

July 12, 2023

Richard E. Brylanski, P.E.
Hole Montes, Inc.
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Fort Myers, FL 33919
Email: rickbrylanski@hmeng.com

**Re: Seawall Inspection for Little Harbor Marina/South Bay CDD
606 Seagrape Dr, Ruskin, FL 33570**

Dear Mr. Brylanski,

This letter provides a summary of the field inspection performed on various dates throughout 2023 of the seawalls within the bounds of the South Bay Community Development District. The Little Harbor Marina basin was recently inspected in October 2022 with conclusions and recommendations for maintenance and repairs provided (Reuben Clarson Consulting, October 20, 2022). This previous seawall section of the Little Harbor Marina basin has been excluded from this report. The following is a summary of findings and recommendations.

Existing Conditions/Construction for All Sections of Seawall (1-5)

- 15,405 LF +/- of Seawall
- Cast-In-Place Concrete Caps (Various Sizes Documented in Observation Tables)
- Vinyl Sheet Piles
- Seawall Exposed Height = 12 to 168 inches

Approximately 15,405 linear feet (LF) of reinforced concrete seawall consisting of 8 to 22 ± ft long sheets with various sized concrete caps. The exposed height from the top of the cap to the berm (mudline) ranges 1.0 to 14.0 ft with the highest exposed height within the marina basin and the lowest by the mangrove areas of Section 1.

The seawall inspection started at the west side of the property, moving to the east side of the property. Structural defects (longitudinal cracking) were observed in the top and the face of the seawall cap indicating rebar in the concrete are rusting from salt intrusion. The rusting causes the rebars to expand and thus crack the concrete. Transverse and stress cracking was observed in the cap. Stress crack is indicative of long-term pressures and stress on the wall. Spalling/chipping was evident in the cap. Spalling in the cap occurs as a byproduct of longitudinal cracking where the concrete in the cap has fallen off the rebar inside of the cap. Exposed rebar was evident in the cap in some of the spalled areas.

Wellpoint drains were observed in some areas to effectively relieve hydrostatic pressure or aid in removing water from behind the wall. Many areas had no drains or defective drains that were misaligned, broken, or barnacle clogged. The annular area around many wellpoint drains was not

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sealed properly. Sediment is being lost through open drain annular areas, and open form holes. The sediment loss has created void pockets behind the seawall in some areas. Many of the wellpoint drains were observed to have vegetation or mangroves growing through them.

Movement since original construction and slight leaning were evident in the seawall cap and some of the sheets. This is due to long-term pressures and stress on the wall. Holes in the vinyl sheeting were evident along with mangroves/vegetation growing through them.

The seawall inspection reporting has been divided into five (5) sections based on site conditions with observations summarized for each section. Section 1 contains 5,889 linear feet of seawall including the western marina basin and adjacent shorelines. Section 2 includes approximately 1,400 linear ft of seawall on the south side of Cabbage Creek. Section 3 incorporates approximately 1,672 linear ft of seawall along the west side of the entrance/exit channel to the Little Harbor Marina (eastern marina basin). Section 4 includes 1,139 linear ft of seawall on the north side of the Little Harbor Marina Basin. Section 5 comprises 5,304 linear ft the shorelines along the east, west and north shorelines along Christopher Water Lane; and the west and north shorelines along Seagrape Drive.

Seawall Section 1 Inspection Area

Section 1 contains 5,889 linear feet of seawall including the western marina basin and adjacent shorelines. The following is a summary of observations at measured stations starting at Station 0 ft which is the west side of the seawall on the property. Recommendations have been provided in red text where applicable. Please find below a highlighted aerial of Section 1.

Figure 1: Seawall Section 1 Inspection Area



Table 1: Seawall Section 1 Inspection Observations

From Sta.	To Sta.	Exposed Ht.	Cap Size (H x W)	Vertical Wall	Observations
0'	26'	54"	18"x24"	Concrete	<ul style="list-style-type: none"> Riprap at the toe of the vinyl wall. Longitudinal cracking (8') in the cap. (Seal) The barnacle line was located down 36" from the top of the cap. Sediment loss was evident throughout approximately 6" to 17" deep. May not have been filled behind or compacted after construction. It is not necessary to fill sediment loss holes at this time due to lack of pedestrian traffic, however if this area is to be traversed in the future, we recommend filling in the holes with crushed shell for safety. Missing wellpoint drain. (Replace) Wellpoint drains spaced approximately every 6'. Transverse cracking in the cap in every section until mentioned further. (Sealant throughout the cap in all sections until mentioned)
26'	76.5'		18"x24"	Concrete	<ul style="list-style-type: none"> Expansion joint location. No expansion joint material. (Seal) Most of the wellpoint drain annular areas were open or poorly sealed. (Seal) Start of drain annular areas observed to be opened in all sections (Station 26-462 ft). 5 chips in the cap. (Sealant) 4" deep sediment loss on average.
76.5'	127'	70"	18"x24"	Concrete	<ul style="list-style-type: none"> Expansion joint location. 5 chips in the cap. (Sealant) Chipping in the cap was visible throughout most sections until mentioned further. 4" deep sediment loss on average.
127'	177'		18"x24"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
177'	228'		18"x24"	Concrete	<ul style="list-style-type: none"> Expansion joint location. No expansion joint material. 2 open form bracket holes. (Seal) 8" deep sediment loss on average. Wall appears straight in all sections.
228'	279'		18"x24"	Concrete	<ul style="list-style-type: none"> Expansion joint location. 10" deep sediment loss in one area. Face of cap has general concrete deterioration in all sections until mentioned further. (Sealant)
279'	328'		18"x24"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Material deteriorated.
328'	412'		18"x24"	Concrete	<ul style="list-style-type: none"> Expansion joint location.

