

**PORT CHARLOTTE BEACH PARK
EROSION AND NAVIGATION CHANNEL STUDY
FINAL REPORT**



Prepared for:

**Charlotte County Board of County Commissioners
18500 Murdock Circle
Port Charlotte, FL 33948-1094**

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Prepared by:



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1 INTRODUCTION

Coastal Engineering Consultants, Inc. (CEC) was contracted by Charlotte County to conduct topographic, bathymetric and natural resource surveys of Port Charlotte Beach Park and the adjacent Sunrise Waterway, perform beach erosion and navigation channel shoaling analysis, and develop restoration plans and strategies to reduce sand transport into the navigation channel and restore the Beach Park’s sandy shoreline.

The Port Charlotte Beach Park is located in Charlotte County, Florida, on the north side of Charlotte Harbor in Alligator Bay. A location map of the Study Area is presented in Figure 1.

In 2011, CEC performed a similar analysis and presented three (3) alternatives including 1) no new action, 2) placement of a feeder beach fill, and 3) placement of a rock groin (CEC, 2011). A conclusion was made that if no new action is undertaken, it was anticipated that the gradual shoaling of the waterway would continue and periodic maintenance dredging with disposal of the material off the Port Charlotte Beach Complex site to improve navigation in Sunrise Waterway would be required.

Since the 2011 study, no new action has been implemented. This report updates the 2011 study with new beach survey and dredging events data and presents new alternatives for consideration by the County.

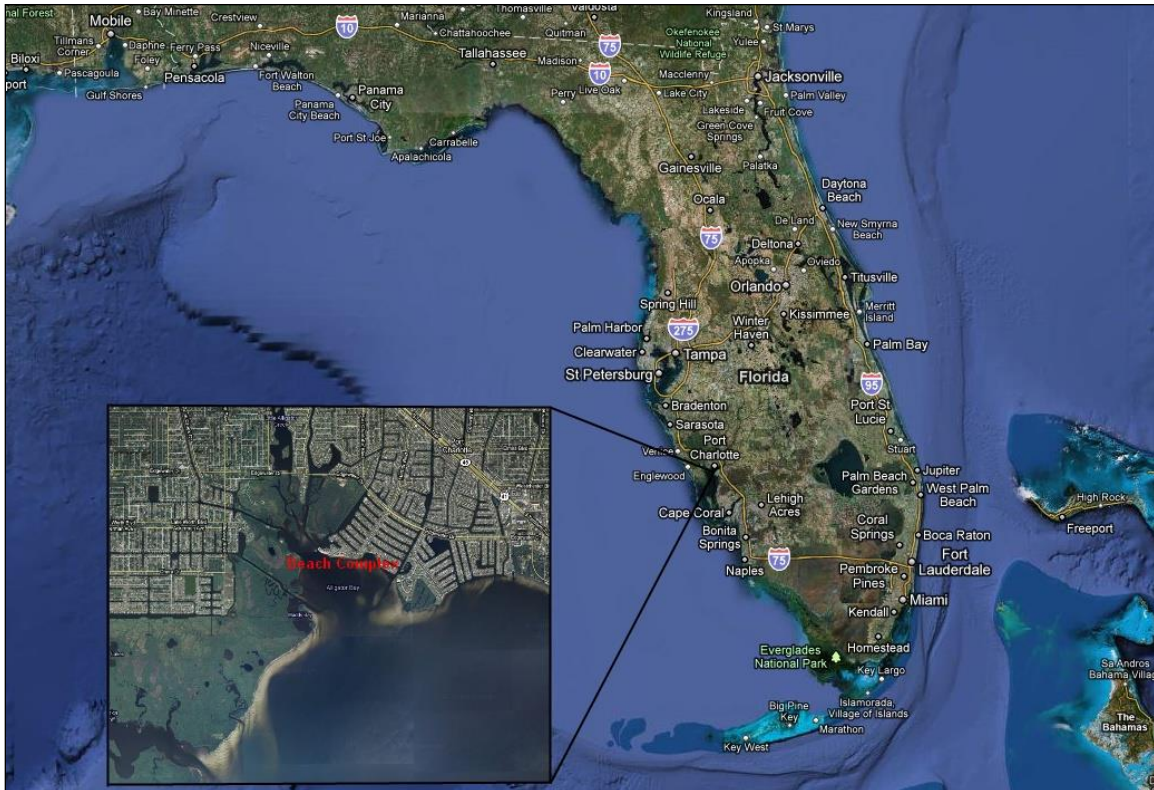


Figure 1. Location Map.

2 DREDGING HISTORY AND BEACH NOURISHMENT

A permit for maintenance dredging of Sunrise Waterway was first obtained by Charlotte County in 1995. The project consisted of restoring an approximate 1,470-foot long by 50-foot wide channel to the design depth of 5 feet Mean Low Water. The first maintenance dredging of Sunrise Waterway and the adjacent Elkcam Waterway was conducted in 1995. According to the permit documents, a combined total of 2,500 cubic yards (CY) of sediment were removed. Table 1 presents a summary of Sunrise Waterway dredging events. Excluding the initial 1995 dredging event, the average volume removed since 2004 was 940 CY.

Table 1. Summary of Sunrise Waterway Dredging Events.

Dredging Event Year	Volume Removed (CY)
1995	2,500*
2004	415
2007	730
2010	715
2013	1110
2019	1600
2020	1060

* also included dredging of adjacent Elkcam Waterway

In personal communication with County staff, the sediment excavated from the channel for the 2013 and 2020 dredging events was placed along the recreational beach within Port Charlotte Beach Park east of the pier. During the 2019 dredging event, the sediment was placed on the uplands immediately adjacent to the Sunrise Waterway on the west end of the Park.

Table 2 presents the volume within the dredge template based on channel condition surveys along with the annualized shoaling rates of the channel. The shoaling rates ranged between 365 CY per year to 495 CY per year with the average rate of 403 CY per year. Taking into account the average volume removed during the dredging events since 2004, it takes on average 2 years and 4 months between dredging to maintain the channel.

Figure 2 presents a graph of dredging events with dredged volumes and the surveyed volumes within the dredge template between 2010 and 2022.

Table 2. Summary of Volume within Dredge Template and Channel Shoaling Rate.

Condition Survey Year	Volume Available in Dredge Template (cy)	Channel Shoaling Rate (cy/yr)
2010	186	Not Computed due to Dredging in 2010
2012	1109	385
2018	1729	368
2019	313	Not Computed due to Dredging in 2019
2020	1106	495
2021	375	365

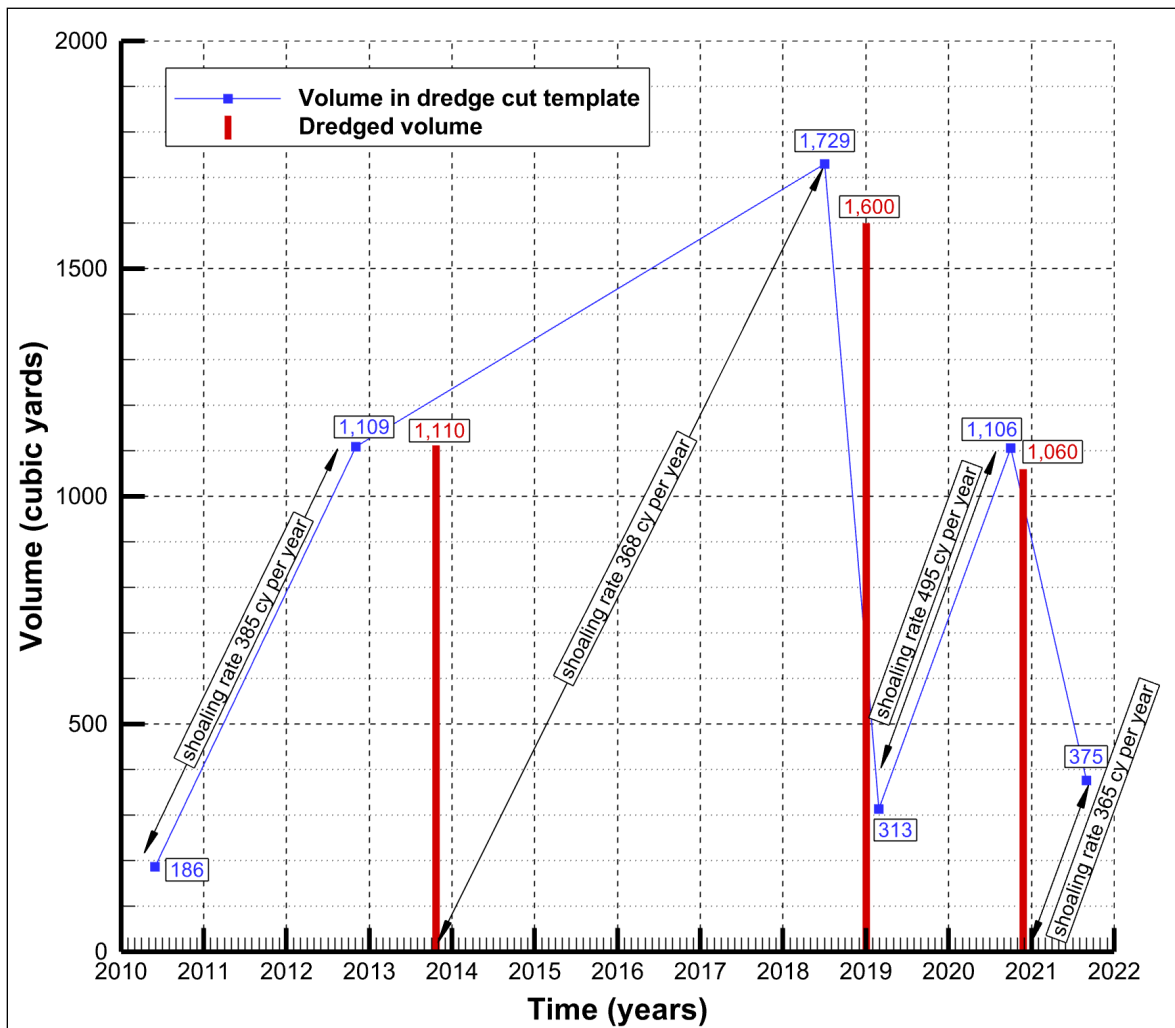


Figure 2. 2010-2022 Dredge Events and Surveyed Volumes within Dredge Template.

3 BATHYMETRIC AND TOPOGRAPHIC SURVEYS

In August 2021, CEC conducted a bathymetric/topographic survey of Port Charlotte Beach Park, Sunrise Waterway and adjacent channels. A hydrographic survey system consisting of a Trimble GPS receiver with real time technology (RTK) and HYPACK 2017 software was utilized during the survey. The system was connected to the RTK link statewide GPS network. This network incorporates Florida Department of Transportation's reference stations throughout the state and utilizes their own additional reference stations in other areas to ensure adequate coverage for reliable and accurate results. Real time tides were collected and reduced to North American Vertical Datum of 1988 (NAVD88). A contour map of the survey is presented in Figure 3.

In May 2010, CEC conducted a similar survey. The survey was conducted on the same day the dredging of Sunrise Waterway was completed. A contour map of the 2010 survey is presented in Figure 4.

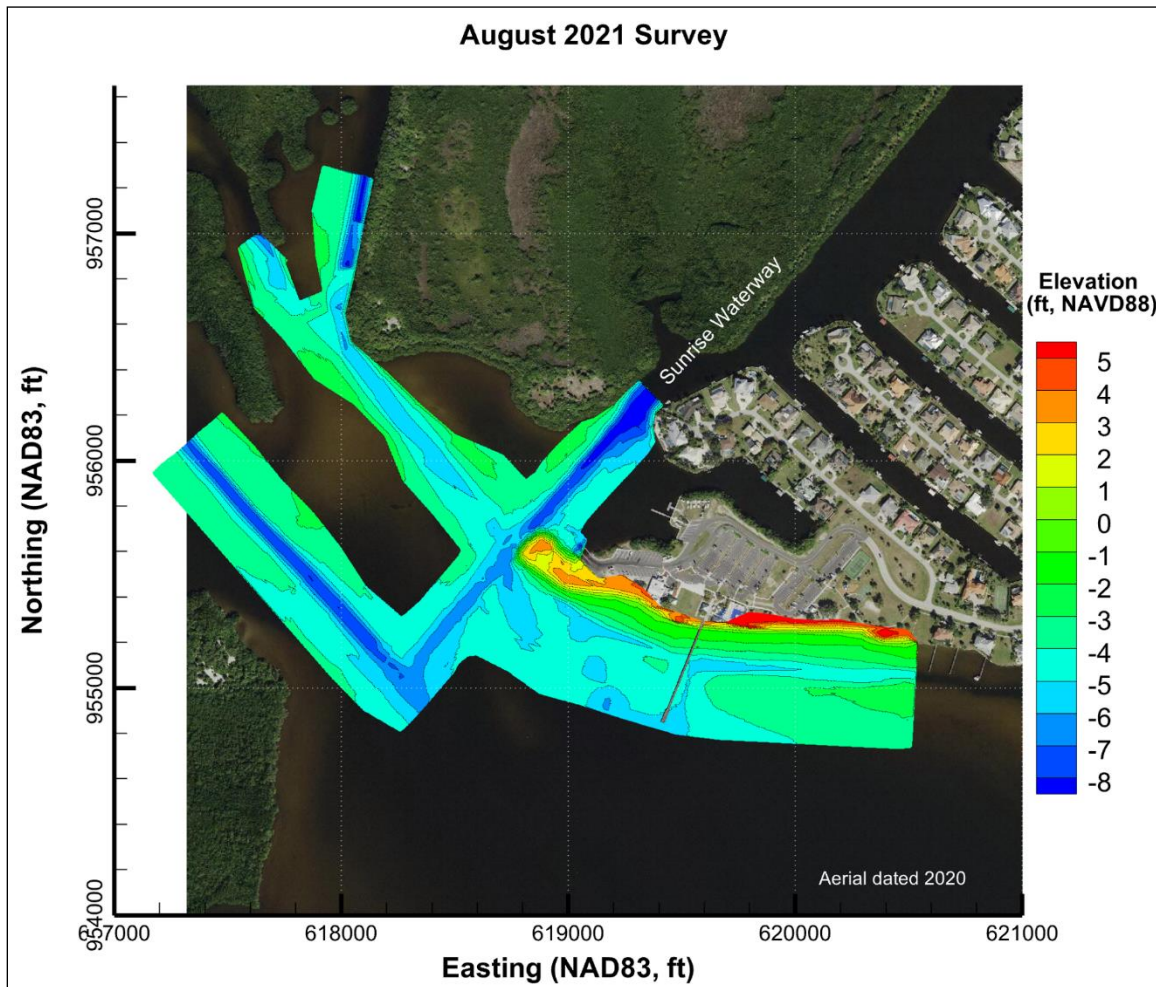


Figure 3. Contour Map of August 2021 Survey.

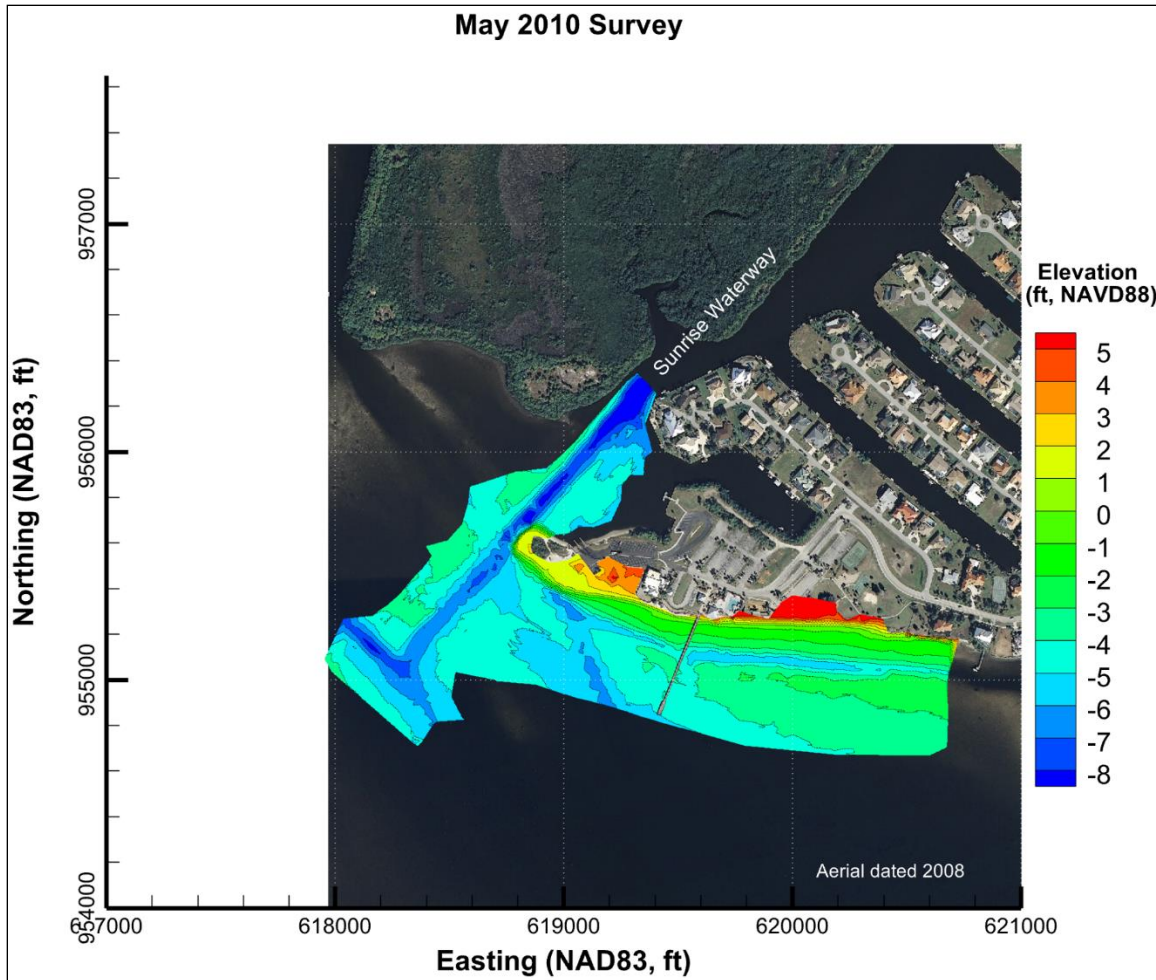


Figure 4. Contour Map of May 2010 Survey.

