US Army Corps of Engineers ®

2020 South Atlantic Regional Biological Opinion Annual Programmatic Review and Report

March 27, 2020 – September 30, 2022

Photo Credit: Clearwater Marine Aquarium Research Institute, taken under NOAA permit #26919.

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ACRONYMS

Acronym	Description
BOEM	Bureau of Ocean Energy Management
CMARI	Clearwater Marine Aquarium Research Institute
CSRM	Coastal Storm Risk Management
DO	Dissolved Oxygen
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
ERDC	U.S. Army Engineer Research and Development Center
ESA	Endangered Species Act
ETOF	Equilibrium Toe of Fill
FDEP	Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
FY	Fiscal Year
GADNR	Georgia Department of Natural Resources
HCD	Habitat Conservation Division
ITS	Incidental Take Statement
NARW	North Atlantic right whale
NCF	National Channel Framework
NMFS	National Marine Fisheries Services
NMFS PRD	National Marine Fisheries Protected Resource Division
NOAA	National Oceanic and Atmospheric Association
ODESS	Operations and Dredging Endangered Species System
ODMDS	Ocean Dredged Material Disposal Site
PBF	Physical and Biological Features
PDC	Project Design Criteria
PDT	Project Delivery Team
PSO	Protected Species Observer
RHDC	Regional Harbor Dredge Contract
SAC	South Atlantic Division, Charleston District
SAD	South Atlantic Division
SAJ	South Atlantic Division, Jacksonville District
SARBO	South Atlantic Regional Biological Opinion for Dredging and Material Placement Activities in the Southeast United States
SAS	South Atlantic Division, Savannah District
SAW	South Atlantic Division, Wilmington District
SMA	Seasonal Management Area
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
UXO	Unexploded Ordnance

SECTION 1 - INTRODUCTION

This annual programmatic report meets the reporting requirements of the Annual Programmatic Review outlined in Section 2.9.4 of the 2020 South Atlantic Regional Biological Opinion for Dredging and Material Placement Activities in the Southeast United States (2020 SARBO or Opinion). The National Marine Fisheries Services (NMFS) signed the 2020 SARBO on March 27, 2020, with revisions on July 30, 2020, to revise Project Design Criteria (PDC) GG.4 to clarify the use of single beam sonar.

This is the first annual programmatic report submitted under the 2020 SARBO. As stated in 2020 SARBO Section 2.9.4.1, "The reporting requirements in this section are meant to ensure that this Opinion is protective of ESA-listed species. These requirements may be adapted by agreement between NMFS, U.S. Army Corps of Engineers (USACE), and Bureau of Ocean Energy Management (BOEM), as this Opinion is implemented, to ensure accuracy, validity, and utility of data collected and to ensure protection of the species discussed in the Opinion." It also stated, "The first annual review for the 2020 SARBO implementation will determine how soon an annual review can be accurately and reasonably completed."

The SARBO Team, consisting of members of the U.S. Army Corps of Engineers (USACE), NMFS, and Bureau of Ocean Energy Management (BOEM), initially agreed the first annual report would include covered activities through the end of fiscal year[1] 2021 (FY21) because a majority of the USACE operations and maintenance work was completed for FY20 before the 2020 SARBO was issued. Due to delays in completing this first annual report that were discussed with NMFS and BOEM, the decision was made to broaden the coverage of this first review to be the period from completion of the 2020 SARBO through the end of FY22. The delay in completion of this formal report did not affect the Corps' reporting of information as required by the 2020 SARBO, and the Corps will continue to provide information, including detailed information shared routinely with the SARBO Team that meets regularly to exchange information and discuss 2020 SARBO implementation. While USACE and BOEM jointly manage 2020 SARBO, USACE is the lead agency overseeing 2020 SARBO implementation, routine reporting, and annual reporting. USACE coordinates its activities with BOEM.