					<ul style="list-style-type: none"> • Longitudinal cracking in the face of the cap (2'). (Seal) • Wall turns left (north). • 3" of sediment loss on average. • Drains slightly tilted up starting from the corner of the wall. (Monitor). • Start of drains clogged with barnacles in all sections going forward. (Clean)
412'	462'	72"	18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. No material. • Vinyl sheet depth was 8" and peak to peak was 36". • 8" deep sediment loss on average. • Drains observed to be extending out 0" to 3" from the vinyl. (Monitor – Will need to be replaced if they fall behind the wall or become missing. • 8" deep sediment loss on average.
462'	512'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • The cap was observed to be slightly tilting landward. (Add riprap 2' x 4' along Station 462-665 ft) • 12" average sediment loss. • Vinyl sheets appear deformed and leaning. • 6 drains missing. (Replace)
512'	563'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • 4" average sediment loss. • All wellpoint drains are dislodged behind the vinyl sheeting. (Replace drains)
563'	615'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • All drains are dislodged behind the vinyl sheeting. (Replace) • Stress crack in the cap. (Seal) • 3" average of sediment loss.
615'	665'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Drains are dislodged behind the vinyl sheeting. (Replace) • 8" average of sediment loss.
665'	715'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • 10" average of sediment loss. • Start where drains revert to having an open annular area (Stations 665-2,417 ft) (Seal) • Open form bracket hole. (Seal)
715'	766'	70"	18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Stress crack in the cap. (Seal) • One area of sediment loss is 8" deep.
766'	817'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.

					<ul style="list-style-type: none"> • 10" average of sediment loss. • Many of the drains are angled or turned down/up slightly. (Monitor)
817'	870'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • 6" average of sediment loss. • Many of the drains are angled or turned down/up slightly. (Monitor)
870'	919'	96"	18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • 2" average of sediment loss.
919'	970'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. No material. • 2" average of sediment loss.
970'	1024'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
1024'	1070.5'	88"	24"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Form holes open throughout this area. (Seal) • 1 hole of sediment loss 16" deep x 2' long x 4' wide. • Culvert encountered that was 3' wide.
1070.5'	1116'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Transitions to a 24" cap face. • Longitudinal cracking in the face of the cap for approximately 20'. (Sealant only)
1116'	1156'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Cap transitions back to 18" face. • Concrete deterioration in cap. (Sealant)
1156'	1209.5'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Sediment loss 8" deep x 2' wide x 2' long in one area.
1209.5'	1260'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Sediment loss 36" deep in one area. • Drains are not clogged with barnacles; however, annular area still open. (Seal)
1260'	1310'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Most sections have open form holes. (Seal)
1310'	1362'	88"	18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
1362'	1411'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
1411'	1460'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
1460'	1511'		18"x24"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Vinyl sheets observed to change to 24" peak to peak and 8" depth.
1511'	1577'		12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Concrete cap transitions to a 12" x 19.5". • Drains were observed to be located within the barnacle line. (Clean)

					<ul style="list-style-type: none"> • Sediment loss 2” deep on average.
1577’	1637’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
1637’	1698.5’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Wall angles left. • Chipping in cap observed to be end. (End sealant)
1698.5’	1757’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
1757’	1817’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
1817’	1875’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
1875’	1936’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Curve starts along the northwest side of the wall.
1936’	1997’	73”	12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Culvert location. • Longitudinal cracking in the top of the cap (1’) (Seal).
1997’	2057’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Longitudinal cracking in the cap (1’). (Seal)
2057’	2117’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
2117’	2177’	92”	12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • The barnacle line was located down approximately 50” in this area.
2177’	2237’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Culvert location.
2237’	2297’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
2297’	2356’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Curve begins along the northeast side of the section.
2356’	2417’	76”	12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Curve ends along this section of wall.
2417’	2476’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Wellpoint drains end. (Add drains from this point going forward)
2476’	2537’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Vegetation growing through conduit. (Remove)
2537’	2597’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
2597’	2655’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. No material. (Fill)
2655’	2716’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Wall appears straight. • Expansion joint location. Deteriorated material. (Fill) • Concrete block is evident underneath the cap. • Open transverse crack. (Seal)
2716’	2775’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Sediment loss 8” deep x 3’ long x 1’ wide.

2775'	2825'	88"	12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Storm drain located down 33". • Transverse cracking evident in the cap approximately every 1' until further mention. (Sealant)
2825'	2838'		12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. Expansion joint material deteriorating. (Fill)
2838'	2850'		12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Chip in the bottom of the cap. (Sealant) • Vegetation in conduit. (Remove)
2850'	2897'		12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. Material deteriorating. (Fill)
2897'	2958'		12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Large chip in back of cap. (Sealant)
2958'	3019'	102"	12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. Missing material. (Fill) • Approximately 1' of sediment loss (Fill) • Conduit has vegetation. (Remove) • Wall turns left.
3019'	3082'		12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Corner of wall (3037'). • Wellpoint drains begin again, and wall turns right (3057').
3082'	3142'	43"	12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Culvert location.
3142'	3202'		12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Chip in the cap. (Sealant). (End sealant at this point)
3202'	3263'	20"	12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Wellpoint drains end.
3263'	3324'		12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
3324'	3382'		12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
3382'	3442'	41"	12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Sediment behind the seawall was observed to be approximately 3.5" down from the top of the cap. • Wellpoint drains begin again. • Chip in the back of the cap. (Seal)
3442'	3502'		12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Chip in the cap. (Seal)
3502'	3562'		12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Culvert location. • Ground behind the seawall flush with the cap. • Chip in the cap. (Seal)
3562'	3621'	34"	12"x19.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.

