# MIRABAY PILOT PROJECT REPORT

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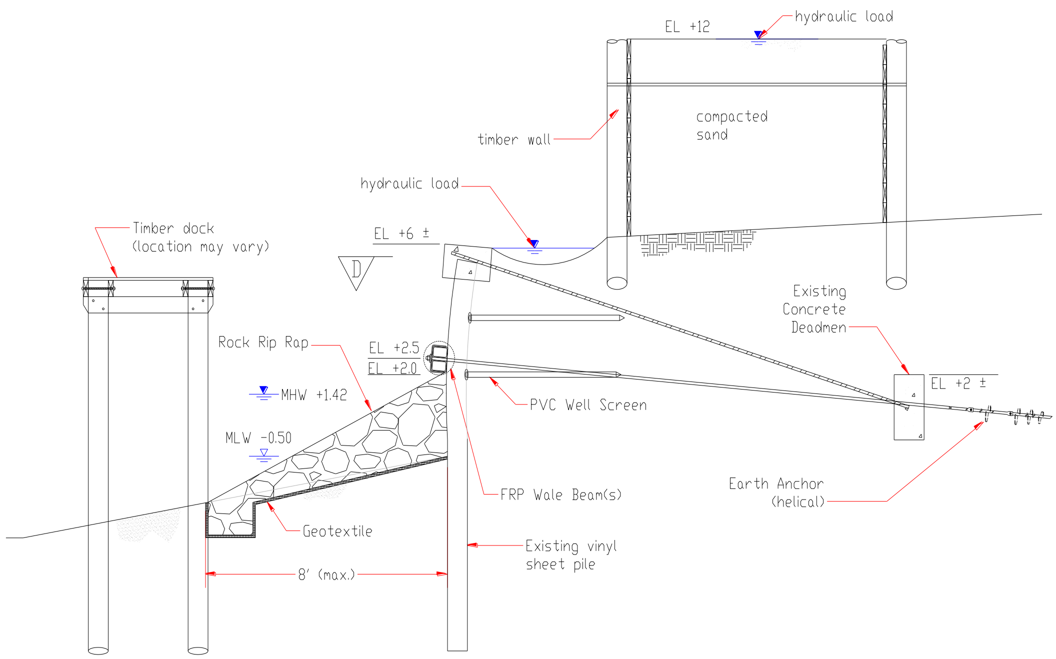
Seawalls along the MiraBay canal system started experiencing problems shortly after construction. Following the issues, litigation took place from 2007 - 2013. As a result of the litigation, recommendations for rock rip rap solutions to stabilize the existing seawalls issues were offered. The goal of pilot project was to examine other possible seawall stabilization solutions for the MiraBay Community. Three solutions were designed, constructed, loaded, and measured for movement on two vacant properties, 5607 Seagrass Pl and 5701 Tybee Island Dr.

# MiraBay Pilot Project Report

## ASSESSMENT OF CONSTRUCTED OPTIONS

### Option #1

Involved the use of a pair of rectangular fiberglass wale beams to support the lower part of the existing vinyl sheet pile. These wale beams were anchored back with a helical screw anchors, which were driven to a distance sufficient to develop the required holding capacity. Anchor installation torques and pulling capacities varied significantly due to the varying soil conditions. Rock rip rap was piled up at the base of the seawall to provide additional stabilization. Maximum slope of the rip rap is 2 horizontal to 1 vertical and has a horizontal impact of approximately 8 feet in front of the existing seawall.