Implementation of the 2020 SARBO proved more challenging than expected, but USACE and BOEM conclude that the implementation has been successful and the 2020 SARBO applied appropriately. The 2020 SARBO affords opportunities to learn and improve in ways that ultimately benefit and the protection of ESA-listed species and critical habitat covered under the 2020 SARBO while allowing both agencies to accomplish their missions. This report describes the challenges and successes experienced during the implementation period and goals going forward.

The 2020 SARBO lists the requirements for the Programmatic Annual Review and Report in Section 2.9.4 of the 2020 SARBO. The remainder of this document will follow

[1] Fiscal year runs from October 1st through September 30th.

the Annual Review and Report requirements listed in Section 2.9.4, which are summarized below.

- Annual Programmatic Review. 2020 SARBO Section 2.9.4 lists four actions NMFS recommends the USACE perform prior to completing the Annual Programmatic Report. These actions and the USACE's response are provided in SECTION 2 - of this report.

- Data Required for the Programmatic Annual Review Report. Data required for the Programmatic Annual Review, as specified in 2020 SARBO Section 2.9.4.2, is provided in Section 2.1 and Appendix A of this report. The completed project list in Appendix A includes compiled project data and project specific data as listed in 2020 SARBO Section 2.9.3.5. Lethal and non-lethal take spreadsheets are provided to NMFS routinely, including annual tallies. Summary reports for species specific information, such as North Atlantic Right Whale (NARW) Survey results and Atlantic sturgeon genetic testing results, have been and will continue to be shared annually.

- Annual 2020 SARBO Programmatic Meeting. After submission of this report, USACE will host a meeting with NMFS and BOEM to discuss the results of the internal review. 2020 SARBO Section 2.9.4.2 states, "Following the annual review, the SARBO Team may jointly determine that revisions to the Opinion or the PDCs may be necessary. If the SARBO Team believes that PDCs require minor modification or correction, the process established below for changing PDCs may be initiated (Section 2.9.5.3 of this Opinion)." In addition to post-annual review suggestions, revision suggestions have been and will continue to be discussed during monthly SARBO Team meetings.

- Lessons Learned. Both the lessons learned while completing projects covered under the 2020 SARBO and topics requiring further discussion with NMFS are provided in SECTION 3 - of this report, as outlined in 2020 SARBO Section 2.9.4.3. Lessons learned are also documented in the 2020 SARBO project tracking spreadsheet that is routinely provided to NMFS and in formal pre-construction risk assessments developed for each Regional Harbor Dredging Contract that covers maintenance dredging of multiple projects Lessons learned will be documented for all projects proposed in the FY23 and FY24 regional risk assessment.

SECTION 2 - ANNUAL PROGRAMMATIC REVIEW

In Section 2.9.4 of the 2020 SARBO, NMFS recommended the USACE to check specific items before submitting the Annual Programmatic Report. Table 2-1 lists the specific items recommended by NMFS and details how the USACE verified those items.

Johnson's seagrass is addressed in this Annual Programmatic Report because the 2020 SARBO PDCs for Johnson's seagrass were applicable for most of the time that is covered by this report. Johnson's seagrass was on the Federal List of Threatened and Endangered Species, to include the designation of critical habitat, based on the September 14, 1998, final rule listing Johnson's seagrass as a threatened species (63 FR 49035). The final rule designating critical habitat was published on April 5, 2000 (65 FR 17786). The change to the 2020 SARBO is because Johnson's seagrass was removed from the Federal List, to include the corresponding designated critical habitat, per the final rule published on April 14, 2022, with the removal effective on May 16, 2022 (87 FR 22137).