					<ul style="list-style-type: none"> • Wall turns right (3595’). • Sediment behind the seawall was observed to be approximately 2” down from the top of the cap. • Chip in the cap. (Seal)
3621’	3681’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Wall turns right (3625’). • Sediment behind the seawall was observed to be approximately 2” down from the top of the cap. • Wall turns right (3677’).
3681’	3740’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Sediment behind the seawall was observed to be approximately 2” down from the top of the cap. • Wall turns right (3726’).
3740’	3799’		12”x19.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Wall turns right (3762’).
3799’	3840’	50”	18”x20.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Cap transitions to an 18” x 20.5”. • Add wellpoint drains in areas of 3’ or less of exposed height. • Spalling in the cap. (Epoxy reform cap)
3840’	3878’		18”x20.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Wall ends at 3878’ with a 5.75’ return.
3878’	3986’		18”x20.5”	Concrete	<ul style="list-style-type: none"> • Failed vinyl wall. (Replace). • Calculation will be approximate going forward due to vegetation and rolling through the grass.
4010’		18”	18”x20.5”	Concrete	<ul style="list-style-type: none"> • Exposed height measured. • Mangroves located in front of this area throughout till the end of the wall.
4192’		19”	18”x20.5”	Concrete	<ul style="list-style-type: none"> • Exposed height measured.
4250’		12”	18”x20.5”	Concrete	<ul style="list-style-type: none"> • Exposed height measured.
4570’		32”	18”x20.5”	Concrete	<ul style="list-style-type: none"> • Exposed height measured. • No wellpoint drains evident throughout this area.
4688’		41”	18”x20.5”	Concrete	<ul style="list-style-type: none"> • No wellpoint drains. (Add drains) • We recommend adding drains in areas with a 3’ exposed height or higher.
4730’		55”	18”x20.5”	Concrete	<ul style="list-style-type: none"> • No wellpoint drains. (Add drains)
4826’		48”	18”x20.5”	Concrete	<ul style="list-style-type: none"> • No wellpoint drains. (Add drains until exposed height drops under 3’)
4834’			18”x20.5”	Concrete	<ul style="list-style-type: none"> • Wall turns left.
4936’			18”x20.5”	Concrete	<ul style="list-style-type: none"> • Spalling in the cap. (Epoxy reform cap)
4981’			18”x20.5”	Concrete	<ul style="list-style-type: none"> • West end of the buildings.
5025’	5085’	13”	18”x20.5”	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Storm drain located down 22” from top of cap.

					<ul style="list-style-type: none"> • Chip in the cap. (Seal)
5085'	5145'		18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. No material. (Fill)
5145'	5205'		18"x20.5"	Concrete	<ul style="list-style-type: none"> • Chip in the back of the cap. (Seal)
5205'	5265'		18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. No material. (Fill) • Approximately 1' of longitudinal cracking in the cap. (Seal)
5265'	5324'		18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
5324'	5386'		18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. No material. (Fill) • Approximately 1' of longitudinal cracking in the cap. (Seal)
5386'	5447'	25"	18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
5447'	5507'		18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. No material. (Fill) • Approximately 1' of longitudinal cracking in the cap. (Seal)
5507'	5567'		18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. No material. (Fill) • Chip in the back of the cap. (Seal)
5567'	5607'		18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. No material. (Fill) • Approximately 2' of longitudinal cracking in the cap. (Seal)
5607'	5687'	23"	18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. Deteriorated material. (Fill) • Approximately 2' of longitudinal cracking in the cap. (Seal)
5687'	5740'		18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Chip in the back of the cap. (Seal)
5725'			18"x20.5"	Concrete	<ul style="list-style-type: none"> • Building ends and is located 16' landward from the seawall.
5748'	5805'		18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Wall turns right (5757'). • Wing wall located in front of vinyl wall.
5805'			18"x20.5"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. No material. (Fill) • Wing wall ends.
5840'		45"	18"x20.5"	Concrete	<ul style="list-style-type: none"> • Storm drain located down 10". • Add wellpoint drains in the area with more than a 3' exposed height.
5851'			18"x20.5"	Concrete	<ul style="list-style-type: none"> • Wall slopes down.
5889'			18"x20.5"	Concrete	<ul style="list-style-type: none"> • Wall ends.

Seawall Section 2 Inspection Area

Section 2 includes approximately 1,400 linear ft of seawall on the south side of Cabbage Creek. The following is a summary of observations at measured stations starting at Station 0 ft which is the east side of the seawall of Section 2. Recommendations have been provided in red text where applicable. Please find below a highlighted aerial of Section 2.

Figure 2: Seawall Section 2 Inspection Area



Table 2: Seawall Section 2 Inspection Observations

From Sta.	To Sta.	Exposed Ht.	Cap Size (H x W)	Vertical Wall	Observations
0'	1400.5'	70"	10.5"x20"	Concrete	<ul style="list-style-type: none"> • Vinyl sheets had 8" depth and 24" peak to peak. • The barnacle line was located down 44" from the top of the cap. • Form holes observed to be open; however, filter fabric or white material behind/covering the holes. The white material feels like starboard. • The annular area of the drains was observed to be open throughout with previous signs of attempted sealing. (Reseal) • Approximately 75% to 80% of all drains were either clogged, misaligned, uplifted or crushed. (Clean and/or replace).