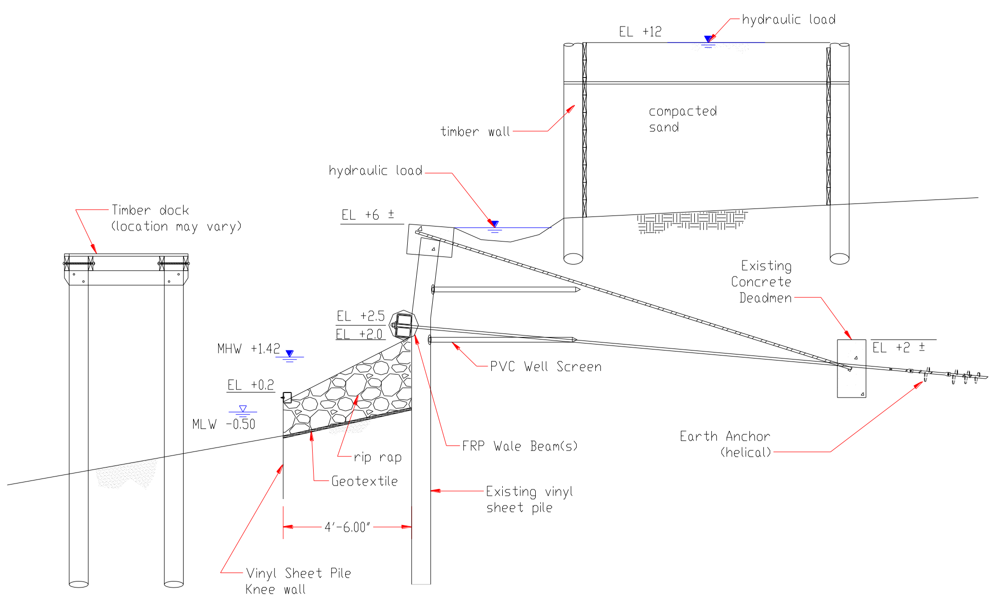



Typical Section of Option #1

Photo of Option #1 from Front

## Option #2

Identical to Option #1, with the exception of a vinyl sheet pile “knee” wall. This was installed to intersect the toe of the rip rap and reduce the horizontal impact waterside of the wall. Sheets were driven 1’ to 1.5’ short of design depth due to refusal from hard soils. Despite this installation struggle, sufficient stability was still achieved. Horizontal impact for this option is approximately 4.5 feet and would cause less conflict with water craft than Option #1.

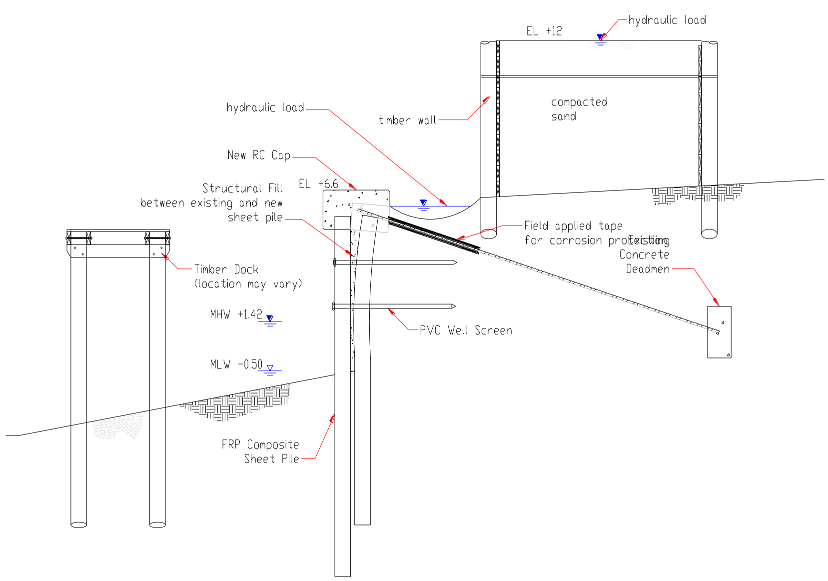


Typical Section of Option #2

Photo of Option #2 (front)

## Option #3

This involved driving of new FRP sheet pile directly in front of existing vinyl sheet pile seawall. New concrete cap was poured at the top to tie the new sheets in with the existing concrete cap and existing deadman system. New sheet piles were driven approximately 0.5' short of design penetration due to conflict of vibratory hammer with existing concrete cap. In spite of this conflict and slightly shorter sheet, sufficient stability was provided by the dense soils.