A contour map of morphologic changes that occurred between the May 2010 and August 2021 surveys is presented in Figure 5. The figure also depicts three (3) cells used for computations of volumetric changes. Cell 1 covers the vicinity of Sunrise Waterway and west tip of Port Charlotte Beach Park. Cell 2 covers the area east of Cell 1 to the pier. Cell 3 covers the area between the pier to the east end of the Park.

The total volume change in Cell 1 was approximately 4,950 CY of shoaling. This calculation accounted for 2,780 CY of shoaling and the 2013 and 2020 dredging projects that removed 1,110 CY and 1,060 CY from the Sunrise Waterway, respectively, and placed the sediment in Cell 3.

The total volume change in Cell 2 was approximately 230 CY of erosion. Most of the erosion occurred along the beach while most of the shoaling was observed offshore.

The total volume change in Cell 3 was approximately 7,110 CY of erosion and it accounted for the sediment that was placed in Cell 3 during the 2013 and 2020 dredging projects. The significant majority of the erosion occurred along the beach and nearshore.

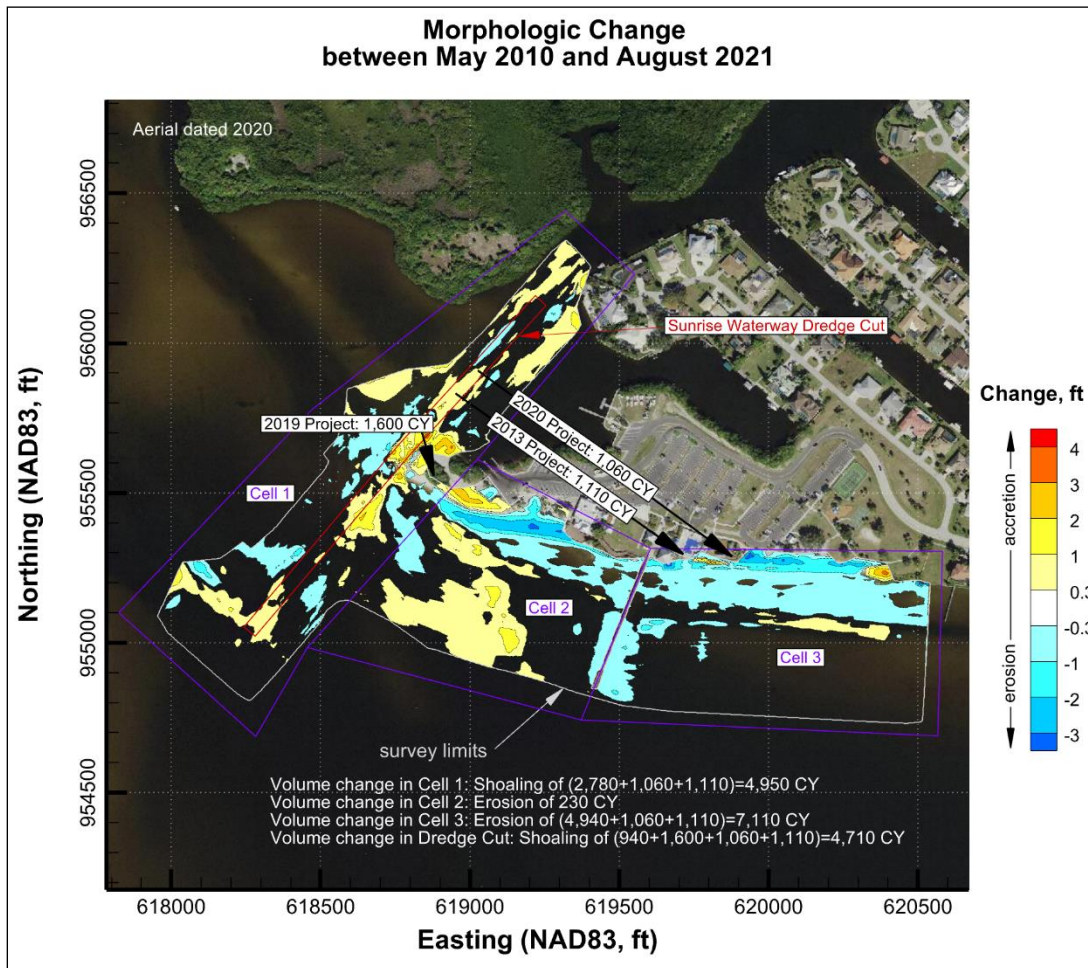


Figure 5. 2010-2021 Morphologic Changes.

The total volume change within the Sunrise Waterway dredge template was approximately 4,710 CY and it accounted for the sediment removed from the channel during the 2013, 2019 and 2020 dredging projects.

The analysis of morphologic changes indicates that the dominant direction of sediment transport is from east to west. This is a result of the dominant wind direction out of east presented in Figure 6. The wind rose in the figure is based on the U.S. Army Corps of Engineers (USACE) Wave Information Studies (WIS) database. The WIS project (Hubertz, 1992) produces a high-quality online database of hindcast, nearshore wave and wind conditions covering U.S. coastlines (<http://chl.erdc.usace.army.mil/>). WIS data used in the analysis were obtained at Station 73282 located in 62-ft depth at (LAT=26.83N, LON=82.50W) approximately 25 miles southwest of Port Charlotte Beach Park and covered a 40-year time period between 1980 and 2020.

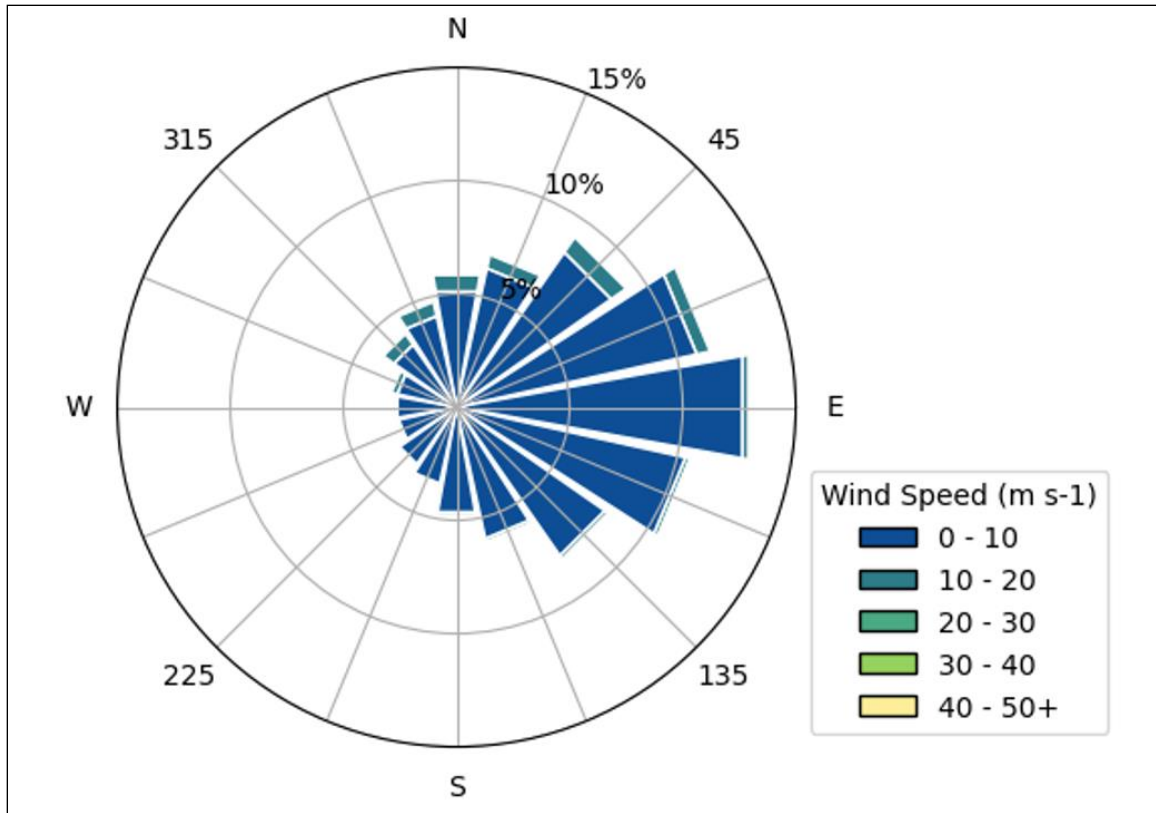


Figure 6. Wind Rose Based on 1980-2020 WIS Data at Station 73282.

The alongshore sediment transport is a result of wind-driven waves and currents. Inside Sunrise Waterway, tidal currents also play a role in transporting sediment off the beach into the channel. Due to significant dominance of easterly winds throughout the year, it is anticipated that the historical morphologic change pattern of beach erosion, sediment transport alongshore to the west, and deposition into the channel will continue in the future.

4 ALTERNATIVES ANALYSIS

4.1 Alternatives Development

Based on the review of survey data and dredging events, shoaling analysis, beach erosion analysis, and discussions with Charlotte County Public Works, seven (7) alternatives and two (2) combinations of alternatives were developed. Conceptual plans of these alternatives are presented in Appendix 1.

- 1) Terminal Groin;
- 2) Groin Underneath Existing Pier;
- 3) T-groins;
- 4) Rock Revetment;
- 5) Oyster Reefs;
- 6) Sediment Trap;
- 7) Floating Breakwaters;
- 8) Combination of Oyster Reefs, Reef Underneath Existing Pier and Sediment Trap; and
- 9) Combination of Floating Breakwaters, Reef Underneath Existing Pier and Sediment Trap.

Common to the alternatives is the Sunrise Waterway navigation channel will need to be dredged on a periodic basis. The interval between dredge events will be a function of which alternative is chosen and natural processes, i.e., winds, waves, tides, and currents. It is recommended the channel is dredged to restore navigation concurrent with implementation of the selected alternative. Sediment dredged from the navigation channel should be placed on the beach east of the pier to reduce immediate infill into the channel.

4.1.1 Alternative 1 – Terminal Groin

This alternative includes placing a rock groin, approximately 100 feet long, at the west end of the Port Charlotte Beach Park shoreline. The groin will trap sand transported alongshore, keep it east of the groin, and reduce the shoaling rate into the Sunrise Waterway navigation channel. The channel will need to be dredged to restore navigation at the time the groin is installed.

This alternative will be effective to reduce shoaling of the navigation channel. Its effectiveness on keeping the sand on the beach will be limited to the “groin influence area”, extending up to several hundred feet east of the groin. Once the area east of the groin is filled with sand, the effectiveness of the groin will be diminished. The beach east of the groin influence area is anticipated to continue eroding.

Permitting this alternative may be challenging. Although it will result in reduced maintenance dredge needs, it is anticipated that the regulatory agencies will consider the groin as impactive to the environment. Additional analyses would be required to demonstrate there would be no adverse impacts to the existing seagrasses within the Project area due to construction of the groin or burial by sand as it accumulates within the influence

of the structure, and no adverse downdrift impacts. Because the footprint of the structure lies within the Aquatic Preserve (AP), it is anticipated that the AP staff will have significant concerns in regard to installing a terminal structure on the shoreline.

The terminal groin should not have an adverse impact to recreational usage of the beach. It is one of the most expensive alternatives.

4.1.2 Alternative 2 – Groin Underneath Existing Pier

This alternative takes advantage of the existing pier. It includes placing a groin perpendicular to the shoreline, approximately 35 feet long, under the pier landward of the existing seagrass edge. The groin will trap sand drifting west from the beach east of the pier, keep it east of the pier and reduce the shoaling rate of the Sunrise Waterway navigation channel. Use of vinyl sheet pile is one option for the groin due to the ease of adjusting the sheet pile to improve sand trapping. The use of natural materials like oyster reef bags or native rocks instead of vinyl sheet pile may be more acceptable to the regulatory agencies.

The effectiveness of this alternative will be limited to the area east of the pier only. The beach west of the pier is anticipated to continue eroding with the eroded sand drifting west into the navigation channel.

Permitting this alternative should be straight forward. The existing pier is already “fill” in the AP. The groin underneath the pier will be short enough to not cause adverse impacts to the existing seagrasses. The regulatory agencies may require post-construction seagrass monitoring to verify no impacts.

The groin underneath the pier should not have an adverse impact to recreational usage of the beach. The cost for this alternative is moderate.

4.1.3 Alternative 3 – T-Groins

This alternative includes placing up to thirteen (13) rock T-groins along the shoreline. By design, T-groins are very effective in stabilizing eroding shorelines. The groin heads will be aligned at landward edge of the existing seagrasses. Beach fill can be added between the groins to reclaim beach width lost to erosion. T-groins will create cuspid patterns in shoreline. By reducing beach erosion and retaining sand on the beaches, the effect of the T-groins will also include a reduction in shoaling into the Sunrise Waterway navigation channel.

Permitting this alternative may be challenging. Although it will result in reduced maintenance dredge needs, it is anticipated that the regulatory agencies will consider the T-groins as impactive to the environment. Because the structures lie within the AP, it is anticipated that the AP staff will have significant concerns in regard to armoring the shoreline in this fashion.

The T-groins may be viewed as an interruption of water access and impact recreational usage of the beach. This is also one of the most expensive alternatives.

4.1.4 Alternative 4 – Rock Revetment

This alternative includes placing a continuous rock revetment within 10 feet of Mean High Water along the shoreline. Rock revetments are very effective in stabilizing eroding shorelines. Implementing it will result in no use of the existing sandy beach, however, building high and dry sandy recreational area can be added landward of the revetment. This alternative will also require building walkovers to access water. Any beach left seaward of the revetment will continue to erode until the shoreline reaches the revetment after which the erosion will stop, and the shoaling of the navigation channel will significantly decrease.

Permitting this alternative is allowed by the regulatory agencies pursuant to Chapters 18 and 62-330, Florida Administrative Code (State) and Nationwide Permit Number 13 (Federal). Although it will result in reduced maintenance dredge needs and is permissible, it is anticipated that the regulatory agencies will consider the revetment as impactful to the environment and have significant concerns in regard to armoring the shoreline in this fashion.

The rock revetment will be viewed as an interruption of water access and impact recreational usage of the beach. This is also one of the most expensive alternatives.

4.1.5 Alternative 5 – Oyster Reefs

This alternative includes placing submerged oyster reefs along the shoreline. The reefs will be placed landward of the existing seagrasses. They are effective in stabilizing eroding shorelines and will result in reduced erosion and less sediment drifting west. It is anticipated that this alternative will decrease the rate of shoaling into the Sunrise Waterway navigation channel.

This alternative is considered as a “living shoreline” approach and may be considered favorably by the regulatory agencies.

The “living shoreline” alternative may be viewed as an interruption of water access. To address this concern, the “living shoreline” units (e.g. oyster reefs) can be designed to provide and preserve water access at designated locations along the park. The “living shoreline” alternative may also be viewed as an impact to recreational usage noting the units will be in close proximity to the shoreline because of the need to site the units landward of the seagrasses. An option would be to reduce the number of units, that is, open up gaps between the units to create unobstructed wading areas. This approach would be less effective for stabilizing the shoreline. The cost for this alternative is moderate.

4.1.6 Alternative 6 – Sediment Trap

This alternative includes dredging an area adjacent to the existing Sunrise Waterway dredge cut, into the uplands, to serve as a trap for the sediment transporting alongshore to the west. It will result in reduction of shoaling rates into the Sunrise Waterway navigation channel. Once the sediment trap is filled with sand, its effectiveness will diminish until it is dredged again. This alternative will not benefit the shoreline as it is anticipated to continue eroding.

Dredging the navigation channel is currently permitted. Based on observations of the recent dredging, there are no documented environmental impacts. Expanding the current dredge cut footprint should not have new permit issues or mitigation requirements. The sediment trap may be considered favorably by the regulatory agencies.

The sediment trap will have a minor impact to recreational usage of the beach immediately adjacent to the channel. It is the least expensive alternative.

4.1.7 Alternative 7 – Floating Breakwaters

This alternative includes installation of up to thirteen (13) offshore floating breakwaters in a staggered pattern. The breakwaters will be anchored to the bottom using downlines and helical anchors. By their design, the breakwaters will reduce the height and energy of the waves approaching the shoreline resulting in less erosion of the beach. This will also decrease the rate of shoaling into the Sunrise Waterway navigation channel. The design will allow for ease of adjustment to improve wave energy reduction.

Permitting this alternative may be challenging. Although it will result in reduced maintenance dredge needs, the regulatory agencies may consider the installation of the breakwaters within the AP as impactful to the environment. It may be possible to design the floating breakwaters to incorporate natural materials so it would be viewed as a “living shoreline” approach.

The floating breakwaters should not have an adverse impact to recreational usage of the beach as they will be located offshore in an existing trough in water depths on the order of 5-ft NAVD88. The floating breakwaters can be designed to provide and preserve water access for sailboats/regattas at designated locations along the Park. The cost for this alternative is moderate.

4.1.8 Alternative 8 – Combination of Oyster Reefs, Reef Underneath Existing Pier, and Sediment Trap

This alternative combines Alternatives 2, 5 and 6 with the groin underneath the existing pier made of natural reef materials. The oyster reefs in the nearshore will reduce beach erosion and decrease the rate of shoaling into the navigation channel. The oyster reef underneath the pier will trap sand drifting west from the beach keeping it east of the pier

and reducing the shoaling rate into the Sunrise Waterway navigation channel. The sediment trap will further reduce the rate of shoaling into the navigation channel.