					<ul style="list-style-type: none"> The wellpoint drains were located down 50" from the top of the cap and were in the barnacle line. (Clean) Sediment loss was evident throughout off and on. May not have been filled behind or compacted after construction. (Fill in sediment loss in areas that are to be traversed). Transverse and light longitudinal cracking in the cap in nearly every section. (Sealant)
0'	5.5'	70" to 87"	10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Wall slopes up approximately 17".
15'	116'	107"	10.5"x20"	Concrete	<ul style="list-style-type: none"> Curve of wall. Throughout the curve of the wall, scouring was evident as the exposed height increases quickly. Sheets slightly kicking out. (Add riprap 2' high x4' wide)
63'	124'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. No Material. (Fill) Approximately 1' of spalling in the cap. (Epoxy reform) Approximately 50% of light longitudinal cracking in this section of cap. (Sealant)
124'	184'	99"	10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Approximately 20% of light longitudinal cracking in this section of cap. (Sealant)
184'	245'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Approximately 30% of longitudinal cracking in this section of cap. (Sealant)
245'	304'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Rusting rebar in the bottom of the cap for approximately 2'. (Epoxy coat) Approximately 20% of longitudinal cracking in this section of cap. (Sealant)
304'	365'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Approximately 20' long x 1.5' deep x 1.5' wide of sediment loss in this section.
307'	567'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Large sediment loss under the pilings laying along the seawall.
365'	425'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. No material. (Fill) Approximately 3' of spalling at the expansion joint (Epoxy reform) Approximately 3' long x 1.5' deep x 1.5' wide of sediment loss in this section.
425'	484'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location.

					<ul style="list-style-type: none"> Approximately 1' of spalling in the cap. (Epoxy reform)
484'	545'	94"	10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Approximately 3' of longitudinal cracking in the top of the cap. (Sealant)
545'	606'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Mangroves are growing through the wellpoint drain. Curve of wall from 567' to 606'. Missing wellpoint drain. (Replace) Concrete backfill apparent below the drain but not apparent above the drain.
606'	651'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
651'	712'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Mangroves growing through 5 wellpoint drains.
712'	772'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Docks located in front of the seawall. Annular area of wellpoint drains sealed. Wellpoint drains appear to be in better condition in this section. (Monitor) Approximately 1' of spalling at the expansion joint. (Epoxy reform)
772'	833'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Drain located down 36" from the top of the cap. Mangrove growing through the drain. Wellpoint drains appear to be in better condition in this section. (Monitor)
833'	892'	99"	10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Material missing. (Fill) Mangroves growing through a wellpoint drain. Sealing of annular area of wellpoint drains appears to be deteriorating. (Reseal) Large crack/chip in the cap at the expansion joint. (Epoxy reform) Hole evident in sheet (6" x 6"). (Seal)
833'	1400.5'				<ul style="list-style-type: none"> Wellpoint drains need to be replaced.
892'	934'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Stress crack in the cap. (Sealant) Very slight kicking out of vinyl sheets. (Add riprap 2' x 4')
934'	954'	89"	10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Stress cracking and chipping in the cap. (Epoxy reform) Replaced section of cap.
954'	1013'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location.

					<ul style="list-style-type: none"> • Approximately 9 holes in the sheets where sediment is escaping. (Seal) • Wall begins to curve. • Sheets slightly kicking out. (Add riprap 2' x 4')
1013'	1073'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Holes in the sheets approximately every 6'. (Seal) • Stress crack in the cap. (Sealant)
1073'	1134'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. Expansion joint material deteriorating. (Fill) • Mangrove growing through the drain. • Chip in the vinyl sheet. (Seal)
1134'	1194'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. Material deteriorating. (Fill) • Vegetation and mangroves growing through 5 of the drains. • Sediment loss hole 24" deep x 1' wide x 3' long. (Fill) • Exposed rebar in top of cap. (Epoxy coat)
1194'	1254'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. Material deteriorating. (Fill) • Hole in vinyl sheet. (Seal)
1254'	1314'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. Expansion joint material deteriorating. (Fill) • Mangroves growing through 2 of the drains. • Longitudinal cracking at the expansion joint. (Sealant)
1314'	1374'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Mangroves growing through 4 of the drains.
1374'	1400.5'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Wall return to the left (north) neighbor concrete slab wall. • The left (north) neighbor wall was observed to be in poor condition.

Seawall Section 3 Inspection Area

Section 3 incorporates approximately 1,672 linear ft of seawall along the west side of the entrance/exit channel to the Little Harbor Marina (eastern marina basin). The following is a summary of observations at measured stations starting at Station 0 ft which is the north side of the seawall of Section 3 moving southward. Recommendations have been provided in red text where applicable. Please find below a highlighted aerial of Section 3.

Figure 3: Seawall Section 3 Inspection Area



Table 3: Seawall Inspection Area 3 Observations

From Sta.	To Sta.	Exposed Ht.	Cap Size (H x W)	Vertical Wall	Observations
2.5'		57"	12"x19"	Concrete	<ul style="list-style-type: none"> Expansion joint was observed to be disjoined. The barnacle line was located down 38" from the top of the cap. Open form holes in the vinyl sheeting. (Monitor for sediment loss in the future) The wall was observed to be straight. Mangroves are located in front of the wall. The sediment behind the seawall was approximately 3" on average throughout. Light layer of riprap in front of the wall. No wellpoint drains were evident. (Add drains until Station 34 ft)
31'	78.5'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Wall turns south (34.5').
78.5'	126'	33"	10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
126'	174'		10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
174'	234'	28"	10.5"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location.

					<ul style="list-style-type: none"> • Buildings located behind the seawall. (198')
234'	282.5'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Wall angles southwest. • Chip in cap.
282.5'	330.5'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
330.5'	379'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
379'	428'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Approximately 1' of spalling in the cap. (Epoxy reform cap)
434'	475.5'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Chipping in the cap. (Epoxy reform cap)
475.5'	1238'	32"	10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint locations.
1238'	1285'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Approximately 1' of spalling in the cap. (Epoxy reform cap)
1285'	1333'	36"	10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Approximately 2' of spalling in the cap at the expansion joint. (Epoxy reform cap)
1333'	1381'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Mangroves growing through 5 wellpoint drains.
1381'	1429'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location.
1429'	1477'	33"	10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint location. • Chipping in the cap. (Epoxy reform cap)
1477'	1574'		10.5"x20"	Concrete	<ul style="list-style-type: none"> • Expansion joint locations.
1623'	1672'	59"	10.5"x20"	Concrete	<ul style="list-style-type: none"> • Approximately 2' of longitudinal cracking in the top of the cap. (Seal) • Wall angles twice. • Stress crack in the cap. (Seal) • End of wall.