Typical Section of Option #3

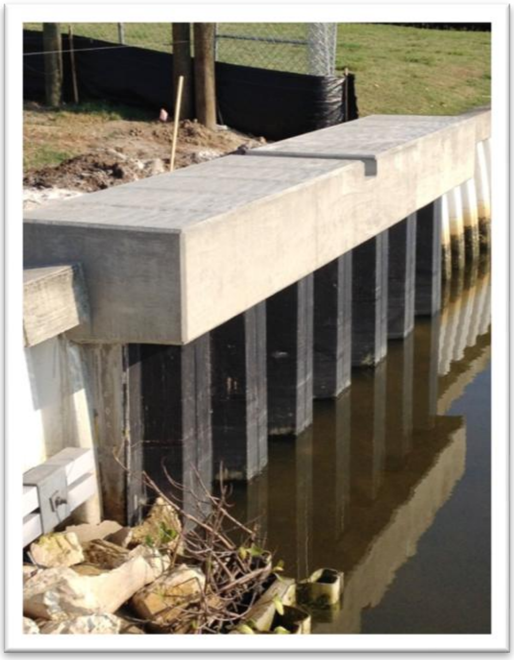
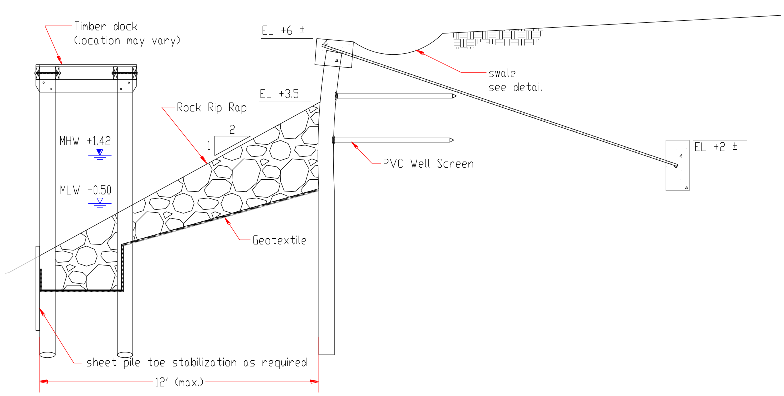


Photo of Option #3

## Option #4

A fourth option represents the proposed solution that resulted from past litigation. This option utilizes rock rip rap placed in front of the existing vinyl sheet pile seawall. The option does not incorporate an earth anchor, resulting in a larger rip rap footprint. Rock would be piled up at a greater elevation on the wall, and encroach waterside approximately 12 feet.




Typical Section Option #4

## Observations during Construction

Variability of site soils and the presence of compacted shell, presented unpredictability when driving of helical earth anchors. Contractor overtorqued and broke several anchor shafts while attempting to drive through lenses of compacted shell. At Seagrass site, contractor excavated to confirm the presence of shell layer where anchors were breaking. At the Tybee location one of the anchors had to be driven longer than the design length due to very loose soil. Installation of the anchor system proved to be the most difficult aspect of the project. Future design and construction should require anchor flexibility to account for these varying site conditions.

Photo of Helical Earth Anchor Installation

Photo of corrosion on existing tie-rod

Furthermore, it is worth noting that existing tie-rods showed signs of corrosion beyond three feet behind the cap. This is unusual since most tie rods tend to corrode immediately behind the cap due to greater presence of oxygen at the ground surface. This may indicate that soils present are chemically aggressive for typical steel. However, no measurements were taken for section loss to determine whether significant structural loss will occur over the life of the structure.