Permitting this alternative may be challenging as there are several components that will have to be approved by the regulatory agencies. However, each individual component can be viewed favorably. Oyster reefs are considered as a “living shoreline” approach to stabilizing eroding shorelines. Dredging the sediment trap adjacent to the already permitted dredge cut within Sunrise Waterway that has not had any documented environmental impacts should not have new permit issues or mitigation requirements.

The combination of these three alternatives was chosen as these strategies represent a “living shoreline” approach with minor impacts to the recreational usage of the beach that will reduce sand transport into the navigation channel and restore and help sustain the Beach Park’s sandy shoreline, and should have a high probability of being permitted.

4.1.9 Alternative 9 – Combination of Floating Breakwaters, Reef Underneath Existing Pier, and Sediment Trap

This alternative combines Alternatives 2, 6 and 7 with the groin underneath the existing pier made of natural reef materials. The floating breakwaters will reduce erosion and decrease the rate of shoaling into the Sunrise Waterway navigation channel. The oyster reef underneath the pier will trap sand drifting west from the beach keeping it east of the pier and reducing the shoaling rate into the Sunrise Waterway navigation channel. The sediment trap will further reduce the rate of shoaling into the navigation channel.

Permitting this alternative may be challenging as there are several components that will have to be approved by the regulatory agencies. Two of the three components can be viewed favorably. Oyster reefs are considered as a natural “living shoreline” approach to stabilizing eroding shorelines. Dredging the sediment trap adjacent to the already permitted dredge cut within Sunrise Waterway that has not had any documented environmental impacts should not have new permit issues or mitigation requirements. Although the floating breakwaters will result in reduced maintenance dredge needs, the regulatory agencies may consider the installation of the breakwaters within the AP as impactful.

The combination of these three alternatives was chosen as these strategies represent an approach with minor impacts to the recreational usage of the beach that will reduce sand transport into the navigation channel and restore and help sustain the Beach Park’s sandy shoreline, and should have a good probability of being permitted.

5 STAKEHOLDERS

CEC arranged for and presented at two stakeholder meetings. The first was with the Marine Advisory Committee. The second was with the Parks and Recreation Committee. CEC presented the summary of the Feasibility Study. Refer to Appendix 2 for the Presentation Slides.

Summary Notes of Marine Advisory Committee Meeting

Primary comments were centered on the Regatta and potential impacts to navigation. CEC responded the living shoreline features or floating breakwaters can be designed to create travel corridors for the vessels. The County and CEC stated if these alternatives move forward, the Committee's input would be taken into account as part of the design process.

The Committee questioned if some of these alternatives could be permitted. CEC shared that upon completion of the stakeholder presentations, the County and CEC will conduct a pre-application meeting with the regulatory agencies, present the Feasibility Study and alternatives, and obtain agency input on the permitting aspects of the alternatives. Charlotte Harbor Aquatic Preserve (CHAP) staff requested to be included in the pre-application meeting.

The Committee questioned what the costs were for both initial construction and then operations and maintenance costs. CEC shared the focus of the Study has been on the technical, environmental, social, and institutional parameters. Once the alternatives were vetted with the stakeholders and agencies, CEC would develop the recommendation and formulate costs for the preferred alternative.

The Committee asked if construction could be phased, for example, construct the stabilization measure on the east side of the park and monitor performance then construct the stabilization measures on the west side. CEC responded phasing could be considered as an approach.

The Committee asked if the floating breakwater system and living shoreline features could both be utilized, for example, one east of the pier and one west of the pier. CEC responded this combination could be considered as an approach.

Summary Notes of Parks and Recreation Committee Meeting

The Committee asked what is the budget source for this? The County replied they have funded the Study; funding of future phases has not been determined and will be dependent upon the recommended plan.

The Committee shared the proposed feature under the pier and sediment trap are straightforward and supported. One Committee member remarked they like the oyster reefs for the shoreline stabilization alternatives.

The Committee questioned what material will be utilized to construct the terminal groin? CEC replied they recommend the use of native limestone.

One Committee member questioned if an additional rock revetment could be constructed to perch the beach fill / create a path. CEC replied while it could be one approach, it would be hard to permit and to expect a lot of resistance from the CHAP staff.

The Committee asked for CEC's recommendation between the two combination plans? CEC stated if the regulatory agencies are receptive they would recommend the floating breakwaters as it has less impact to the beach and nearshore for recreational use and allows for future flexibility as the system is adaptable.

General consensus of the Committee was they like both the combinations, with a preference for the floating breakwaters.

6 AGENCY PRE-APPLICATION MEETINGS

CEC arranged for and presented the summary of the Feasibility Study at two regulatory agency pre-application virtual meetings. The first was with the U.S. Army Corps of Engineers (USACE) and National Marine Fisheries Service (NMFS). The second was with the Florida Department of Environmental Protection (FDEP) and CHAP. Summaries of the two meetings are presented below. Refer to Appendix 2 for the Presentation Slides.

Summary Notes of USACE/NMFS Pre-Application Meeting

Attendees:

USACE: Stephen Fleming

NMFS: Mark Sramek

County: Tina Powell, Jamie Scudera, Jennifer Henderson, Matt Logan

CEC: Michael Poff

USACE provided comments on the various alternatives and stated they are all "permissible." USACE expressed the selected alternative will have to avoid impacts to seagrasses or provide an appropriate mitigation plan. USACE shared they do not have any personal experience with the floating breakwaters alternative and shared they will have to consider potential impacts to navigation. Also, a resource survey would have to be performed of the alignment to document no impacts to resource habitats from installation. With respect to the sediment trap, USACE shared the loss of habitat (e.g. shorebirds) would have to be addressed. With respect to sand fill, the project will have to have Best Management Practices (BMPs) in place to protect the seagrasses, and perform pre- and post-construction monitoring to document no adverse impacts.

CEC responded the goal of the project is to avoid all impacts to seagrasses and resources. CEC shared that the floating breakwaters are easily adaptable and can be removed and stored temporarily during the regattas (typically four per year) to avoid impacts to navigation. CEC shared that there has not been documented nesting on the park beach but the plan will include creating beach habitat with the sand dredged from the sediment trap. CEC concurred with USACE the project would include BMPs and a monitoring plan.

NMFS stated the USACE was very thorough with their comments and concurred with them. NMFS too does not have experience with the floating breakwaters and the concept intrigues them. CEC shared they are trying to design the floating breakwaters with a living shoreline component; either have a screen hanging down that would serve as "structure" for benthics, oysters, etc. or to hang a basket that would be filled with oyster shells. NMFS cautioned that they and U.S. Fish and Wildlife Service (USFWS) will raise the concern of potential entrapment for manatees and smalltooth sawfish. NMFS also said the design should be described so the agencies understand the system's holding strength in storms, noting the

concern of pipe sections breaking free and damaging resources. CEC shared they have a lot of experience with mooring and anchoring systems and appreciated this comment. NMFS prefers combination # 8. NMFS likes the reef under the pier and suggested it be designed as intertidal habitat.

CEC shared that with the agency comments, they will finalize and submit the report to the County. The County will then take it under advisement. CEC shared the earliest new action taken for the Project would be after October 1, 2022 in the County's new fiscal year.

Subsequent to the meeting NMFS posed the following. Would proposed in-water construction activities (including, but not limited to floating breakwater, oyster reef, and sediment trap construction) be conducted from motorized vessels? If so NMFS recommends BMPs designed to minimize potential secondary impacts (such as vessel grounding and prop scarring) on seagrass habitat in the Project area be included in the design.

CEC replied that they have not detailed the construction methods for the floating breakwaters in advance of a design. CEC also shared they expect that the oyster reefs / living shoreline units would be constructed from the uplands with a combination of a long reach excavator and hand placed. CEC then shared the sediment trap would be excavated utilizing a long reach excavator from the uplands or from a barge located in the channel noting there are no seagrasses within the channel. CEC acknowledged the design will include BMPs to minimize secondary impacts.

Summary Notes of FDEP/CHAP Pre-Application Meeting

Attendees:

FDEP: Cindy Rivera

CHAP: Mary McMurray, Melynda Brown, Heather Stafford

County: Tina Powell, Jamie Scudera, Matt Logan

CEC: Michael Poff

FDEP shared they are very new and do not have experience with the structural alternatives presented. FDEP suggested the Project be reviewed with one of the Level 3 staff or consultants.

CHAP shared their thoughts and asked questions. First, what is the primary cause of the beach erosion. CEC replied the primary cause is storm events that create a large fetch across the harbor.

Second, are there swim buoys as shown on the slides? The County clarified they are pilings with signs.

Third, could the channel be angled to minimize shoaling and impacts to navigation? CEC brought up Google Earth to show the shoals and potential seagrass beds on the opposite side of the channel that could be impacted by angling the channel.

CHAP raised the concern of the floating breakwaters breaking free during storms and impacting resources. CEC shared they have a lot of experience with mooring and anchoring systems and appreciated this comment. CHAP questioned if there were any local applications of floating breakwaters for shoreline stabilization? CEC replied not that they are aware of, but floating breakwaters are used around the world for such applications. Discussion ensued on the trough located offshore of the beach park and CEC noted this trough could have been dredged for either access or for a borrow source for fill noting it connects to the parallel channel for the development to the east of the park. CEC asked if anyone knew if this was indeed dredged? They replied they did not know.

CHAP suggested the design incorporate future sea level rise.

CHAP also suggested the County may want to consider planting mangroves in the new rock revetment.

With respect to the reefs / living shoreline concept, CHAP shared they prefer the units to be installed with only natural materials (vs bags). CEC shared their concern of placing loose oyster shells or in biodegradable bags that the material would be displaced during a storm and adversely affect the shoreline. CEC shared they are trying to design the floating breakwaters with a living shoreline component; either have a screen hanging down that would serve as "structure" for benthics, oysters, etc. or to hang a basket that would be filled with oyster shells. CHAP cautioned the agencies will raise the concern of potential entrapment for manatees. CEC shared NMFS expressed the exact same comment.

CEC shared that with respect to sand fill, the Project will include BMPs to protect the seagrasses. Discussion ensued on including a permit requirement to perform pre- and post-construction monitoring to document no adverse impacts to seagrasses.

CEC shared that with the agency comments, CEC will finalize and submit the report to the County. The County will then take it under advisement. CEC shared the earliest new action taken for the Project would be after October 1, 2022 in the County's new fiscal year.

7 RECOMMENDED PLAN

Based upon the Feasibility Study analyses, County's stated goals and objectives, stakeholder input, and regulatory agency input, CEC recommends the following features be advanced to the design and permit phase (Figure 7). The combination of these features is the optional alternative for achieving the goals of reclaiming recreational beach and stabilizing the park's shoreline while reducing channel infilling to increase the time cycle between maintenance dredge events.

Floating Breakwater System

Install floating breakwater system along the shoreline extent. System to include HDPE pipe segments in two rows at an offset anchored to the bay bottom with helical screw anchors and synthetic downlines. System to withstand storm parameters to be determined during the design phase through coordination with the County. Explore a living shoreline design approach for the system during the design phase.

Structure Under Pier

Install living shoreline unit under the pier with the maximum extent bayward to the seagrass edge. Unit to be comprised of native limestone with a footprint to create intertidal habitat.

Channel Dredging and Sediment Trap

Conduct maintenance dredging of the navigation channel and excavate a sediment trap. Sand shall be placed to restore critically eroding beach areas along the Park shoreline while avoiding impacts to seagrasses.

Import Beach Compatible Sand

If the channel and sand trap do not contain sufficient volume to restore the critically eroding beach areas, import beach compatible sand from inland mine to complete the restoration along the Park shoreline while avoiding impacts to seagrasses.

Best Management Practices

Implement BMPs during construction to avoid impacts to seagrasses, water quality, and other resource habitats; and to protect threatened and endangered species.

Monitoring

Perform pre- and post-construction monitoring to document no adverse impacts to seagrasses.

Adaptive Management

Develop an Adaptive Management Plan to address adjustments to the floating breakwater system for the regattas or similar local boating events, for the structural features based upon the results of the monitoring, and to address the future plans for redevelopment of Port Charlotte Beach Park.

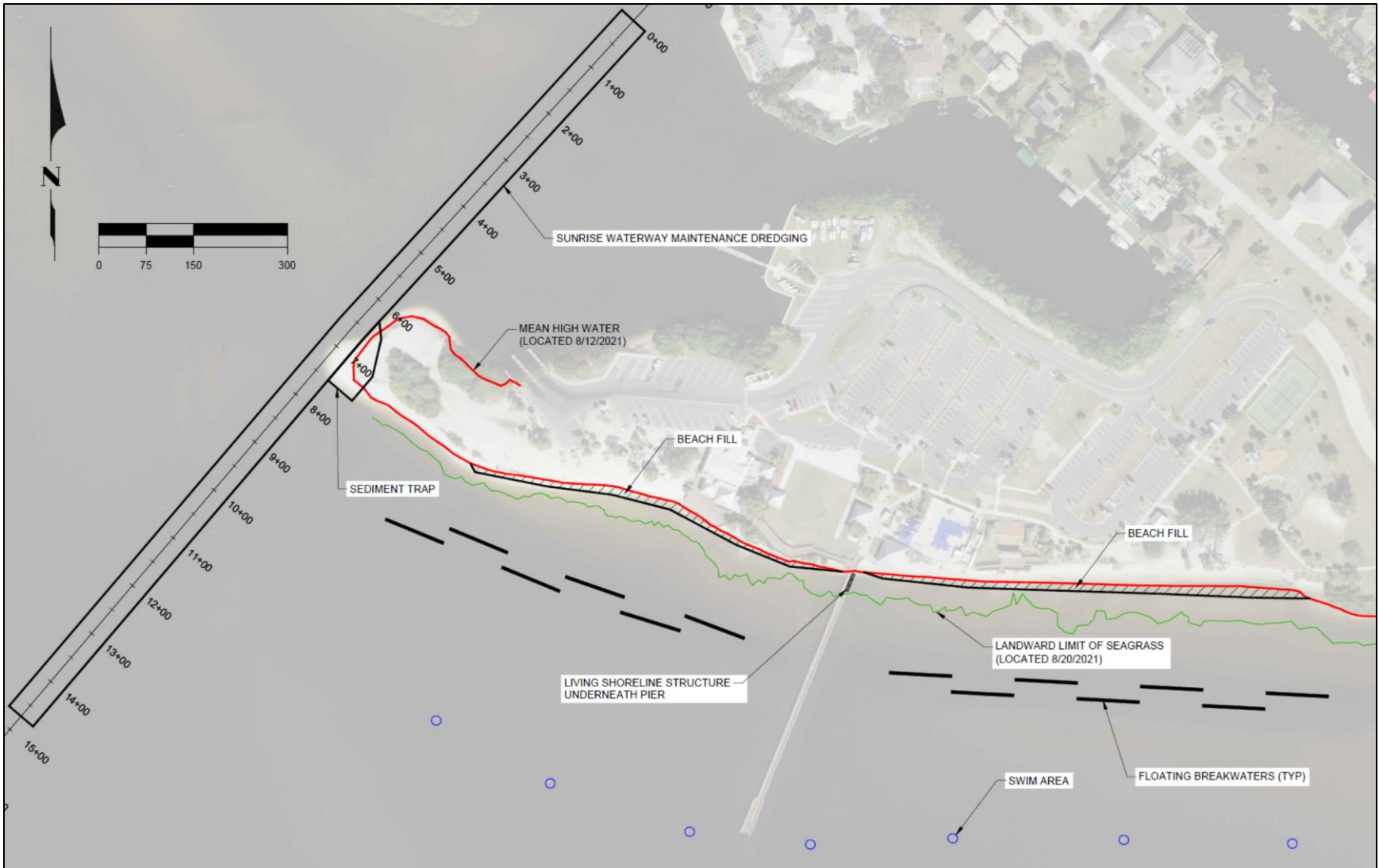


Figure 7. Recommended Plan and Its Features.

8 ORDER OF MAGNITUDE CONSTRUCTION BUDGET

Utilizing recent bid tabs from similar projects and professional experience, the order of magnitude construction budget for the recommended plan, equal to \$776,000, is presented in Table 3.

Table 3. Order of Magnitude Construction Budget for the Recommended Plan.

Description	Unit	Est Qty.	Unit Price	Extended Price
Floating Breakwater System	LS	1	\$430,000.00	\$ 430,000.00
Structure Under Pier	LS	1	\$ 30,000.00	\$ 30,000.00
Channel Dredging & Sand Trap	LS	1	\$184,000.00	\$ 184,000.00
Import Beach Fill	LS	1	\$132,000.00	\$ 132,000.00
Total				\$ 776,000.00

9 RECOMMENDATIONS

The scope of this Study was to develop restoration plans and strategies to reduce sand transport into the Sunrise Waterway navigation channel and restore the Port Charlotte Beach Park's sandy shoreline.

A design survey was conducted in 2021 and compared to the 2010 surveys to analyze beach erosion and channel infilling patterns. A morphologic change analysis was completed that took into account the history of maintenance dredging and beach placement events during this time period. Significant beach erosion and localized channel infilling were documented. While periodic maintenance dredging provides for improved navigation, the sand placement has been insufficient to maintain the recreational beach areas.

If no new action is undertaken, it is anticipated that the shoaling of the waterway will continue and periodic maintenance dredging (every one to two years) of Sunrise Waterway will be required. The two beach areas will continue to experience erosion. Future upland infrastructure may be impacted due to beach erosion over time.

Based on the analyses, professional experience and discussion with the County staff, the following alternatives were developed. Common to the alternatives is the Sunrise Waterway navigation channel will need to be dredged on a periodic basis. Sediment dredged from the navigation channel should be placed on the beach east of the pier to reduce immediate infill into the channel.