Seawall Section 4 Inspection Area

Section 4 includes 1,139 linear ft of seawall on the north side of the Little Harbor Marina Basin. The following is a summary of observations at measured stations starting at Station 0 ft which is the east side of the seawall of Section 4 moving westward. Recommendations have been provided in red text where applicable. Please find below a highlighted aerial of Section 4.

Figure 4: Seawall Section 4 Inspection Area



Table 4: Seawall Inspection Area 4 Observations

From Sta.	To Sta.	Exposed Ht.	Cap Size (H x W)	Vertical Wall	Observations
0'	294.5'		18"x24"	Concrete	<ul style="list-style-type: none"> Cap tilting landward slightly. Sheets observed to be kicking out. (Add Waler)
0'	408'				<ul style="list-style-type: none"> Wellpoint drains observed to be upturned and crushed. Replace wellpoint drains.
0'	1139'				<ul style="list-style-type: none"> Wellpoint drains are located in the barnacle line. (Clean all wellpoint drains wherever not being replaced) Apply concrete sealant throughout cap.
~58.5'			18"x24"	Concrete	<ul style="list-style-type: none"> Approximately 3' of spalling in the cap. (Epoxy reform cap)
~ 112.5'			18"x24"	Concrete	<ul style="list-style-type: none"> Stress cracking evident in the cap. (Seal) 2 joints/cracks in the cap evident. (Seal)
294.5'		120"	18"x24"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
307'			18"x24"	Concrete	<ul style="list-style-type: none"> Sediment loss evident. (Fill)
355.5'			18"x24"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Spalling and stress crack at the expansion joint. (Seal and reform)
401'	408'	108"	18"x24"	Concrete	<ul style="list-style-type: none"> Stress cracking throughout the cap. (Epoxy inject) Wall turns left at 408'.

414.5'			18"x24"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Approximately 2' of spalling at the expansion joint. (Epoxy reform cap) Approximately 8' of sediment loss x 1.5' deep. (Fill)
408'	820'		18"x24"	Concrete	<ul style="list-style-type: none"> Annular area of wellpoint drains open. (Seal)
415.5'	475.5'		18"x24"	Concrete	<ul style="list-style-type: none"> Cap tilting landward slightly. (Add riprap 2' x 4')
475.5'		120"	12"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Approximately 2' of spalling at the expansion joint. (Epoxy reform cap)
484'			12"x20"	Concrete	<ul style="list-style-type: none"> Wall turns right. Very slight landward tilt in the cap. (Monitor) Approximately 3' of stress cracking in the cap. (Seal)
537'			12"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
552'		96"	12"x20"	Concrete	<ul style="list-style-type: none"> Sediment loss (1') (Fill)
547'	677'		12"x20"	Concrete	<ul style="list-style-type: none"> Wellpoint drains barely extending through the vinyl. (Replace) General sediment loss throughout this area. (Fill as needed)
598'			12"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
632'			12"x20"	Concrete	<ul style="list-style-type: none"> General stress cracking in the cap. (Sealant)
658'			12"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Spalling in the cap at the expansion joint. (Epoxy reform cap) Wellpoint drains missing. (Replace)
598'	772'		12"x20"	Concrete	<ul style="list-style-type: none"> Cap tilts landward. (Add waler)
706'			12"x20"	Concrete	<ul style="list-style-type: none"> Longitudinal cracking in the cap. (Seal)
717.5'			12"x20"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
726'	850'		12"x20"	Concrete	<ul style="list-style-type: none"> Higher up drains begin along with lower wellpoint drains. (2 sets)
771'			18"x25.5"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
788'		97"	18"x25.5"	Concrete	<ul style="list-style-type: none"> Chip in the cap. (Sealant)
820'	850'		18"x25.5"	Concrete	<ul style="list-style-type: none"> Missing wellpoint drains. (Replace lower)
830.5'			18"x25.5"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
883.5'			18"x25.5"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
927.5'		92"	18"x25.5"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
850'	1077.5'		18"x25.5"	Concrete	<ul style="list-style-type: none"> Annular area of wellpoint drains open. (Seal)
1024.5'			18"x25.5"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Sediment loss (1'). (Fill)
1077.5'		97"	12"x20.5"	Concrete	<ul style="list-style-type: none"> Expansion joint location.
1077.5'	1139'		12"x20.5"	Concrete	<ul style="list-style-type: none"> Missing wellpoint drains. (Replace)
1137'		86"	12"x20.5"	Concrete	<ul style="list-style-type: none"> Stress crack in the cap. (Seal)
1139'			12"x20.5"	Concrete	<ul style="list-style-type: none"> End of Section 4.

Seawall Section 5 Inspection Area

Section 5 comprises 5,304 linear ft the shorelines along the east, west and north shorelines along Christopher Water Lane; and the west and north shorelines along Seagrape Drive. The following is a summary of observations at measured stations starting at Station 0 ft which is the south end of the seawall of Section 5 heading northeasterly. Recommendations have been provided in red text where applicable. Please find below a highlighted aerial of Section 5.