Table 2-1: NMFS Recommended Actions Pre-Annual Programmatic Review Submission

NMFS Recommendations (Section 2.9.4 Bullets)	USACE Verification
Randomly select and review projects covered under this Opinion by staff other than those on the SARBO Team to confirm compliance with the requirements of this Opinion including all applicable PDCs.	Seventeen projects (approximately 10% of the total projects completed in FY20-FY23) were randomly selected to confirm compliance with all applicable PDCs and were reviewed by a USACE biologist. The selected projects are identified with an asterisk after the project name in the project table (Appendix A).
Map all project locations to determine how many occurred in critical habitat.	All project locations were mapped along with the designated critical habitat under NMFS purview. The maps for Acropora, Atlantic sturgeon, Johnson's seagrass, and North Atlantic right whale critical habitat can be found in Appendix B. The maps in Appendix B only show locations of critical habitat relevant to where projects occurred. No projects occurred in green sea turtle or hawksbill sea turtle critical habitat. Maps for loggerhead critical habitat are not provided due to the high number of projects occurring in that area. However, the project table in Appendix A lists all projects that occurred in loggerhead critical habitat.

NMFS Recommendations (Section 2.9.4 Bullets)	USACE Verification
Map all project locations to determine how many occurred in areas that required additional PDCs such as those within the range of ESA-listed corals and ensure the additional protective measures were followed.	All project locations were mapped along with the range of ESA-listed coral, range of Johnson's seagrass, and the area where sturgeon PDCs apply. The maps can be found in Appendix C.
Review the compiled spreadsheet to ensure that all information is reported. Certain details may be provided as an estimate during the pre-construction notification and then will need to be updated once work is complete such as the total dredge volume or start and end date.	The project spreadsheet located in Appendix A has been reviewed to ensure all information listed in 2020 SARBO Section 2.9.3.5.1 has been reported.

2.1 DATA REQUIRED FOR THE PROGRAMMATIC ANNUAL REPORT

2020 SARBO Section 2.9.4.2 outlines six reporting requirements, which are provided in the following sections.

2.1.1 Master spreadsheet of required information from 2020 SARBO Section 2.9.3.5

To streamline and ensure all 2020 SARBO reporting requirements are met, USACE South Atlantic Division (SAD) hired a contractor in June 2020 to develop a 2020 SARBO Reporting Form, which was completed in April 2021. This new reporting form gathers all necessary project details outlined in 2020 SARBO Section 2.9. It uses dynamic features in a multi-tab Excel spreadsheet to obtain answers to a series of overview questions that lead to more detailed project-specific questions. Ultimately, it generates a row of data that is entered in a master project tracking spreadsheet used internally by USACE to track ongoing and upcoming projects.

The development of the new reporting form required USACE District staff to review and test multiple drafts. During development of this form, versions were discussed and visually shared with NMFS and BOEM to obtain accurate project details. The form is now used to gather project details that are compiled into a master spreadsheet and shared with NMFS and BOEM during monthly meetings and used to summarize project information for the Programmatic Annual Review. At the beginning and end of each project, the District SARBO Project Delivery Team (PDT) and SAD SARBO PDT Lead review and update the project reporting form.

In September 2022, the form, in a spreadsheet format, was revised to streamline the reporting requirements into a more manageable form to review and use. Details that were originally split into multiple columns were combined into a single column, such as critical habitat units in which work occurred. This shortened the spreadsheet from 319

columns to 136 columns of data reported. All required information is reported in the project tracking spreadsheet provided electronically with this report. Due to the amount of data, a complete spreadsheet could not be inserted into this report; however, a project list with key project information is in Appendix A of this report. The required spreadsheet is provided electronically covering work completed under the 2020 SARBO from March 27, 2020, to September 30, 2022, including the following information.

2.1.1.1 Tally of the number of nonlethal and lethal take by species/distinct population segment.

The SARBO Take Workbook is provided after each lethal take, provided with this report electronically and in Appendix E, and publicly available on ODESS for lethal take.

2.1.1.2 Document any loss of critical habitat features by critical habitat unit and quantify any loss of each feature by the area of loss (acres or square feet).