- 1) Terminal Groin;
- 2) Groin Underneath Existing Pier;
- 3) T-groins;
- 4) Rock Revetment;
- 5) Oyster Reefs;
- 6) Sediment Trap;
- 7) Floating Breakwaters;
- 8) Combination of Oyster Reefs, Reef Underneath Existing Pier and Sediment Trap; and
- 9) Combination of Floating Breakwaters, Reef Underneath Existing Pier and Sediment Trap.

The recommended features include the floating breakwater system, living shoreline unit under the pier, maintenance dredging and sediment trap excavation with sand placement on the park beach areas, and importing beach compatible sand. The combination of these features is the optimal alternative for achieving the goals of reclaiming recreational beach and stabilizing the shoreline while reducing channel infilling to increase the time cycle between maintenance dredge events.

The order of magnitude construction budget was computed to be approximately \$776,000 in 2022 dollars. A budget of 20 percent, equal to \$155,000, is recommended for engineering, permitting, and monitoring. The County should also budget for an inflation factor through the anticipated time of construction.

10 REFERENCES

Coastal Engineering Consultants, Inc. (CEC). 2011. Port Charlotte Beach Complex Shoaling Analysis. Report. February 9, 2011.

Hubertz, J.M. 1992. User's Guide to the Wave Information Studies (WIS) Wave Model, Version 2.0. WIS Report 27(AD A254 313), U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

APPENDIX 1

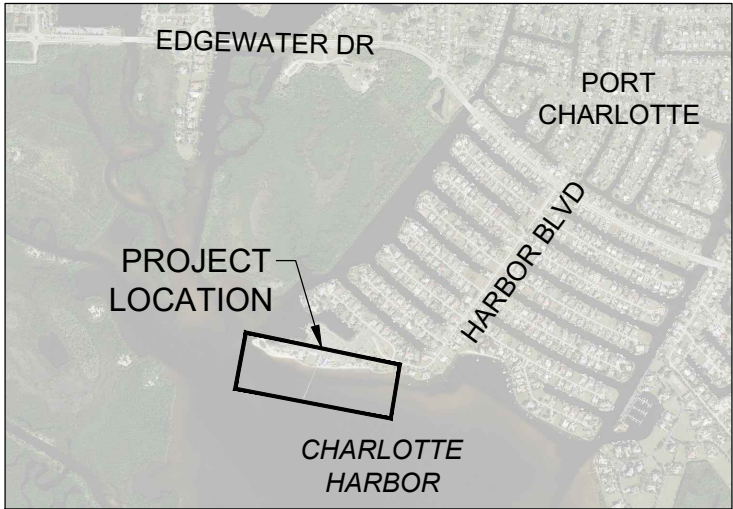
ALTERNATIVES CONCEPTUAL PLANS

PORT CHARLOTTE BEACH PARK SHORELINE STABILIZATION ALTERNATIVES

PREPARED FOR:
CHARLOTTE COUNTY

INDEX

1. COVER SHEET
2. TERMINAL GROIN
3. GROIN UNDERNEATH PIER
4. T-GROINS
5. REVETMENT
6. OYSTER REEFS
7. SEDIMENT TRAP
8. FLOATING BREAKWATERS
9. COMBINATION OF OYSTER REEFS, REEF UNDERNEATH PIER AND SEDIMENT TRAP
10. COMBINATION OF FLOATING BREAKWATERS, REEF UNDERNEATH PIER AND SEDIMENT TRAP



LOCATION MAP
SCALE: 1" = 2000'

PUBLISHED TIDAL INFORMATION

TIDAL DATUMS AT PUNTA GORDA, CHARLOTTE COUNTY ARE BASED ON FLORIDA 872 5744 TIDE STATION, PUBLISHED 10-18-2010.

LENGTH OF SERIES	= 8 MONTHS
TIME PERIOD	= 7/1977 - 2/1978
TIDAL EPOCH	= 1983 - 2001
CONTROL TIDE STATION	= 872 5110 NAPLES, GULF OF MEXICO

ELEVATIONS OF TIDAL DATUMS ARE REFERENCED IN NAVD88.

MEAN HIGH WATER (MHW)	= +0.06 FT NAVD88
MEAN TIDE LEVEL (MTL)	= -0.57 FT NAVD88
MEAN LOW WATER (MLW)	= -1.20 FT NAVD88
MEAN LOWER LOW WATER (MLLW)	= -1.65 FT NAVD88

NOTES

1. SURVEY COMPLETED BY COASTAL ENGINEERING CONSULTANTS, INC. (CEC) ON 8/12/2021.
2. SEAGRASS EDGE SURVEYED BY CEC ON 8/20/2021.
3. PLANE COORDINATES ARE BASED ON THE TRANSVERSE MERCATOR PROJECTION FOR THE WEST ZONE OF FLORIDA AND REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD 83).
4. ELEVATIONS SHOWN HEREON ARE IN FEET AND TENTHS AND REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). REFERENCE BENCHMARK: U 797, ELEV. = +4.25' NAVD88.
5. INFORMATION SHOWN HEREON REFLECTS CONDITIONS AS THEY EXISTED ON THE SURVEY DATE SHOWN AND CAN ONLY BE CONSIDERED INDICATIVE OF CONDITIONS AT THAT TIME.
6. AERIAL PHOTOGRAPHY OBTAINED FROM FLORIDA DEPARTMENT OF TRANSPORTATION, DATED 2020.

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CHECKED:	MTP	PG:			
SEC:	TWP:	RNG:			
ACAD NO.	20426-Alternatives.dwg		NO.	20 426	
REF. NO.			DATE	BY	REVISION DESCRIPTION
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			3/10/2022	VVA	ADDED FLOATING BREAKWATERS

CHARLOTTE COUNTY

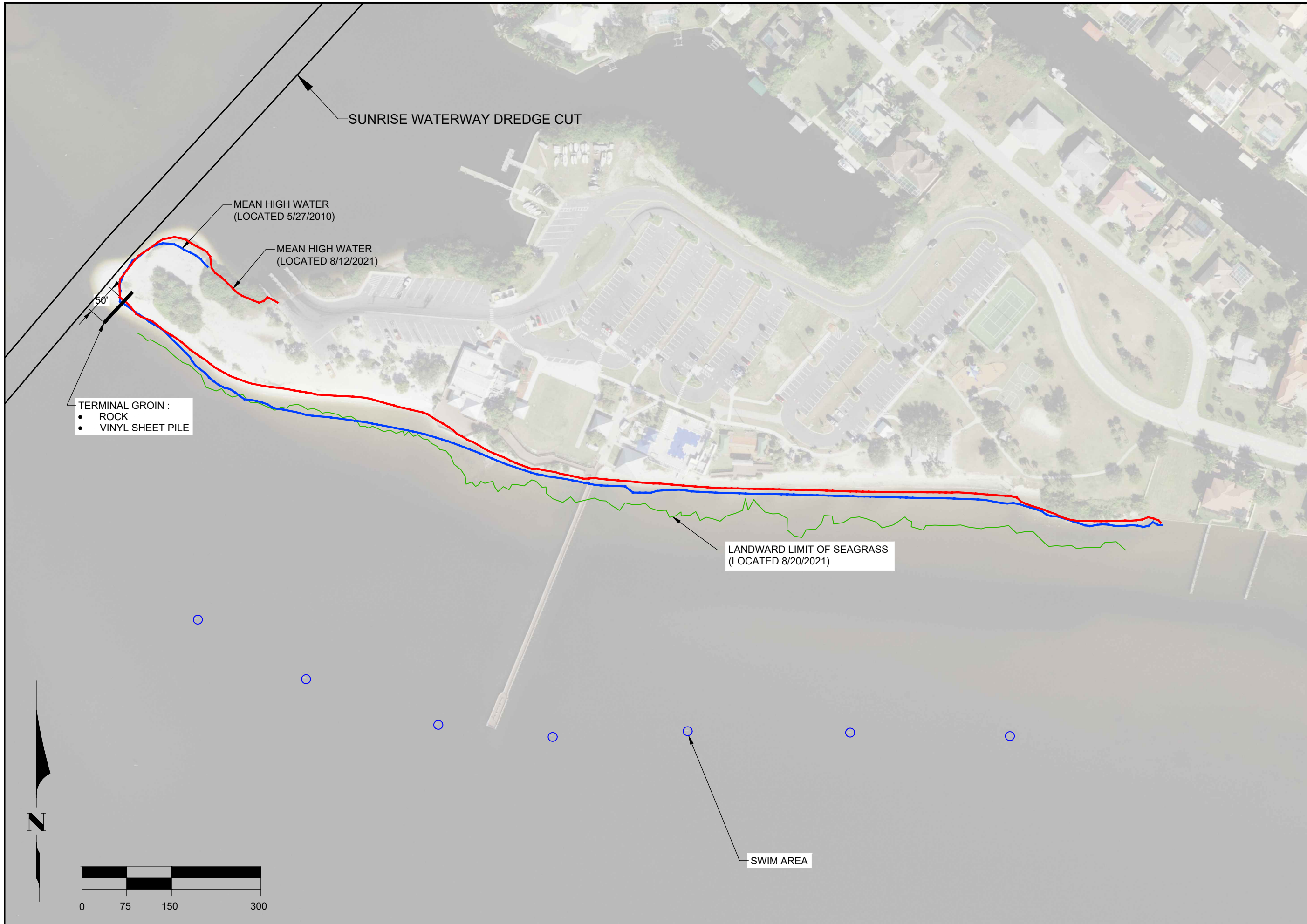
COVER SHEET

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY AND MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecill.com

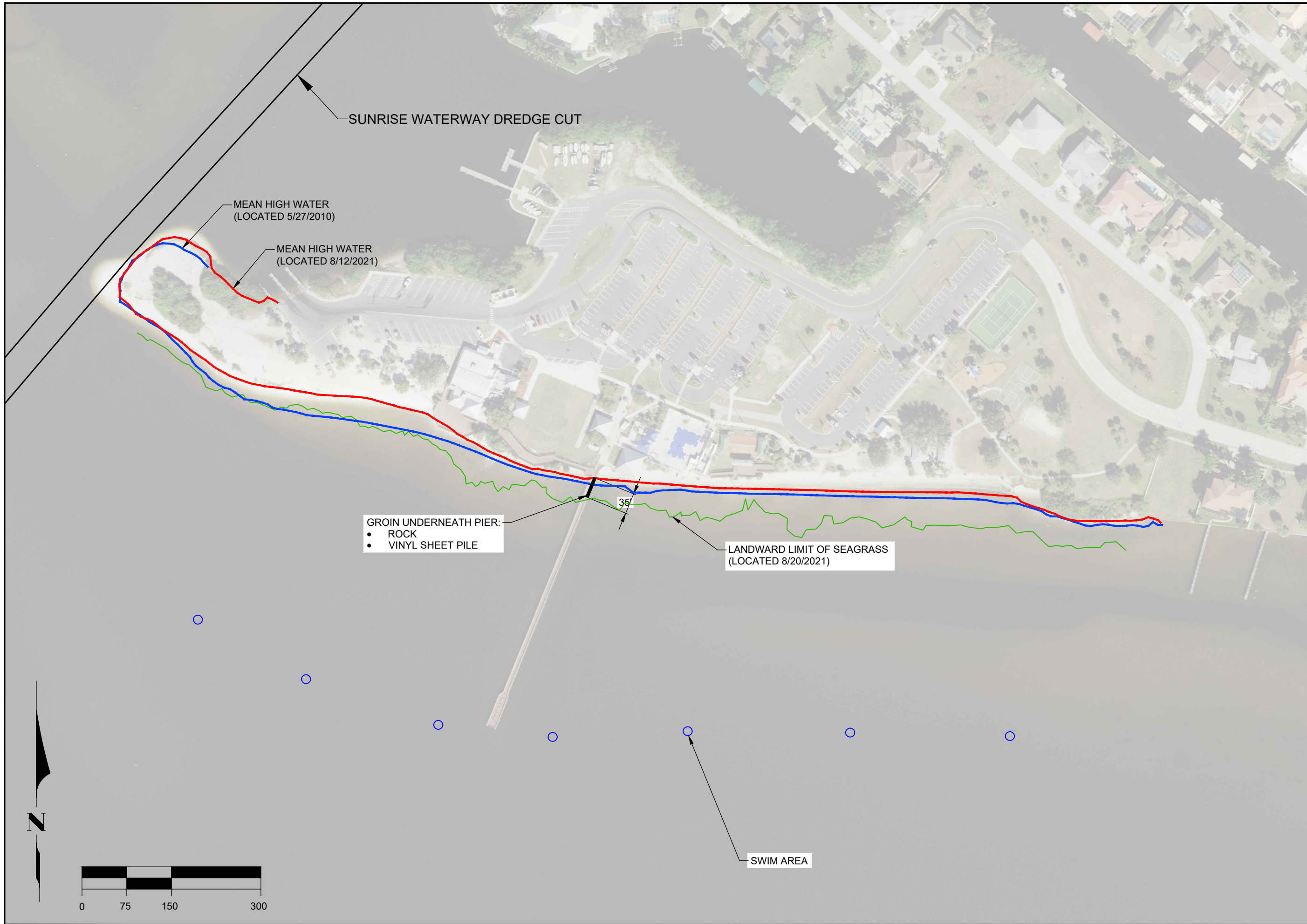
COASTAL ENGINEERING CONSULTANTS INC.

Serving Coastal Communities Since 1977

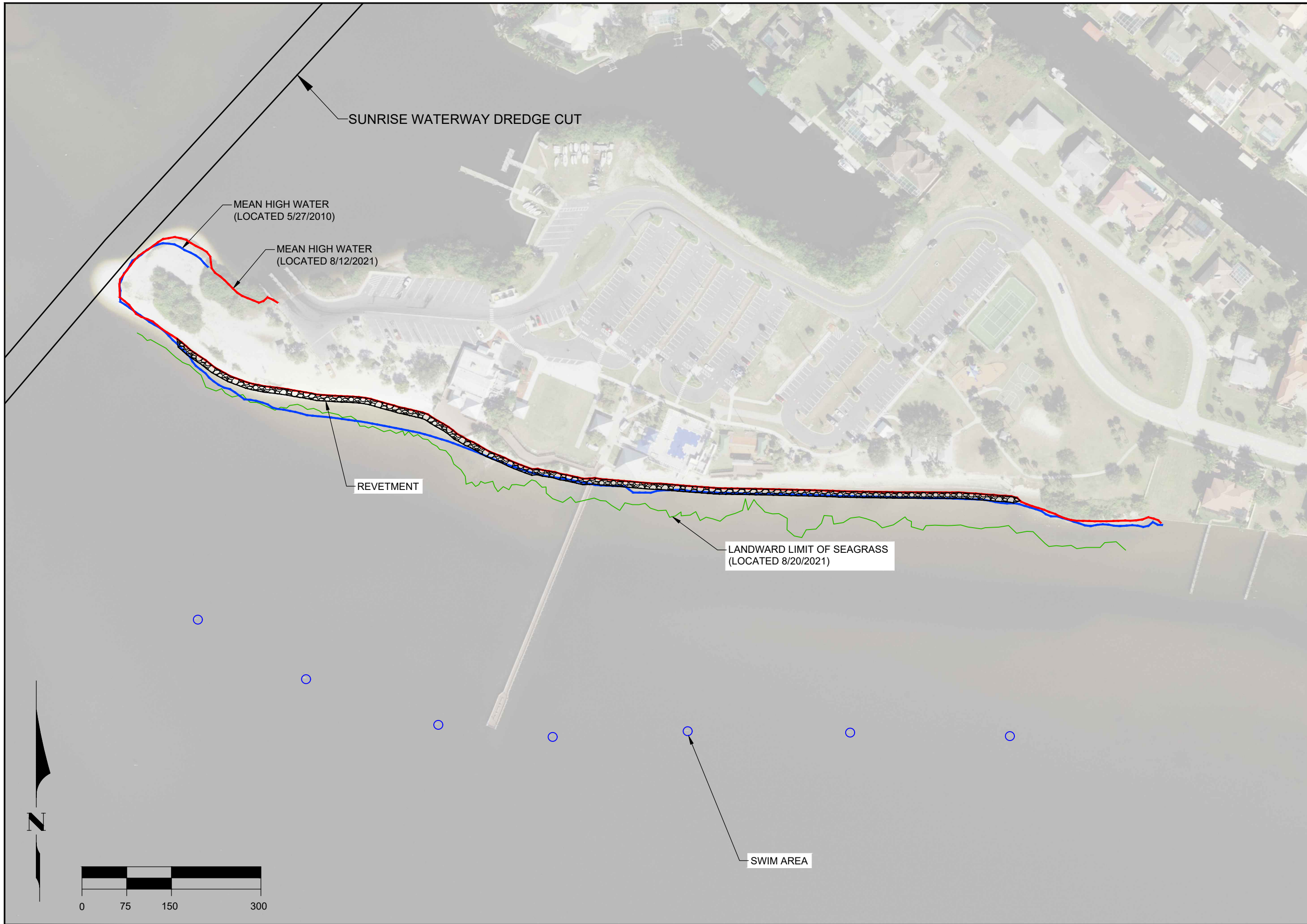
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BONITA SPRINGS, FLORIDA 34135