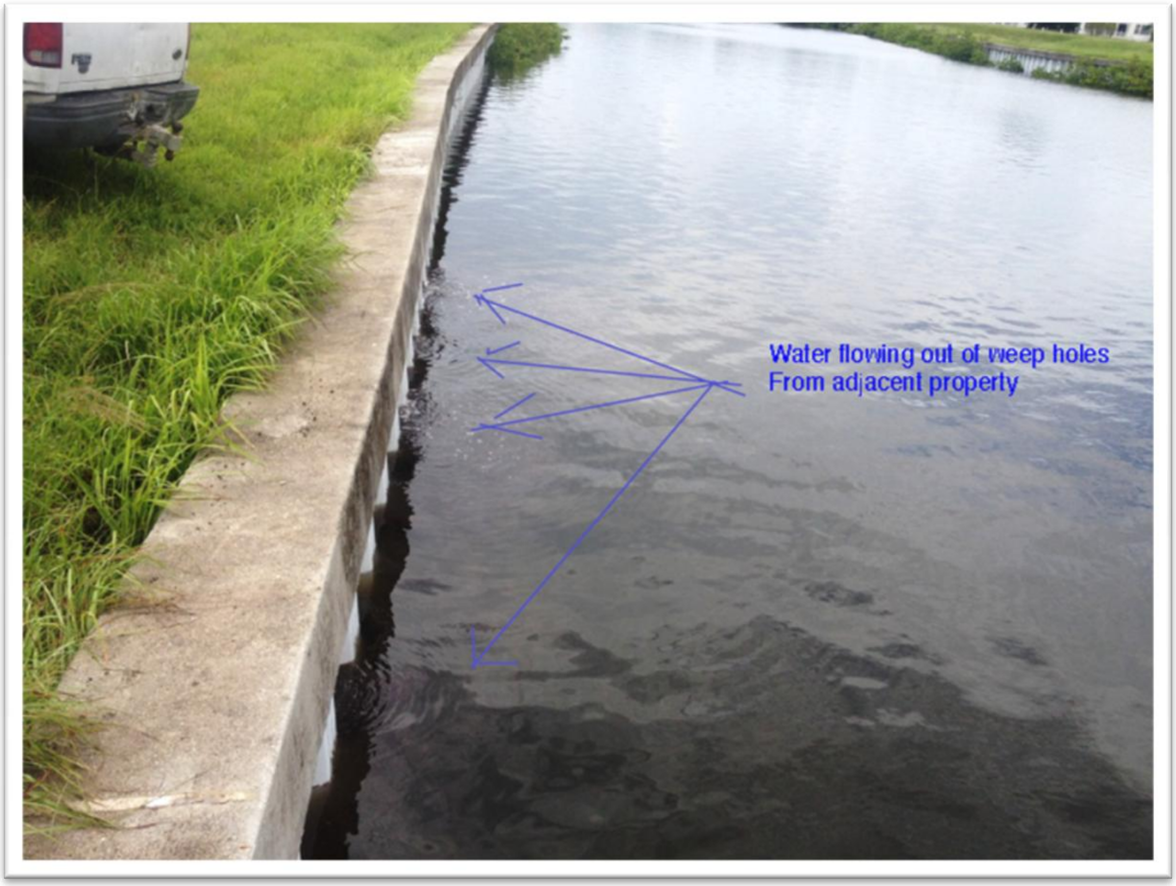
Anchors, rods, and hardware installed on the pilot project for options #1 and #2 were treated by a thermal diffusion galvanization for superior corrosion protection.

## Loading of Seawall

Timber walls were constructed approximately 5' behind the existing seawall. The intent was to simulate segmental block retaining walls present throughout the community. These timber walls were filled with compacted sand and built 6' tall. This is 25% higher than the 4.75' high segmental block walls, and corresponds to a 25% greater surcharge being applied to the seawall than typically present. Next, water was pumped immediately within the backfill areas of both the retaining and seawalls to induce a full saturated hydraulic load. While impossible to know

the exact hydraulic loading of the existing seawall throughout the community during heavy rain events, I estimate the loading applied for the pilot project is 100% to 250% greater than the current seawall normally experiences.

Also, due to lack of compaction of backfill and presence of voids, much of the water flowed parallel to the seawall and flowed out at drainage(weep) holes of the seawall on the adjacent property.




## Instrumentation

Inclinometers and surveying were performed along the two properties to measure movement along the seawall. Initial baseline readings were taken prior to construction of the timber retaining wall. Subsequent measurements for movement were taken after each hydraulic loading. In summary, all of the options constructed for the pilot project showed little to no movement. The little movement noted in a few inclinometers, were likely due to voids present in the backfill soils. Survey information along the concrete cap and front of the sheet pile, showed no appreciable movement of the seawall and coincided with the results obtained from the inclinometers.

Photo of inclinometer installation

Photo of inclinometers in place (blue)

## Conclusion

The pilot project attempted to replicate the primary loading conditions of the existing seawall throughout the community. However, due to size and variation present within the community, it is impossible to account for all possible variables that impact the seawall. Therefore, it is vital that as sections of the seawall are stabilized throughout the community as part of the master seawall stabilization project, that each of these potential variables are recognized and considered for the implemented design. Nevertheless, construction of a taller timber retaining wall (6 feet) applied a significant greater load than the segmental block wall of 4.75 feet. Also, saturation of water behind the seawall and timber retaining wall applies loads far greater than of likely hydraulic loads present on site. All three options constructed and measured in the field appear to be acceptable in terms of sufficiency concerning structural capacity and movement.