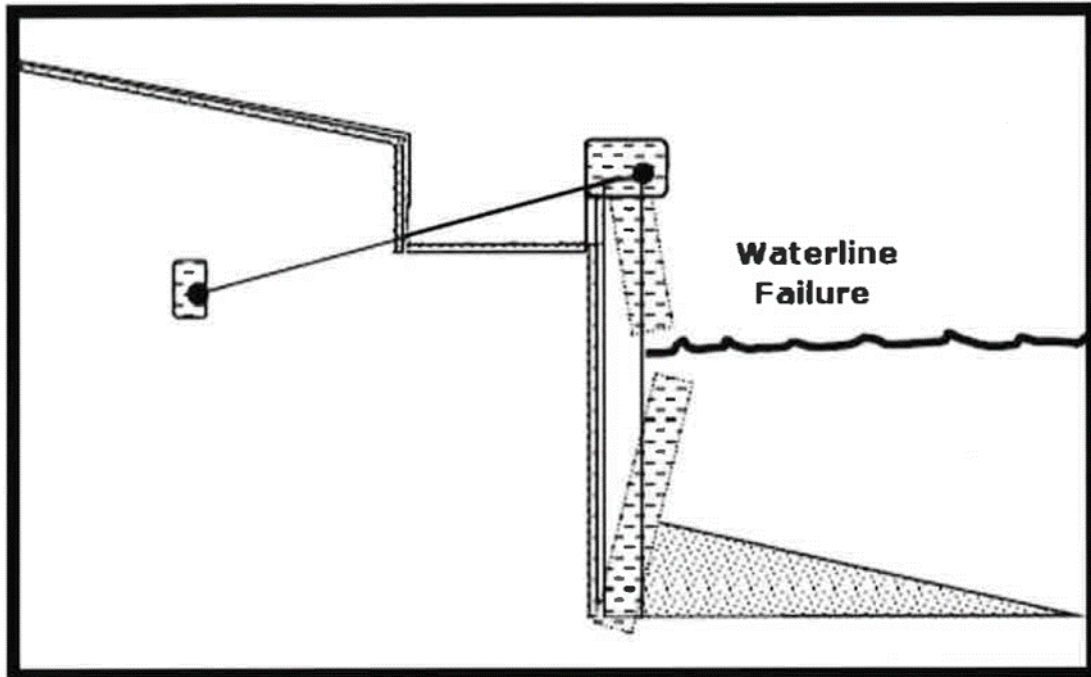
Toe and Berm Failure. Losing the supporting berm at the bottom of the panels in the water will tilt the panels out and cause the cap to crack, twist, or break. This is often the result of



wave action or could occur if the panels are not buried sufficiently in the bottom or the berm is improperly placed. Observable symptoms include cap rotation, movement, or cracking; an opening gap between the bulkhead and an existing dock or any support pilings built tightly against the bulkhead. Potential remedies include:

- stabilizing the bottom with additional berm, rip rap, or bags of dry concrete mix if the failure is not severe;
- pulling and replacing or reconstructing the sheet panels; or
- wedging dry concrete bags of cement between pilings and the sheet panels.

Waterline Failure. Failure at the waterline consists of cracking and rust marks on the water-side of the panels. This is caused by aging, corrosion of the concrete cap or reinforcing tieback rods, and uneven hydrostatic pressure. Initially cracks will appear along the waterline



and the panels will eventually break along those lines. In this situation the affected sheet panels must be replaced and the tiebacks either replaced or supplemented with helical tiebacks.

Cap Failure: Aging, corrosion of concrete and reinforcing rods, and uneven hydrostatic pressure may also cause rust, spalling, exposed rebar, and fractures of the cap as shown in the

following picture. This can also lead to waterline failure of the panels. Partial or full cap replacement is called for in this situation.



Maximizing the Life of Bulkheads and Waterways

The best way to maximize bulkhead life is to start with a properly engineered and installed bulkhead. Subsequent problems will be reduced if the original design and construction is properly done.


Undeveloped (vacant) lots provide reasonable access for contractor's equipment and materials. However, developed lots present access problems, often requiring work to be completed from a barge. The presence of a house, dock davits, tress, other landscaping, sprinkler systems, exterior plumbing and electric conduits will add to the cost of replacement, as these items will either limit access or require removal and replacement.

There are several things a property owner may do to prolong the useful life of a bulkhead, and thereby postpone the expense of major repairs or replacement. As an owner of waterfront property you are a steward of the condition of the waterway and everything living there. The

health and well-being of our surrounding waters, and the marine life therein, is greatly impacted by your action. We recommend that you follow these best practices.

1. Install pilings or supplemental tieback rods around the perimeter of the bulkhead to add support and help maintain alignment of the sheet panels.
2. Properly maintain and enforce the appropriate “Idle Speed” in the waterways, and canals of Key Allegro Island. This protects berms securing the lower end or toe of the panels.
3. Encourage your neighbors to properly maintain their bulkheads. A sagging bulkhead adjacent to yours may cause some damage to your property.
4. Avoid the placement of large trees adjacent to bulkheads and avoid the use of heavy equipment traveling along bulkhead perimeters to reduce pressure on the bulkhead.
5. Adjust sprinkler heads in the vicinity of the bulkhead to minimize water application behind the wall.
6. Try to redirect drainage from the yard and roof so that it does not flow directly into the water behind the bulkhead structure.
7. Ensure your landscaper protects the water from lawn clippings, tree/ shrub trimmings and other vegetative waste.
8. Never store gas, diesel, oil, or chemical solvents on or near your dock or bulkhead.
9. Keep decks and bilges of your boat free of fuels and chemicals that may produce hazardous chemical discharge by onboard pumps.
10. Try to use only biodegradable cleaners and soaps when maintaining your boat or personal watercraft.

11. Discuss best waterside practices with your neighbors and cooperate with them to ensure that bulkheads, boat docks, boats, and personal watercraft are maintained and pose no environmental threats.
12. Notify the KACPOA if you notice any unusual discharges, colorations, debris, or hazard to navigation in any of the waterways.



An occasional thorough bulkhead inspection for your property is just as important as termite and other inspections are for your home. Lacking either may lead to costly damage to your home or potential liability for damage to your neighbor's property. Remember that early detection of issues can save significant costs for repair.