Figure 5: Seawall Section 5 Inspection Area

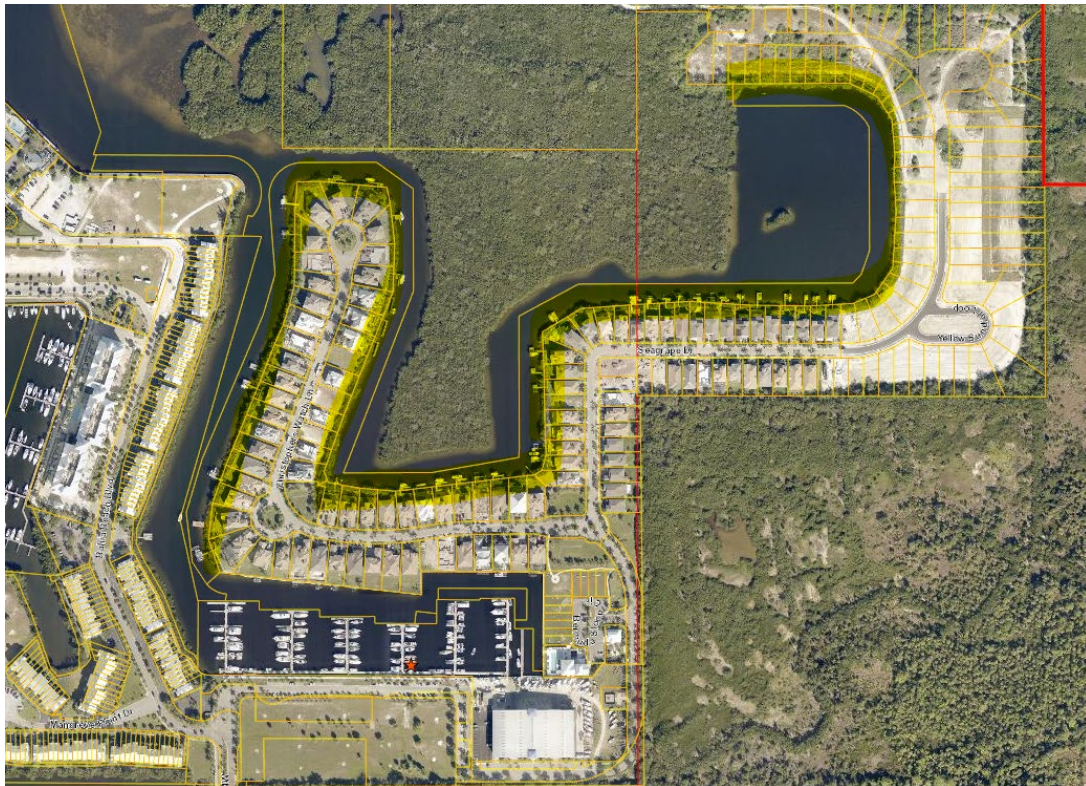


Table 5: Seawall Inspection Area 5 Observations

0'	5304'		12"x20.5"	Concrete	<ul style="list-style-type: none"> Mangroves are located in front of the wall throughout and in some areas they are flush against the cap. Expansion joint locations approximately every 30' to 70'. No wellpoint drains evident. (Install drains)
1300'		36"	12"x20.5"	Concrete	<ul style="list-style-type: none"> Chipping in cap evident (Seal)
1588'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Spalling evident in the cap at the expansion joint. (Epoxy reform cap)
1610'		48"	12"x20.5"	Concrete	<ul style="list-style-type: none"> Sheet interlock.
1646'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Expansion joint location. Crack evident in the sheet. (Seal)

1798'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Palm trees are growing out from the wall. (Remove)
1883'	1971'		12"x20.5"	Concrete	<ul style="list-style-type: none"> Riprap in front of the wall extending 5' to 10' waterward.
2630'		36"	12"x20.5"	Concrete	<ul style="list-style-type: none"> Spalling evident in the cap at the expansion joint. (Epoxy reform cap)
2635'	2687'		12"x20.5"	Concrete	<ul style="list-style-type: none"> Riprap in front of the wall extending 2' to 3' waterward.
2744'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Storm drain location.
3002'		48"	12"x20.5"	Concrete	<ul style="list-style-type: none"> Storm drain location.
3232'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Spalling evident in the cap at the expansion joint. (Epoxy reform cap)
3250'		60"	12"x20.5"	Concrete	<ul style="list-style-type: none"> Exposed height measurement.
3631'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Storm drain location.
3814'		48"	12"x20.5"	Concrete	<ul style="list-style-type: none"> Spalling evident in the cap at the expansion joint. (Epoxy reform cap)
3883'	3926'		12"x20.5"	Concrete	<ul style="list-style-type: none"> Shell fill in front of wall extending out 2' to 5'.
3992'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Spalling evident in the cap at the expansion joint. (Epoxy reform cap)
4113'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Spalling evident in the cap at the expansion joint. (Epoxy reform cap)
4390'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Storm drain location.
4641'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Spalling evident in the cap at the expansion joint. It was previously patched but should be resealed. (Epoxy reform cap)
4642'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Chipping evident in the cap. (Epoxy reform cap)
4880'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Spalling evident in the cap at the expansion joint. (Epoxy reform cap)
5058'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Spalling evident in the cap at the expansion joint. (Epoxy reform cap)
5304'			12"x20.5"	Concrete	<ul style="list-style-type: none"> Wall ends.

Seawall Recommendations

It should be noted that the useful life of a concrete seawall on saltwater is approximately 50± years.

All Sections 1-5:

Due to the age and condition of the existing seawall system we recommend the following maintenance, repair items and structural reinforcement of the existing seawall systems to be completed within the next 1+/- years.

For additional structural support of the seawall, we recommend adding approximately 469 LF of a double box beam composite waler approximately 6” above the mean highwater (MHW) line to be anchored with new 1” diameter x 16’ long HDG tieback rods to Manta Ray (MR-SR) anchors at 6’ on center. The tieback rods should extend past both the existing vinyl wall and the original concrete wall.

All wellpoint drains installed through vinyl wall at 6’ on center and 5” above the barnacle line to relieve the hydrostatic pressure or aid in removing water from behind the wall. The annular area around the existing wellpoint drains and any holes should be filled with epoxy to limit sediment loss.