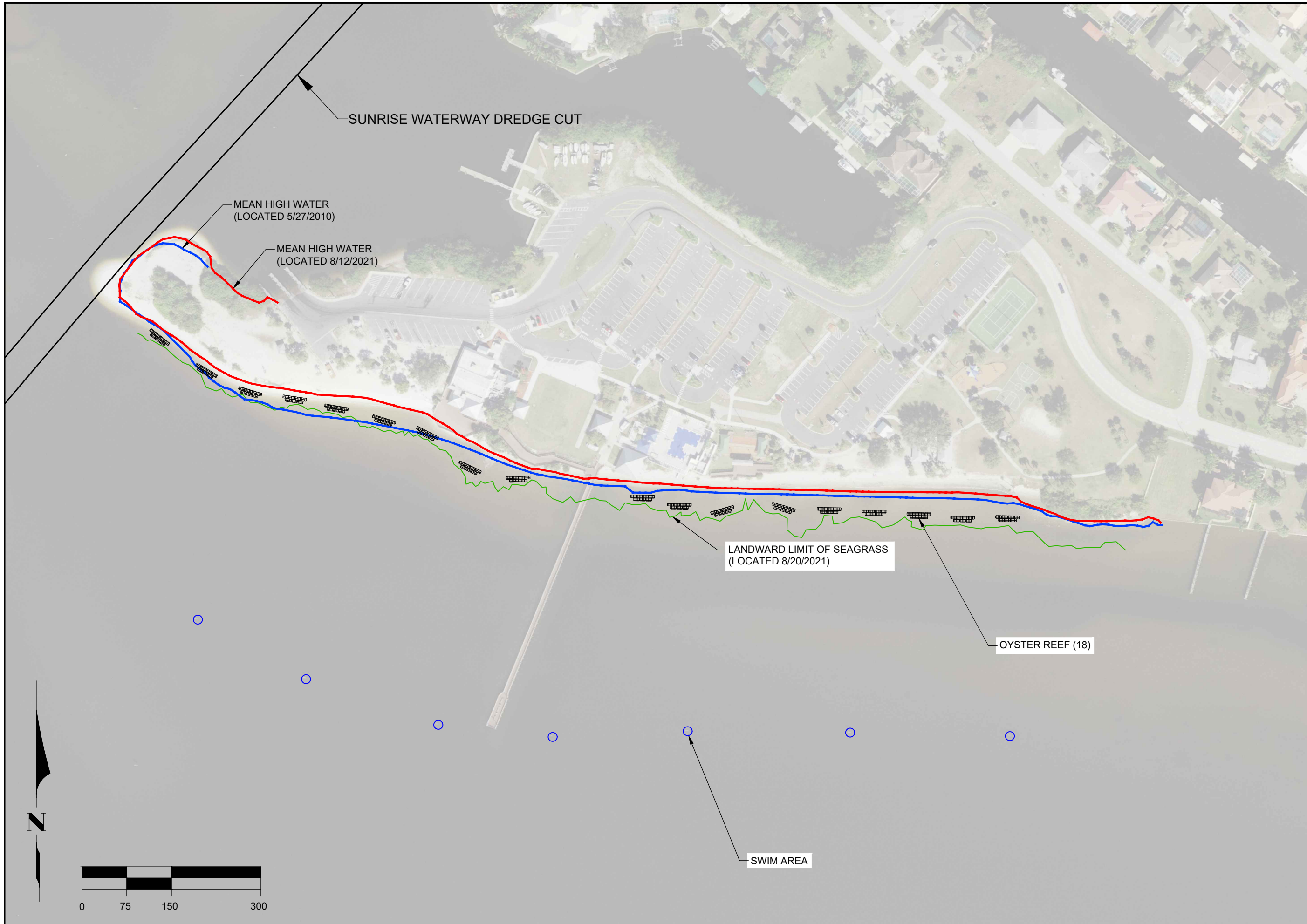
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PHONE: (239)643-2324 FAX: (239)643-1143 www.coastalengineering.com E-Mail: info@cecill.com		ACAD NO.: 20426-Alternatives.dwg REF. NO.: 20,426		NO. BY DATE 20,426
SHEET 2 FILE NO.: 20426-2				



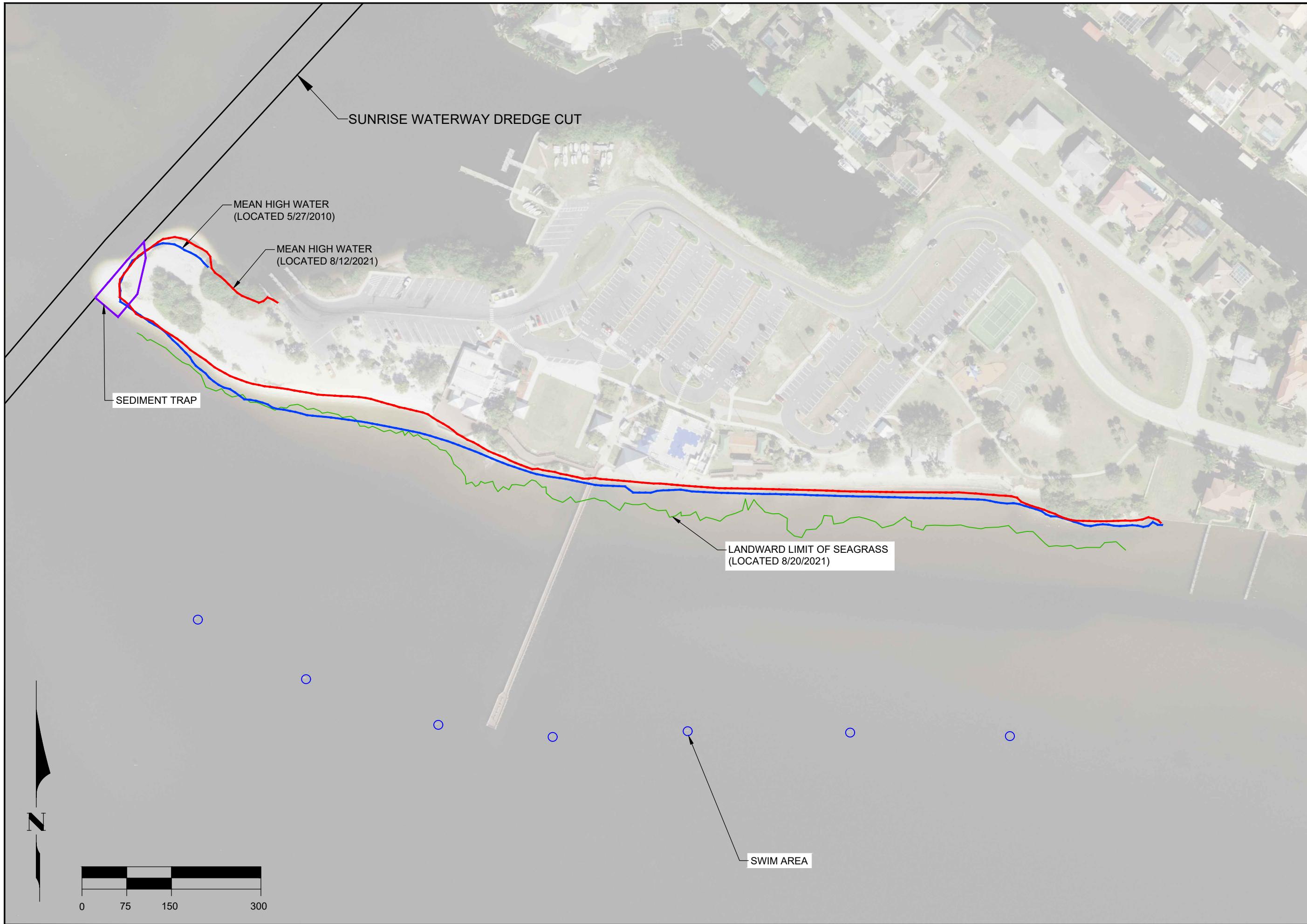
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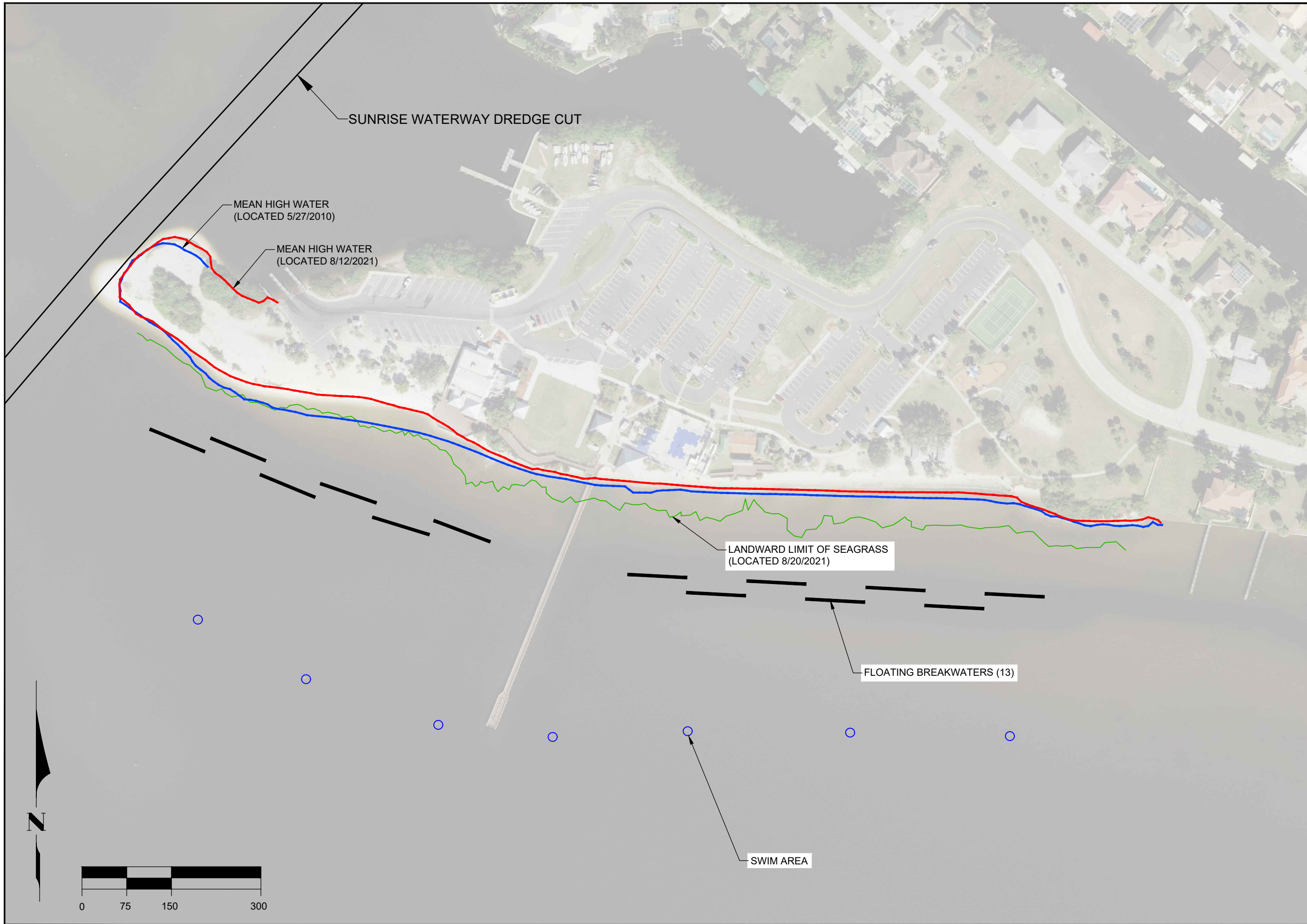
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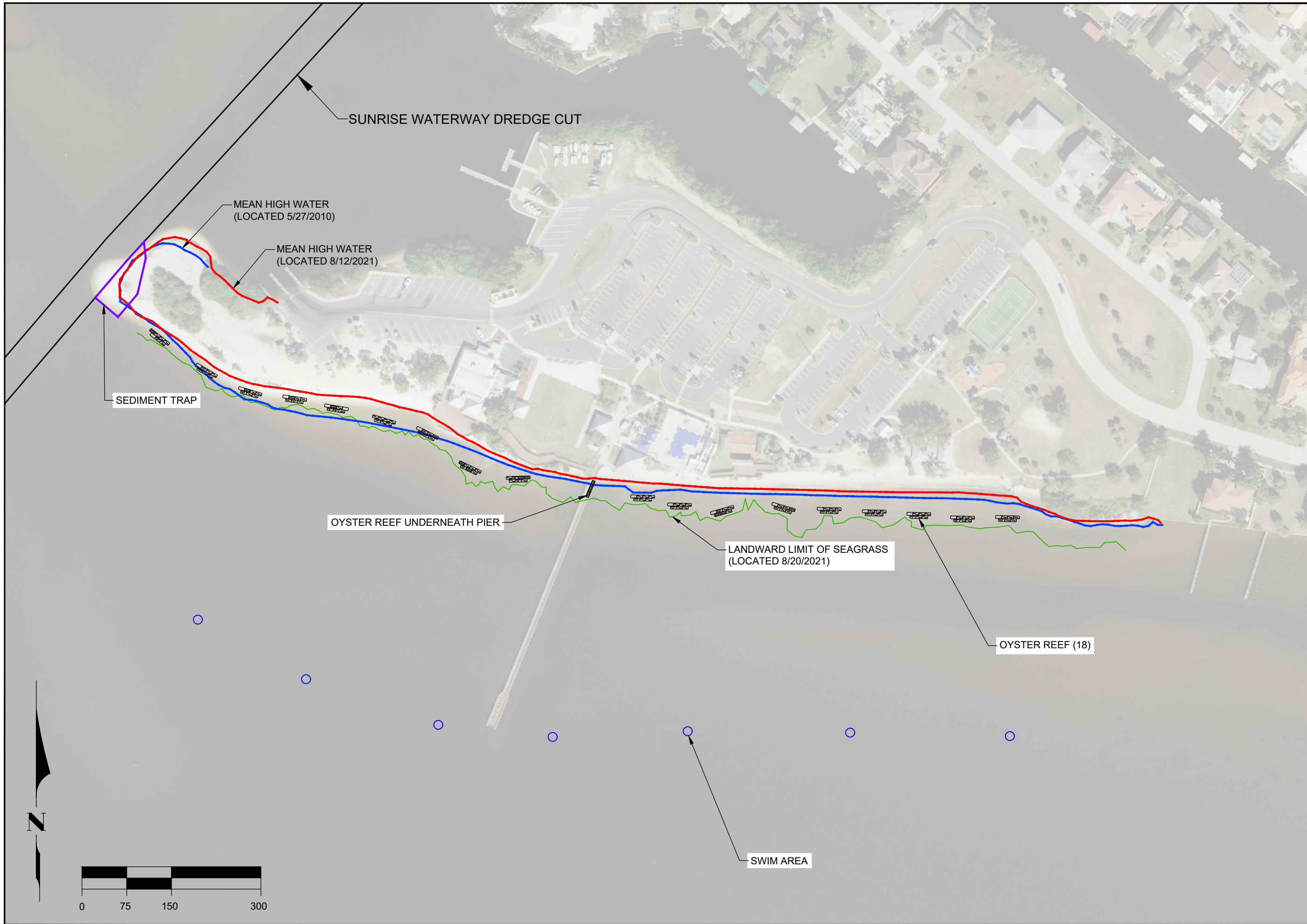
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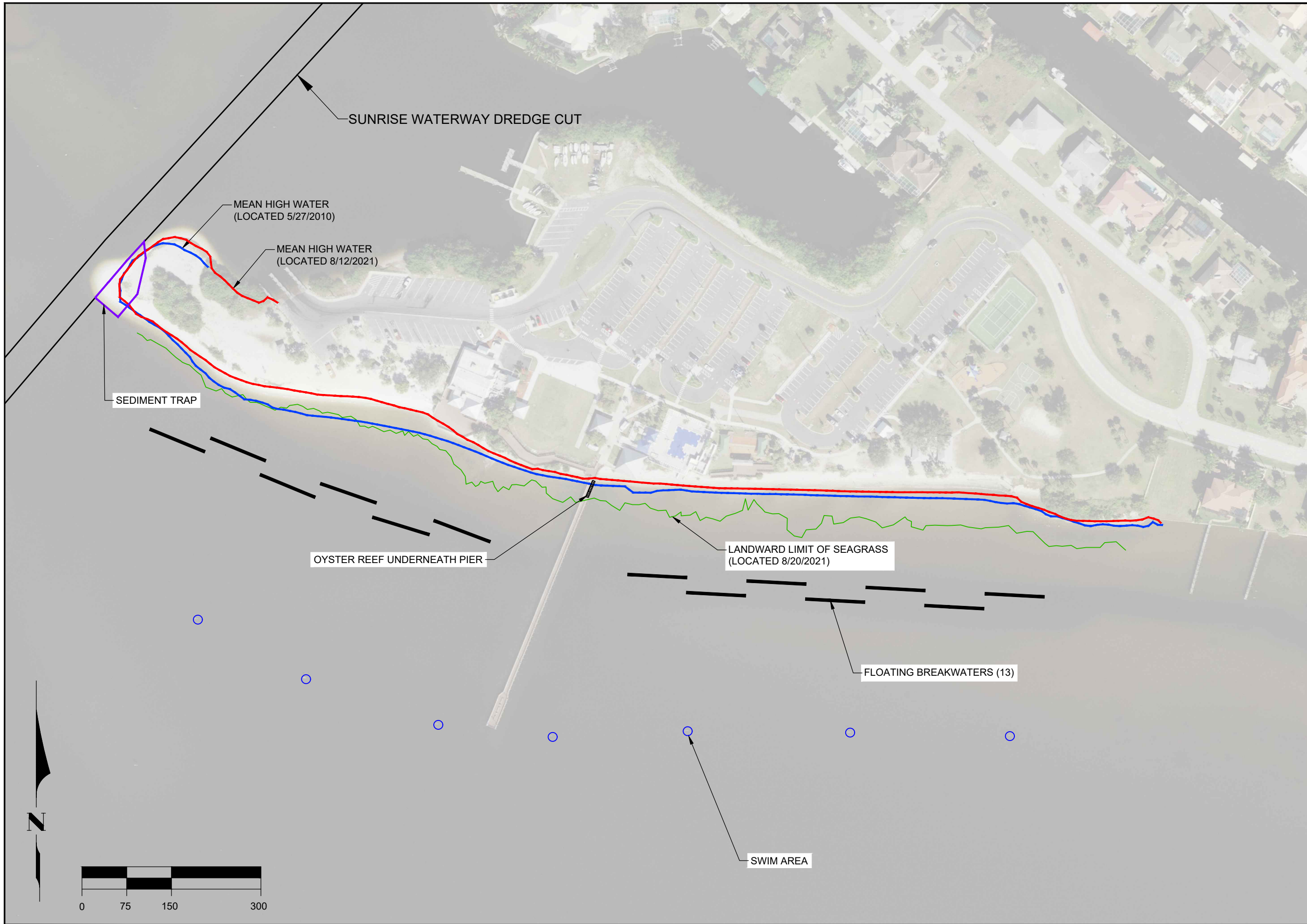
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PORT CHARLOTTE BEACH PARK FLOATING BREAKWATERS		TITLE:		ACAD NO: 20426-Alternatives.dwg REF. NO: 20,426		NO. DATE BY 20,426	
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COASTAL ENGINEERING CONSULTANTS INC. Serving Coastal Communities Since 1977 28421 BONITA CROSSINGS BLVD BONITA SPRINGS, FLORIDA 34135		COASTAL & MARINE ENGINEERING ENVIRONMENTAL & GEOLOGICAL SERVICES SURVEY AND MAPPING ENGINEERING: CA 2464 SURVEYING: LB 2464 PHONE: (239)643-2324 FAX: (239)643-1143 www.coastalengineering.com E-Mail: info@cecill.com		CLIENT: CHARLOTTE COUNTY TITLE: PORT CHARLOTTE BEACH PARK COMBINATION OF OYSTER REEFS, REEF UNDERNEATH PIER AND SEDIMENT TRAP	
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	PHONE: (239)643-2324 FAX: (239)643-1143 www.coastalengineering.com E-Mail: info@cecill.com		TITLE: PORT CHARLOTTE BEACH PARK COMBINATION OF FLOATING BREAKWATERS, REEF UNDERNEATH PIER AND SEDIMENT TRAP
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APPENDIX 2