All voids behind the seawall should be filled with crushed shell or pea gravel as needed (perhaps more than once) to fill in the existing voids behind the seawall, allowing for drainage, but aid in trapping the sand particles. All cracking in the seawall cap areas should be chipped, cleaned, and filled with hydraulic cement or epoxy and reformed where specified. The maintenance and repair items are summarized below.

1. Clean and seal all cracking in the seawall concrete cap with hydraulic cement or trawlable epoxy.
2. Install/replace wellpoint drains through every 6’ and 5” above the barnacle line to relieve the hydrostatic pressure from behind the wall.
3. All voids behind the seawall should be filled with crushed shell or pea gravel as needed (perhaps more than once) to fill in the existing voids behind the seawall, allowing for drainage, but aid in trapping the sand particles. (In areas indicated by the red notes in the table)
4. Clean wellpoint drains to ensure proper relief of hydrostatic pressure.
5. Epoxy reform spalling/chipping in the cap to protect rebar.
6. Apply a concrete sealant to the cap to protect the rebar and reduce further cracking.
7. Seal/block form holes and other holes in the vinyl sheets.
8. Fill expansion joints with material to reduce sediment loss.
9. Seal the annular area of wellpoint drains to reduce sediment loss.
10. Add riprap at a 2 to 1 slope at the base of the vinyl wall.
11. Install a box waler for additional structural support of the wall in Section 4 (Station 0-295 ft and Station 598-772 ft)

The above work could cost:

1. Seal Cracking - 59 LF x \$25.....	\$1,475
2. Install Wellpoint Drains – 1,269 x \$225.....	\$285,525
3. Fill Voids Behind Seawall -	\$8,500
4. Clean Wellpoint Drains – 485 Drains x \$10.....	\$4,850
5. Reform Spalling/Chipping – 62 LF x \$120.....	\$7,440
6. Concrete Sealant – 4,665 LF.....	\$95,632
7. Seal Holes -	\$5,564
8. Seal Annular Areas – 601 Drains x \$35.....	\$21,035
9. Riprap – 112 Tons x \$250.....	\$28,000

10. <u>Waler – 469 LF x \$300-460.....</u>	<u>\$140,700 to \$215,740</u>
	\$598,721 to \$673,761

It should be noted that even with the above repairs we recommend planning to replace the existing seawall system within 25-35± years. We recommend monitoring the seawall for additional structural defects and movement with engineering inspection at least every 3 years. The estimated remaining useful life of the seawall can be revised as needed upon future inspection. We recommend removing vegetation growing through the wall and the drains.

Section 4 – Northern Side of Little Harbor Marina Basin

As far as repairs for the northern section of seawall in the Little Harbor Marina basin, where a pool structure or other structure is proposed within approximately 22 ft or less from the seawall, we recommend replacement of the seawall per the October 2020 inspection report. The cost per linear ft for seawall replacement in this area could range from \$650-\$850 (competitively bid). High density or composite sheet piles may be required from the northeast corner of the basin heading to approximately 350 linear ft west. At this location the exposed height of the seawall (height from the mudline to the top of the seawall cap) decreases and composite sheets would not be required. Composite sheeting was installed by Waterline Construction on the east side of the marina basin where the exposed height of the seawall is approximately 128". The composite sheet piles are darker in color. Composite sheet pile seawalls would be on the upper end of the construction cost range of \$850/linear ft. The details of the construction of the eastern composite seawall were very similar to the replacement seawall plans that were recently designed for the 120 ft location on the south side of the marina basin. The only difference being in the sheet pile selection where the eastern seawall used composite sheeting and the proposed south wall replacement is using the highest density vinyl sheet piling.

For replacement of the seawall for the western end (500 lf) of the northern residential section we would recommend a similar plan to what is being proposed on the south side of the Little Harbor Marina Basin. For the eastern most 350 lf we would most likely recommend composite sheet piling instead of high density (HD) vinyl sheet piling.

Failed Area in Section 1 (Station 3,878 – 3,986 ft)


Due to the age and condition of the existing seawall system we recommend replacement of the seawall system within 1± years. Recommended specifications for a new seawall would include construction of a new vinyl corrugated seawall system with a new concrete cap and 1" diameter HDG PVC encased tieback rods to Manta Ray anchors or deadmen. Well point drains should be installed through both walls at 6' on center and 5" above the barnacle line to relieve the hydrostatic pressure or aid in removing water from behind the wall. The existing wall may need to be removed. The ballpark cost for this portion of wall in today's prices is approximately \$65,500± with a useful life expectancy of 50 ± years.

Mr. Richard E. Brylanski, PE, Little Harbor Marina/South Bay CDD
RE: Seawall Inspection Report – 606 Seagrape Dr, Ruskin, FL 33570
July 12, 2023
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If you should have any questions or comments, please do not hesitate to contact me. We appreciate the opportunity to provide this report.

Sincerely,

REUBEN CLARSON CONSULTING, INC.



John B. Adams, Jr., PE
FL Professional Engineer No. 53963

Section 1 Photos

Photo #1- West End of Seawall. Beginning of Section 1.



Photo #2 – Spalling in the Cap and Sediment Loss



Spalling/
Chipping

Photo #3 – Sediment Loss.



Sediment Loss

Photo #4 – Front View of the Seawall.



Photo #5 – Vegetation growing Through Conduit.



Photo #6 – Failed Section of Wall.



Photo #7 – Typical Spalling of Concrete Cap.



Photo #8 – Top View of the Wall Near the End of Section 1.



Section 2 Photos

Photo #1- East End of Seawall. Beginning of Section 2.



Photo #2 – Missing Drain



Missing
Wellpoint
Drain

Photo #3 – Stress Cracking in the Cap.



Stress Cracking in the
Cap

Photo #4 – Holes in the Vinyl Sheet.

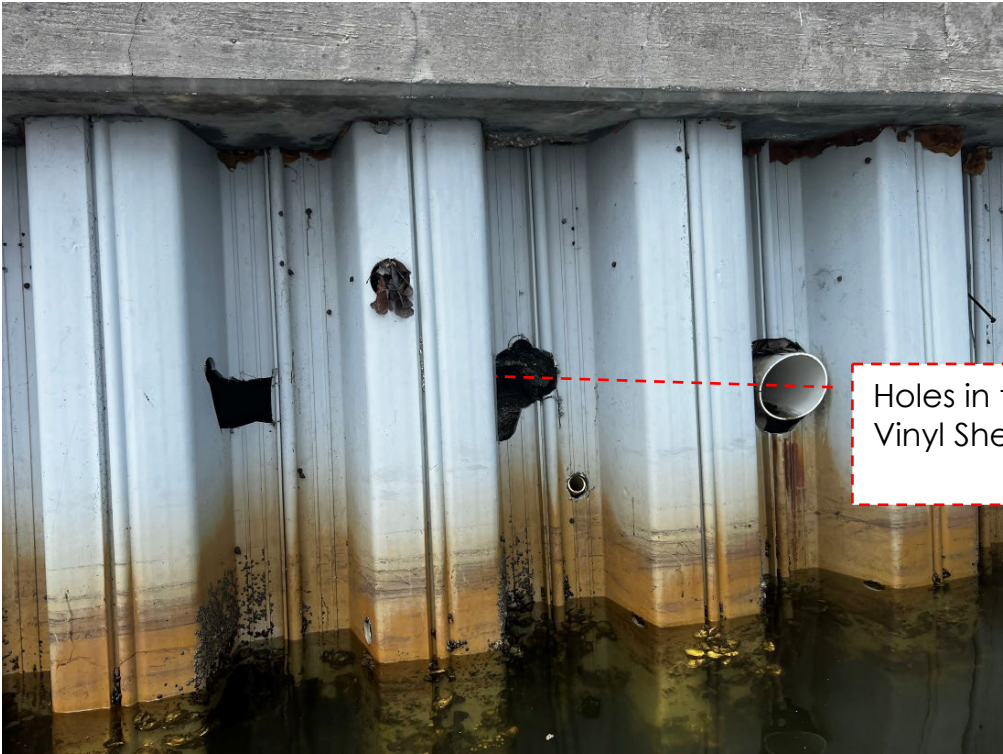


Photo #7 – End of Section 2.



Section 3 Photos

Photo #1- North End of Seawall. Beginning of Section 3.



Photo #2 – Front View.



Photo #3 – Top View.



Photo #4 – Spalling in the Cap.



Photo #5 – Spalling in Cap. End of Section 3.



Section 4 Photos

Photo #1- East End of Seawall. Beginning of Section 4.



Photo #2- Cap Tilting Landward.



Photo #3 – Cracking in the Cap.



Photo #4 – Stress Cracking in the Cap.



Stress Cracking in the
Cap

Photo #5 – Missing Drain.



Missing Drain

Photo #6 – Spalling.

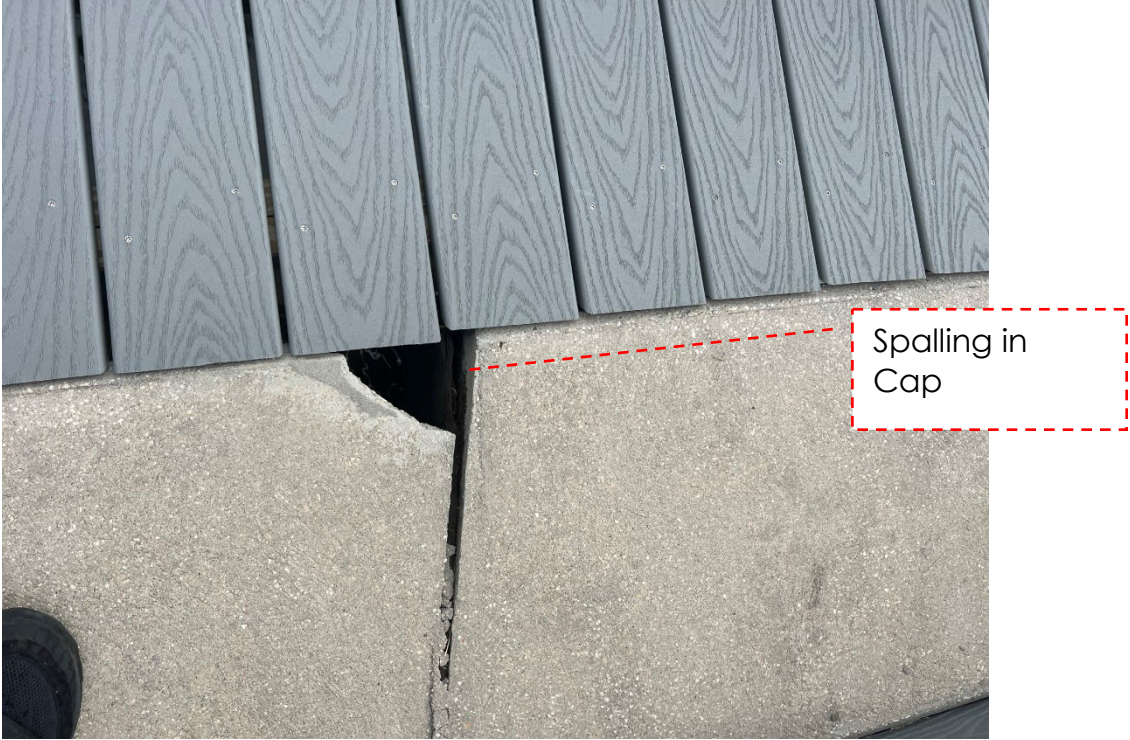


Photo #7 – Top View of the Wall Facing West.



Section 5 Photos

Photo #1- Section 5.



Photo #2 – Front View.



Photo #3 – Front View.