STAKEHOLDER AND AGENCY PRESENTATION SLIDES

PORT CHARLOTTE BEACH PARK EROSION AND NAVIGATION CHANNEL STUDY



PRE-APPLICATION

MEETINGS

MAY 25, 2022



**COASTAL
ENGINEERING
CONSULTANTS
INC**

OUTLINE

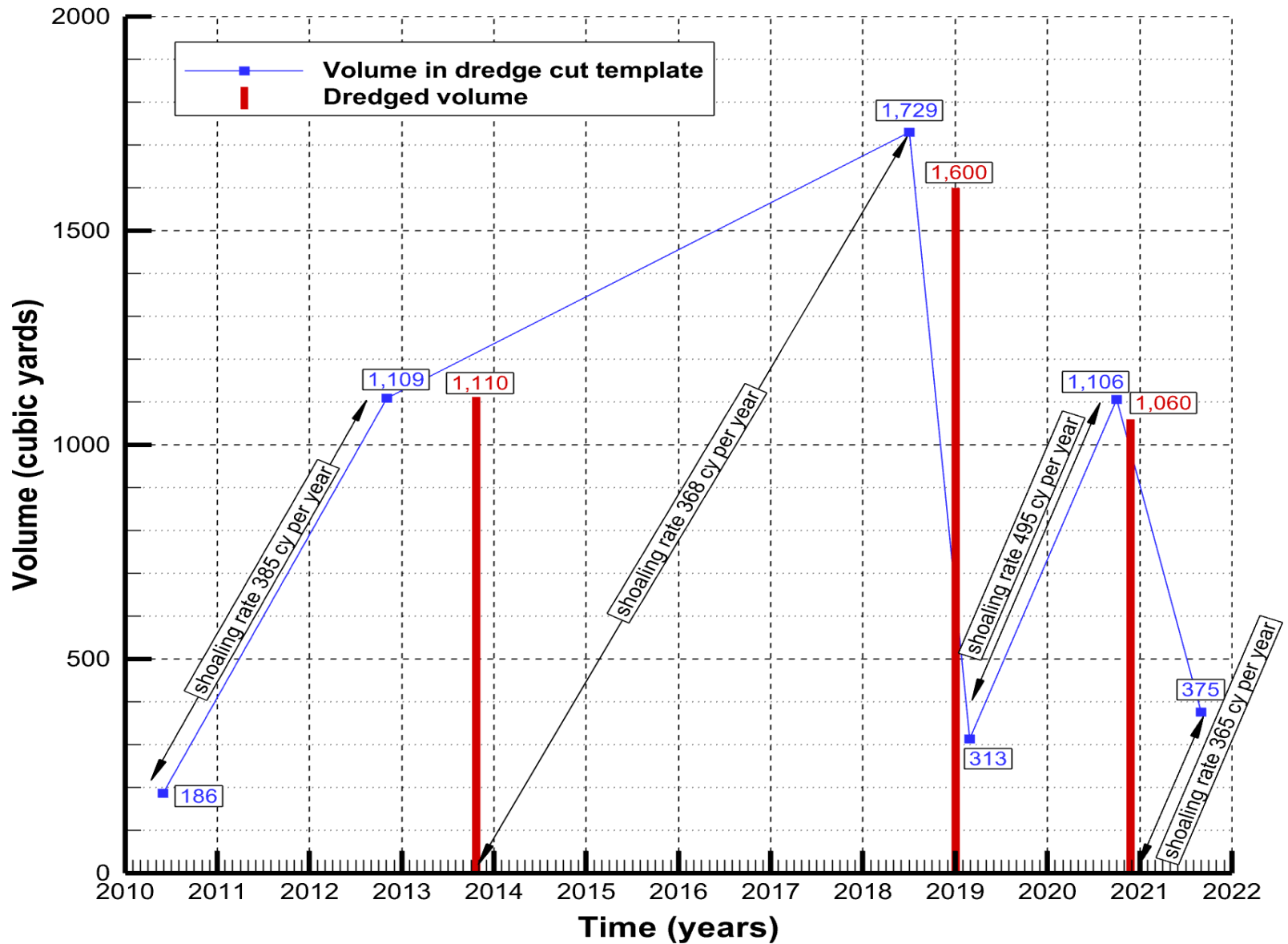
- **Dredging History**
- **Morphologic Changes**
- **Recent Work**
- **Shoreline Stabilization Alternatives**
- **Agency Input**

DREDGING HISTORY

Dredging Event Year	Volume Removed (CY)
1995	2,500*
2004	415
2007	730
2010	715
2013	1110
2019	1600
2020	1060

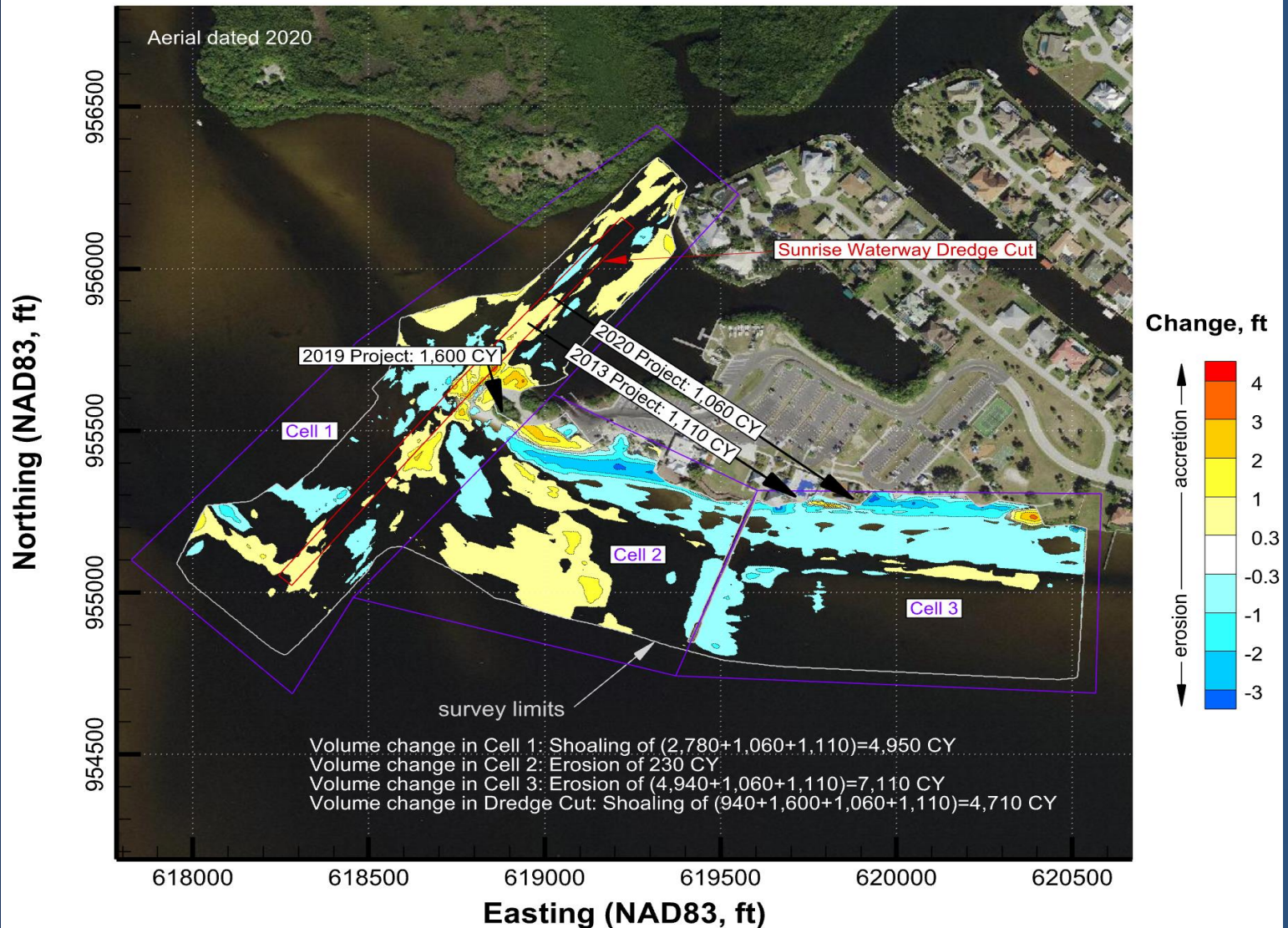
* also included dredging of adjacent Elkcam Waterway

DREDGING HISTORY



MORPHOLOGIC CHANGES

Morphologic Change between May 2010 and August 2021

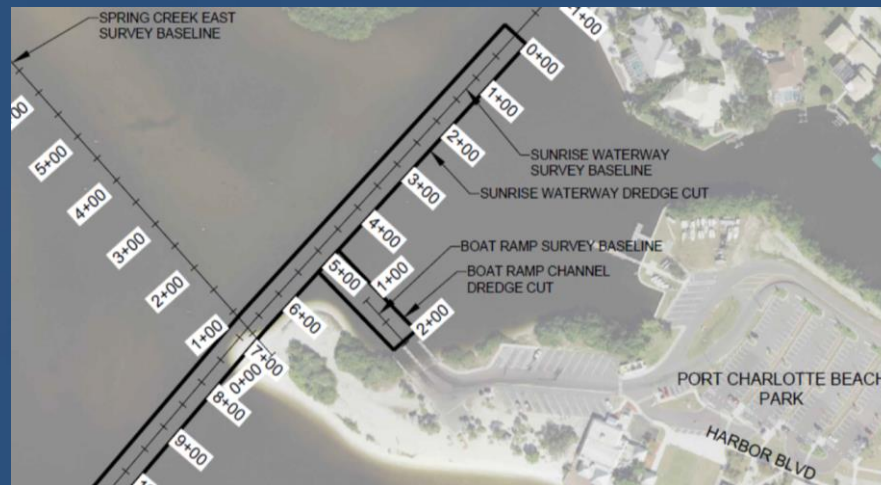
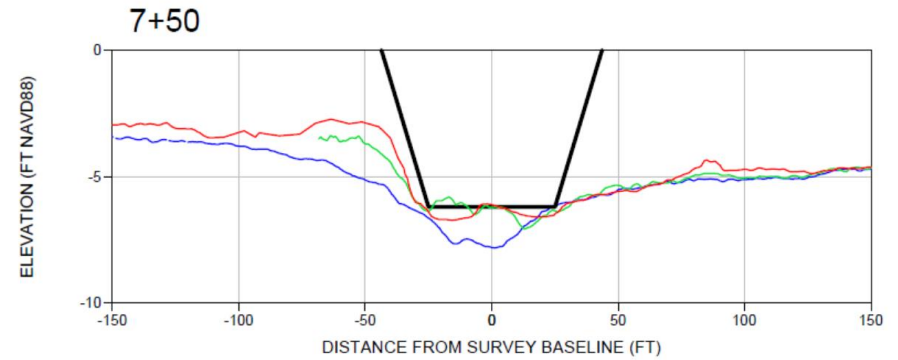
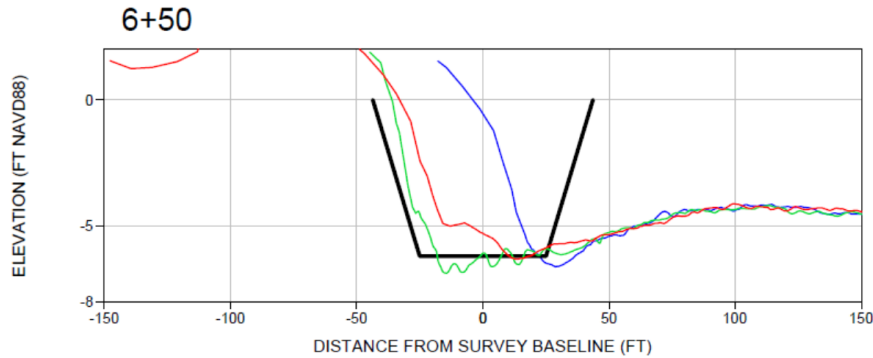
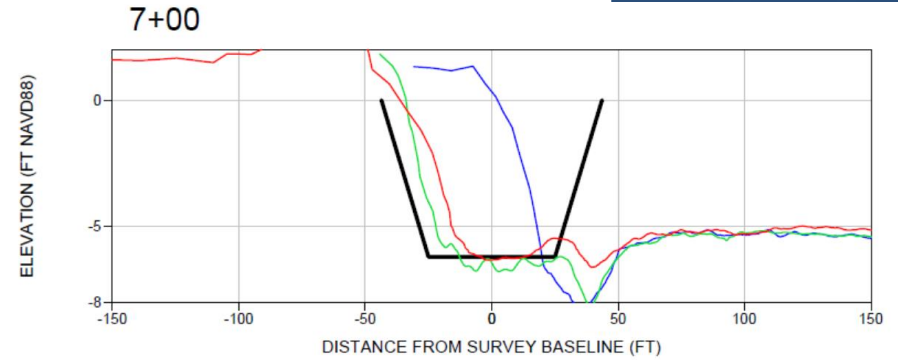
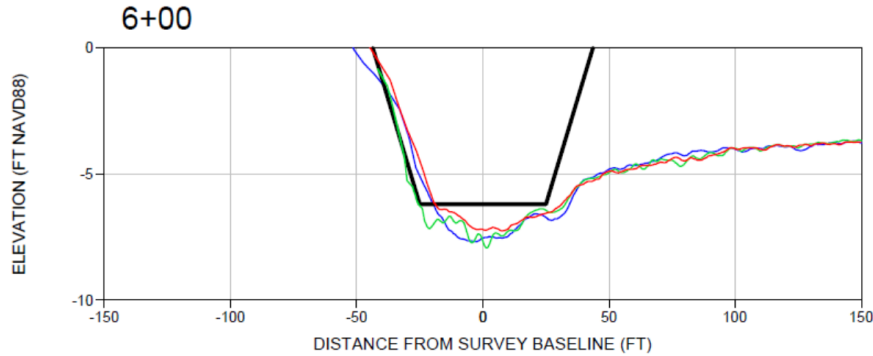


MORPHOLOGIC CHANGES AT SPIT

LEGEND

— = 6/14/2018 MON SURVEY
— = 2/22/2019 MON SURVEY

— = 8/12/2021 MON SURVEY
— = SUNRISE WATERWAY DREDGE CUT



RECENT WORK

January 3, 2022



RECENT WORK

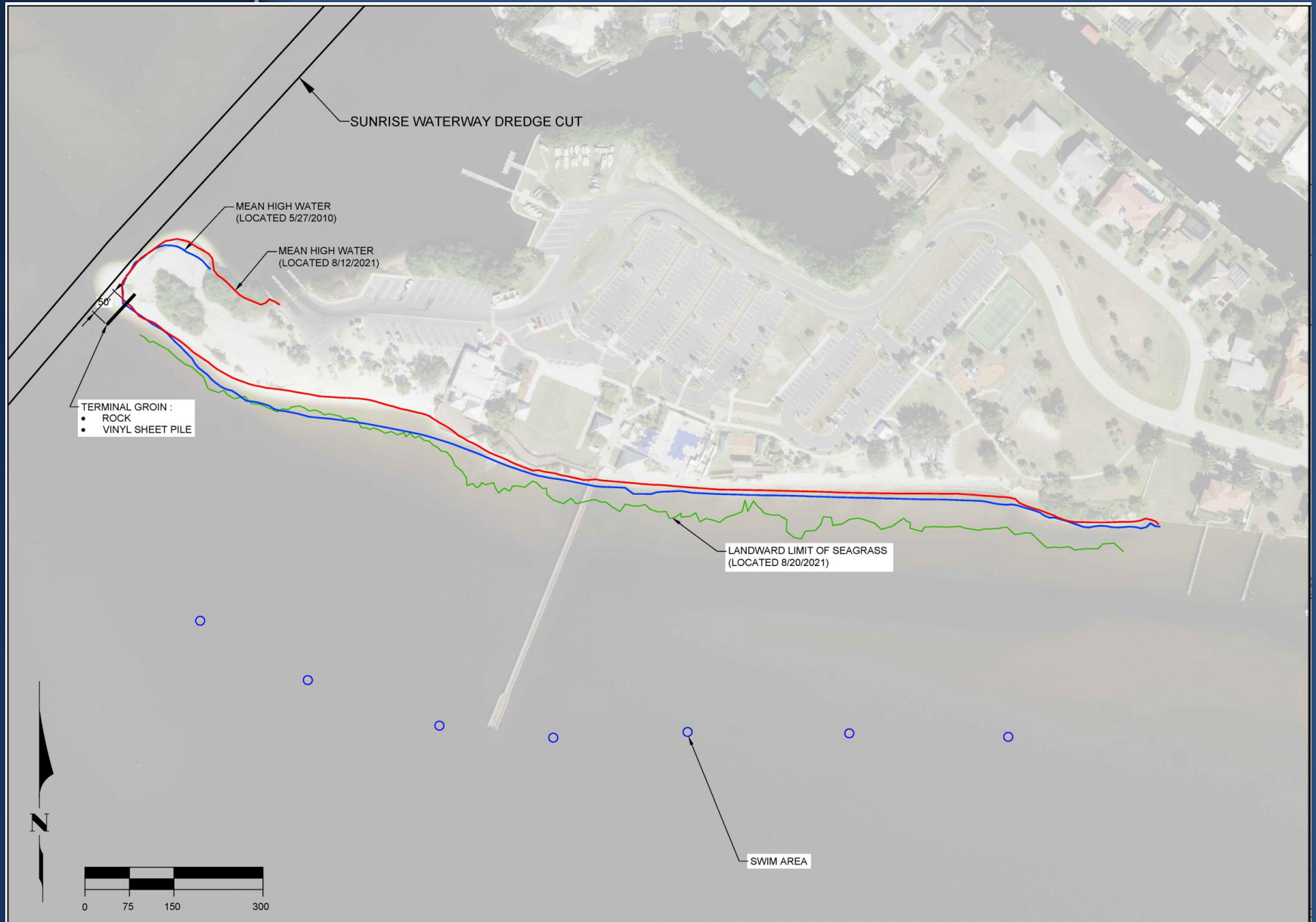
February 11, 2022



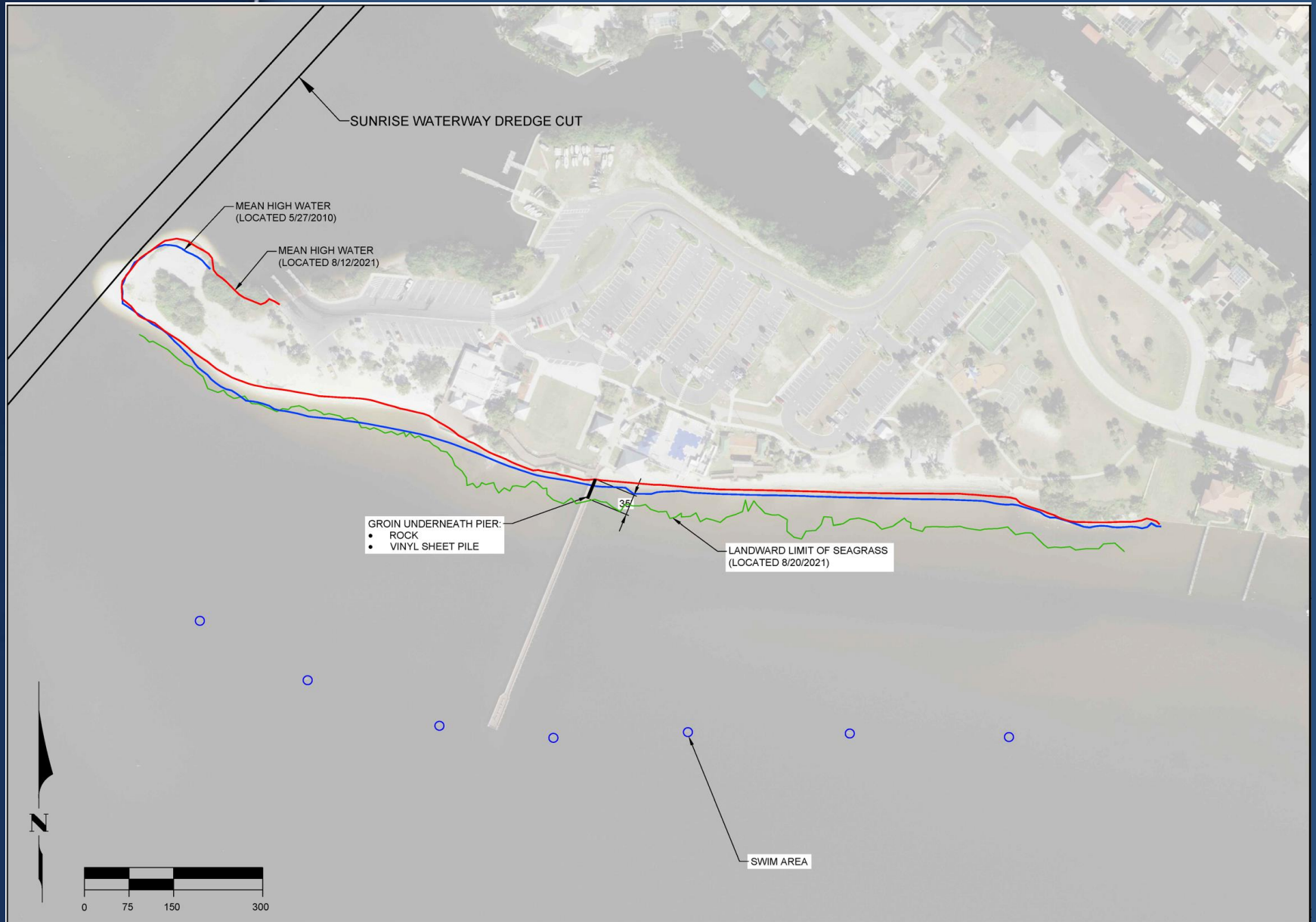
SHORELINE STABILIZATION ALTERNATIVES

- 1: Terminal Groin**
- 2: Groin Underneath Pier**
- 3: T-Groins**
- 4: Revetment**
- 5: Oyster Reefs**
- 6: Sediment Trap**
- 7: Floating Breakwaters**
- 8: Combination of Oyster Reefs, Reef Underneath Pier,
and Sediment Trap**
- 9: Combination of Floating Breakwaters, Reef Underneath
Pier, and Sediment Trap**

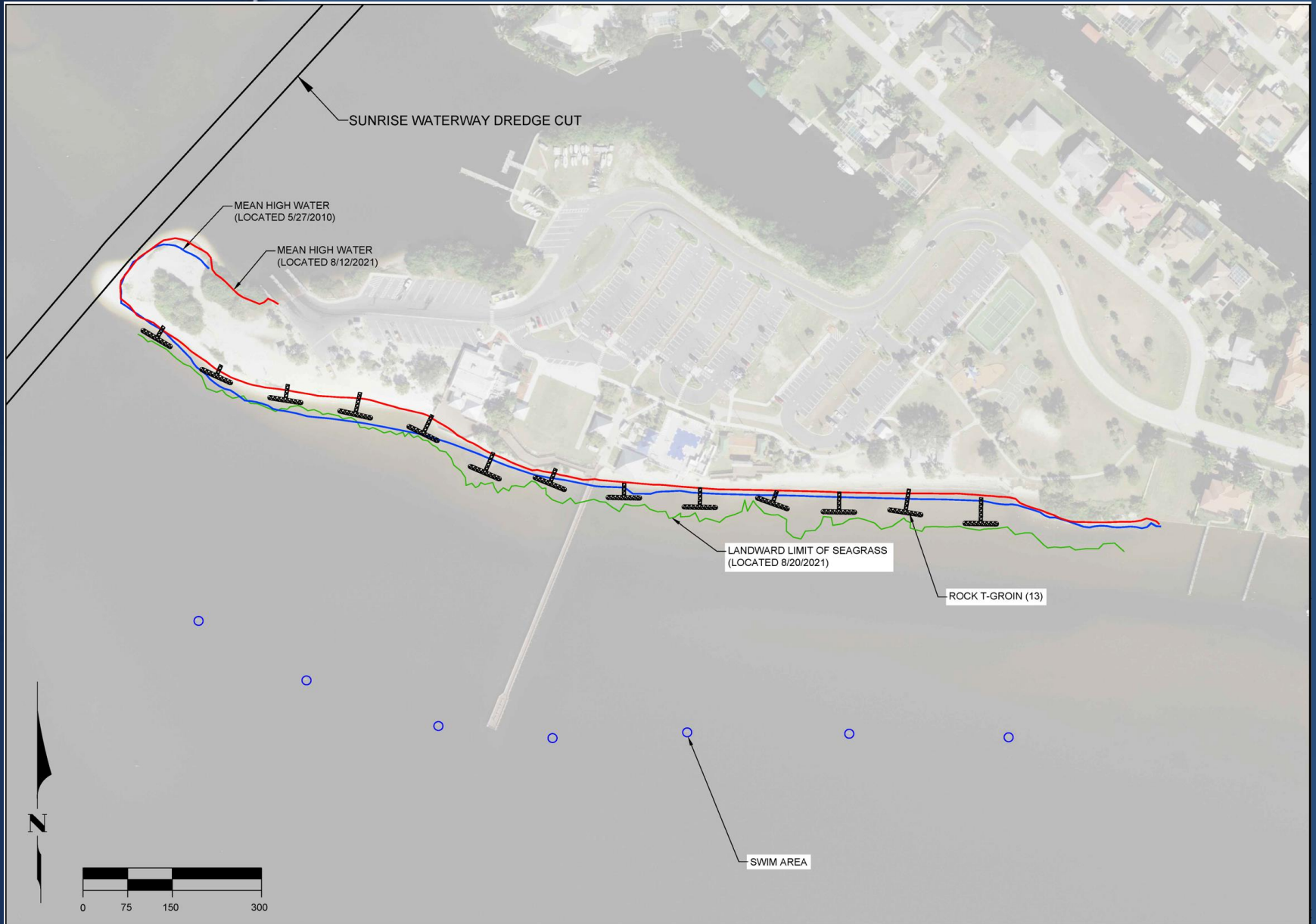
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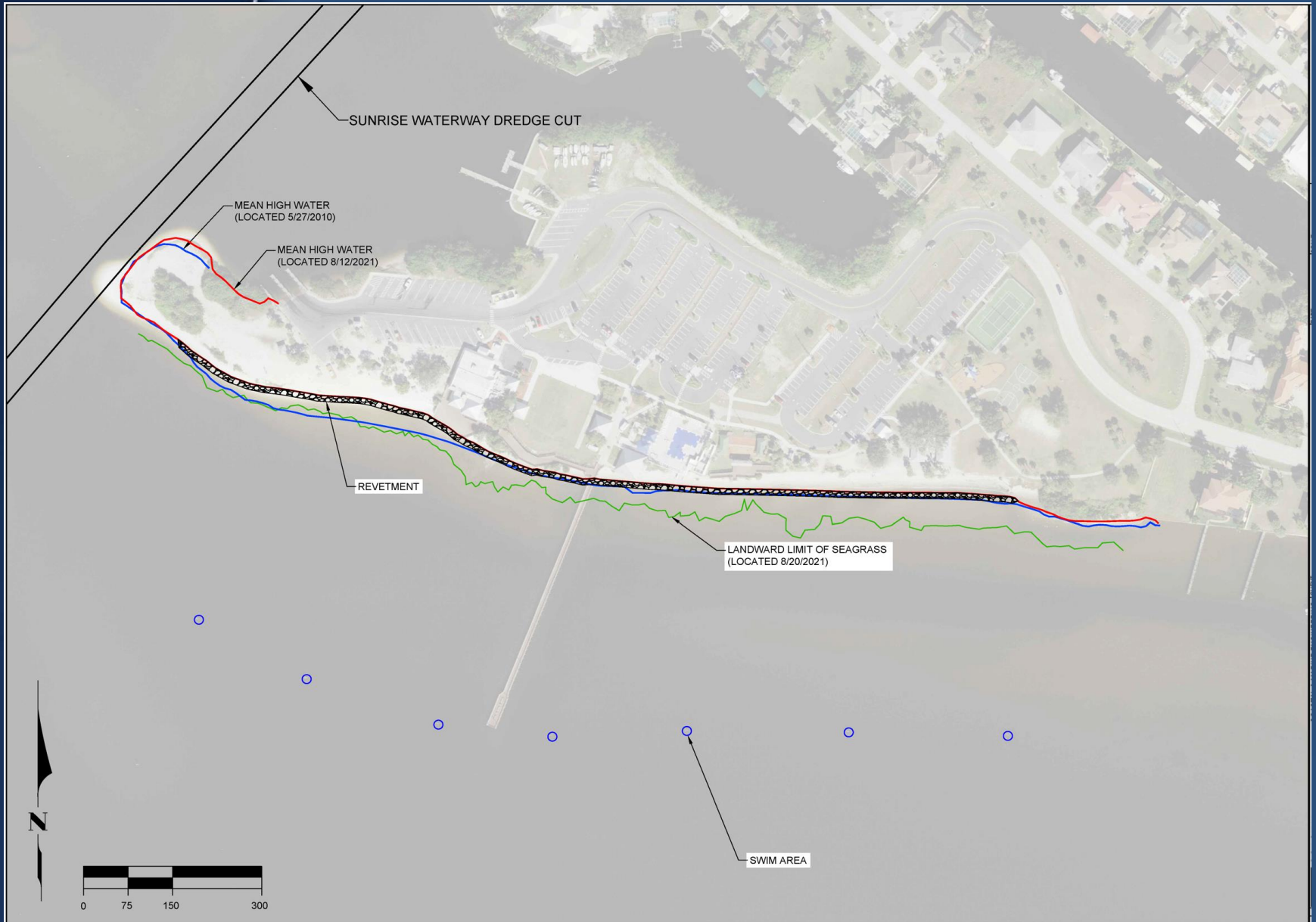
2: GROIN UNDERNEATH PIER



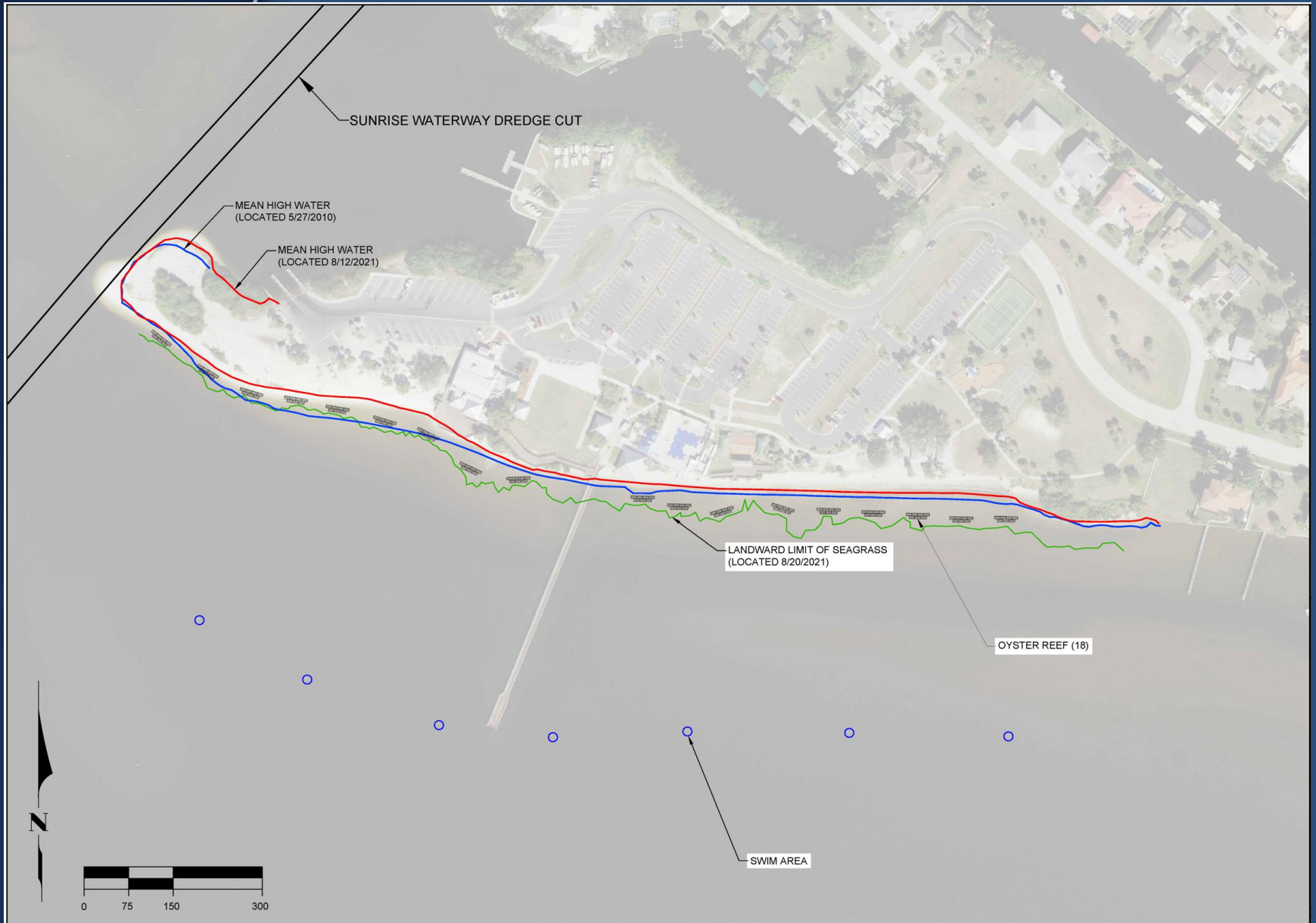
3: T-GROINS



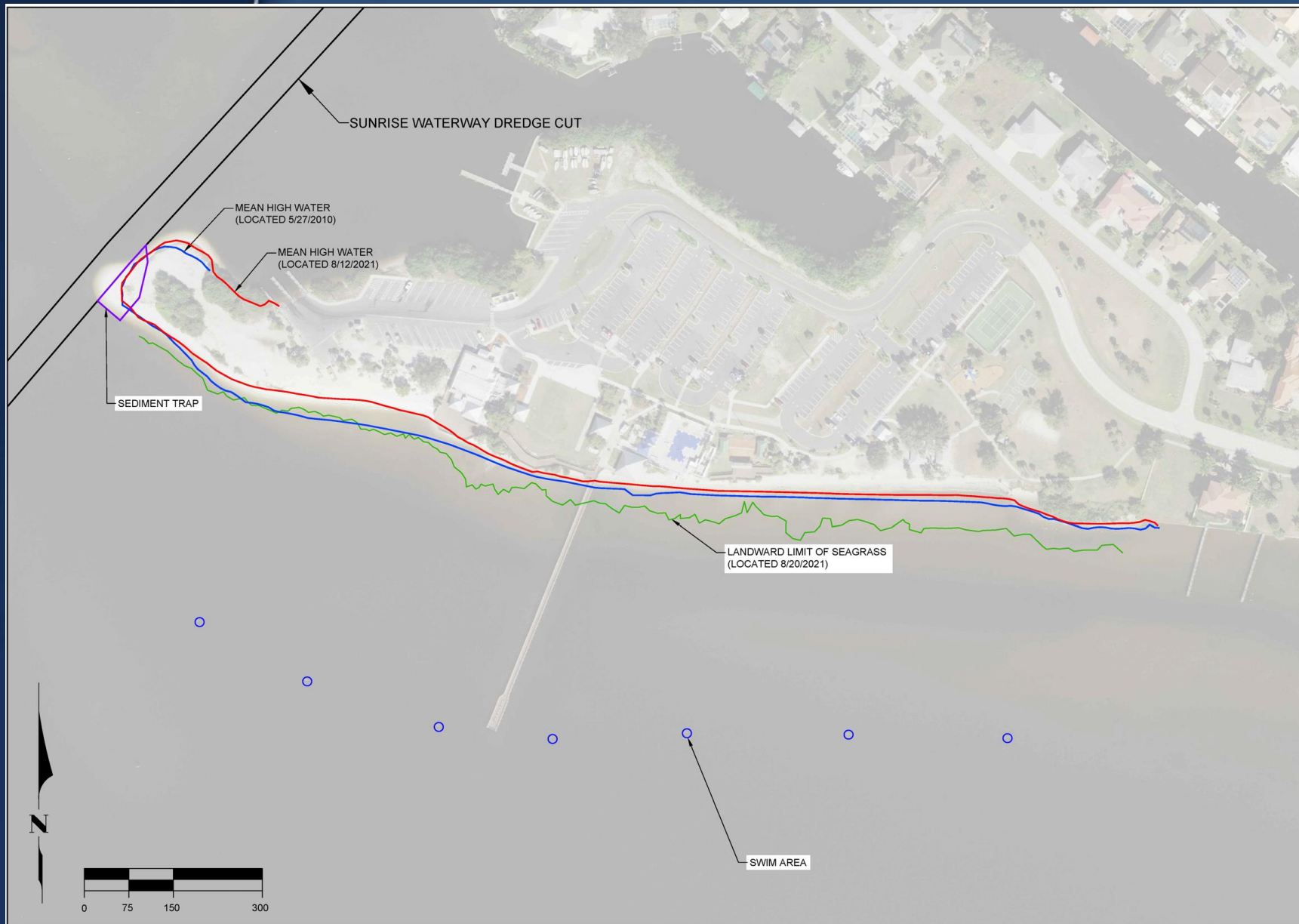
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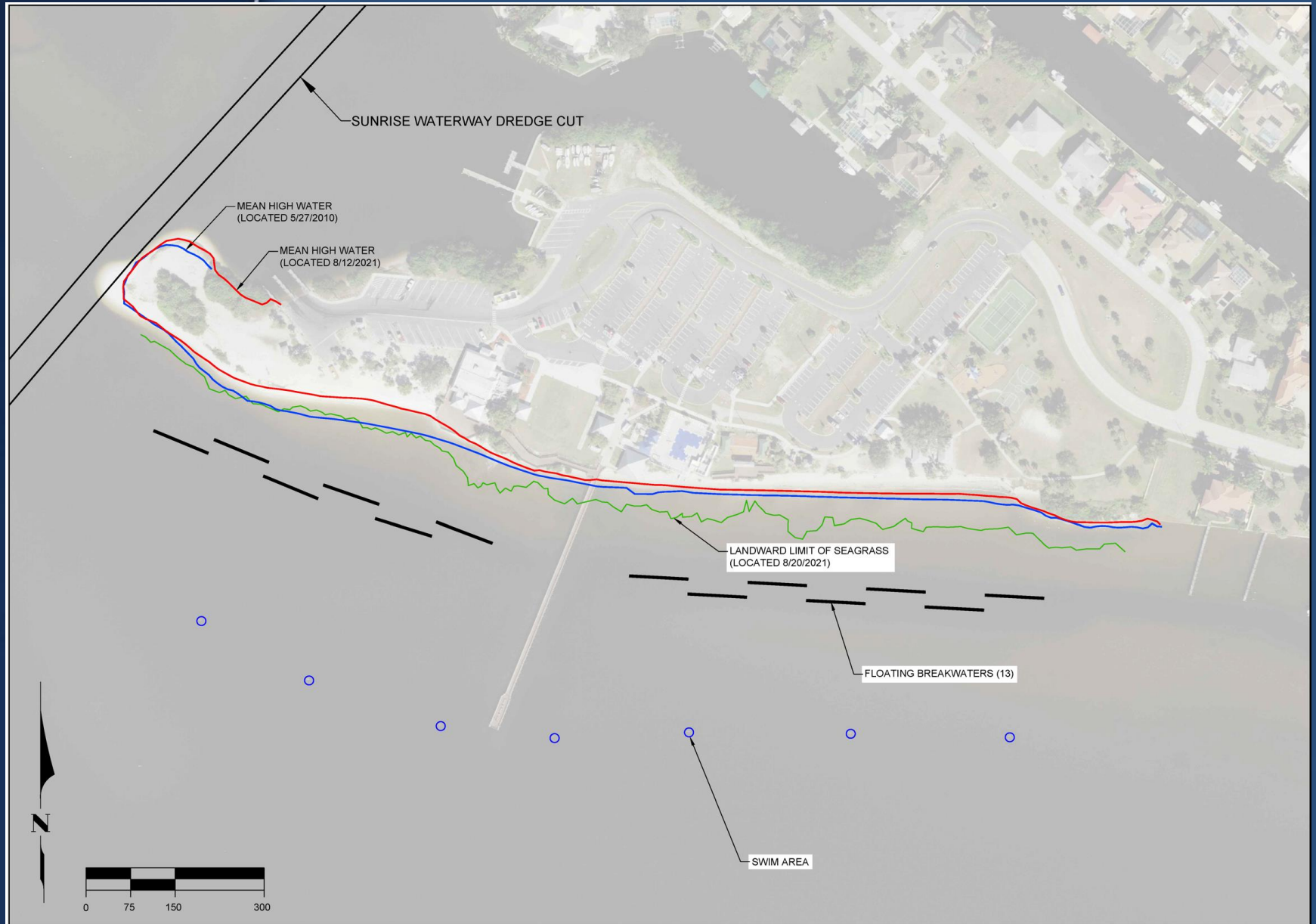
5: OYSTER REEFS



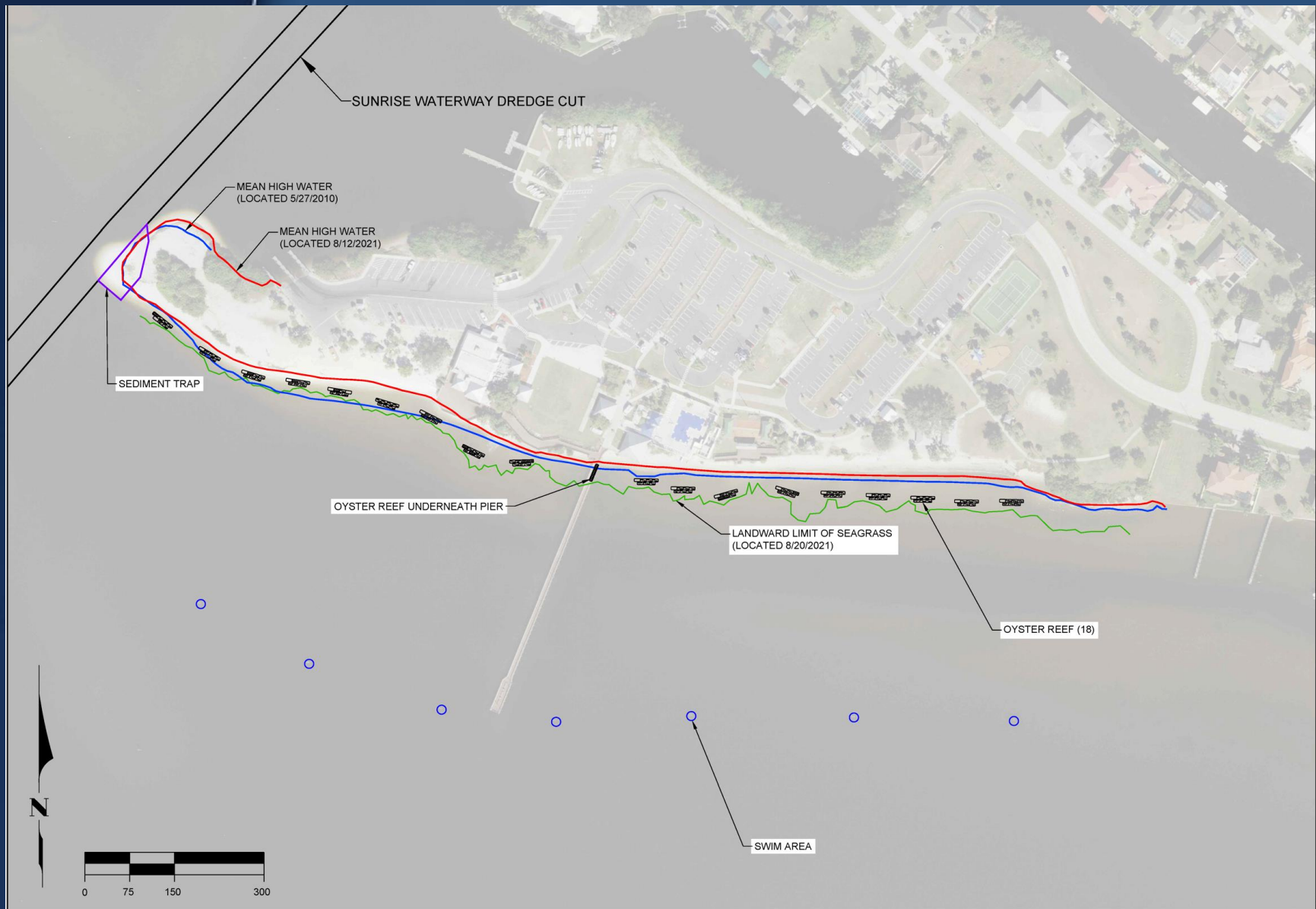
6: SEDIMENT TRAP



7: FLOATING BREAKWATERS



8: COMBINATION OF OYSTER REEFS, REEF UNDERNEATH PIER. AND SEDIMENT TRAP



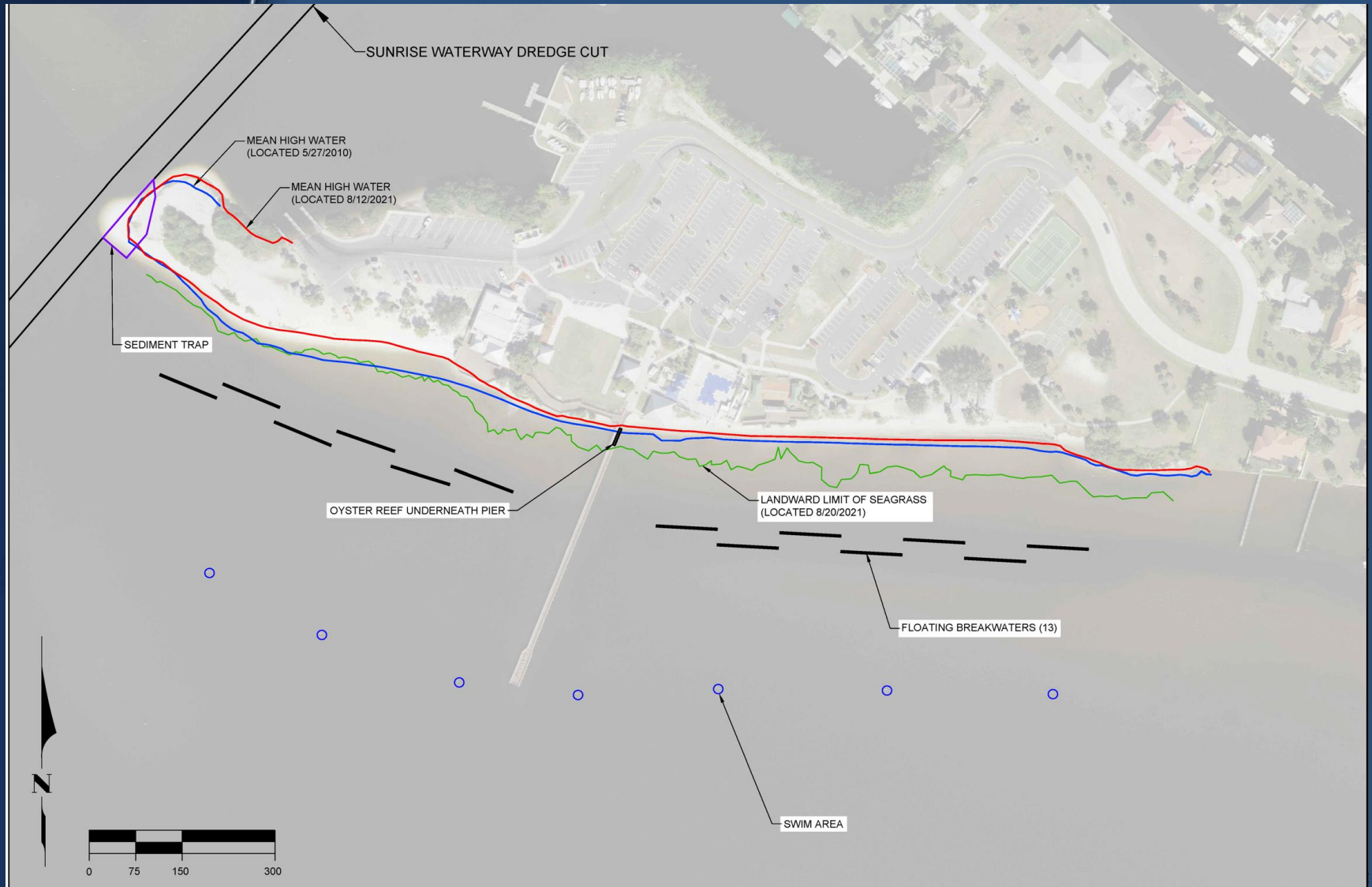
LIVING SHORELINE RENDERING



LIVING SHORELINE RENDERING



9: COMBINATION OF FLOATING BREAKWATERS, REEF UNDERNEATH PIER, AND SEDIMENT TRAP



FLOATING BREAKWATER RENDERING



FLOATING BREAKWATER RENDERING



ALTERNATIVES ASSESSMENT

ALT.	EFFECTIVE- NESS TO REDUCE BEACH EROSION	EFFECTIVE- NESS TO REDUCE CHANNEL INFILLING	IMPACT TO RECREATION USE OF BEACH	COST
Terminal Groin	Low	High	Very Low	High
Reef Under Pier	Medium	Medium	Very Low	Moderate
T-Groins	High	Medium	High	Very High
Revetment	High	High	Very High	Very High
Oyster Reefs	High	Medium	High	Moderate
Sediment Trap	Low	High	Very Low	Low
Floating Breakwaters	Medium	Medium	Low	Moderate
Combination 1	High	High	High	High
Combination 2	Medium	High	Low	High

STUDY HIGHLIGHTS

- **Net Beach Erosion / Land Loss is Historic Pattern**
- **Seagrasses in Nearshore Present Challenges to Stabilize Shoreline / Rebuild and Sustain Sandy Shoreline**
- **Infilling of Navigation Channel is Localized**
- **Current Management is Frequent Small Dredge Projects**
- **Improve Backpassing Sand to East of Pier**
- **Vetted Alternatives with Stakeholders: Developed Consensus for Stabilizing Shoreline – Reducing Dredging Demands through Combinations 8 or 9**
- **Seeking Agency Input on Alternatives**

AGENCY INPUT

ALT.	EFFECTIVE- NESS TO REDUCE BEACH EROSION	EFFECTIVE- NESS TO REDUCE CHANNEL INFILLING	IMPACT TO RECREATION USE OF BEACH	COST	PERMITTING
Terminal Groin	Low	High	Very Low	High	
Reef Under Pier	Medium	Medium	Very Low	Moderate	
T-Groins	High	Medium	High	Very High	
Revetment	High	High	Very High	Very High	
Oyster Reefs	High	Medium	High	Moderate	
Sediment Trap	Low	High	Very Low	Low	
Floating Breakwaters	Medium	Medium	Low	Moderate	
Combination 1	High	High	High	High	
Combination 2	Medium	High	Low	High	