Projects completed in accordance with the 2020 SARBO were determined by NMFS to have no effect to green sea turtles, hawksbill sea turtles, or North Atlantic right whale (NARW) critical habitat. However, projects completed in accordance with the 2020 SARBO may have insignificant effects on some of the Physical and Biological Features (PBFs) of leatherback sea turtle, loggerhead sea turtle, Atlantic sturgeon, *Acropora*, and Johnson's seagrass critical habitat as described in the effects analysis in Section 3 of the 2020 SARBO. Because the effects to PBFs are insignificant, USACE concludes no critical habitat features were adversely affected and that this reporting requirement is not applicable for this report. The intent of tracking effects from projects covered under the Opinion is met without quantifying the spatial extent of projects that had no effects to insignificant effects. Dredging and placement projects covered under 2020 SARBO are not reported in square feet, and it is an unnecessary burden to have project managers focus on this reporting requirement.

USACE recommends removing this requirement as noted in Appendix F showing requested revisions to the 2020 SARBO. The Project Tracking Workbook routinely provided to NMFS indicates the critical habitat and unit but omits the area of the project located in critical habitat. A condensed version of the Project Tracking Workbook is provided in Appendix A.

2.1.1.3 Total volume dredged during the year.

The SARBO Project Reporting Workbook, which is provided routinely to NMFS, includes the total volume dredged. A condensed version is provided in Appendix A and summarizing in Table 2-2 below.

Table 2-2. SARBO Project Dredge Volume Totals (cubic yards) of Projects March 27, 2020 to September 30, 2022

District	Hopper	Modified Hopper	Cutterhead	Mechanical	Truck Haul	Total
SAW	14,890,188	1,551,848	8,626,646	2,083,734	0	27,152,416
SAC	350,329	39,000	3,082,993	0	0	3,472,322
SAS	2,193,603	0	7,620,066	0	0	9,813,669
SAJ	7,390,066	292,897	2,712,869	839,248	914,744	12,149,824
Total	24,824,186	1,883,745	22,042,574	2,922,982	914,744	51,673,487

2.1.2 Identification and tally of projects.

Projects that occurred under the 2020 SARBO within designated critical habitat, or within the range of a species for which there are PDC requirements, are documented below. Maps of these projects are also provided in Appendices B and C.

2.1.2.1 Projects located within a critical habitat unit or species-specific range that required additional protection.

In Sturgeon Rivers. The 2020 SARBO Sturgeon PDCs provided new requirements in rivers identified as “sturgeon rivers”. Projects occurring in areas identified as sturgeon rivers in the 2020 SARBO Appendix E are required to adhere to the Sturgeon PDCs. The projects completed between FY20 and FY22 occurring within sturgeon rivers are shown in Appendix B. For certain rivers at specified times of year (labeled as “B” or “C” in Table 56 of the 2020 SARBO), cutterhead dredging requires monitoring take at upland disposal sites. No sturgeon were observed at any of the upland placement sites monitored.

In the Range of Johnson’s seagrass. Johnson’s seagrass was delisted on May 16, 2022, and is therefore no longer required to be protected under the 2020 SARBO. As coordinated with NMFS and BOEM, USACE will no longer apply Johnson’s seagrass specific requirements in the 2020 SARBO when evaluating future projects. A map of the projects completed within the range of Johnson’s seagrass (as defined in 2020 SARBO Appendix D) during this report’s review period are provided in Appendix C.

In the Range of ESA-listed corals. The projects completed within the range of ESA-listed corals (as defined in 2020 SARBO Appendix C) are provided in Appendix C.

In the Range and during the time when NARW may be present. The projects completed within the range of NARW that were conducted during the times when these whales may be present (as defined in 2020 SARBO Appendix F) are provided in Appendix B.

2.1.2.2. Projects using an equipment type that required additional reporting.

Geophysical and geotechnical surveys. Geophysical surveys conducted on USACE maintained navigation waterways are tracked on the USACE publicly available hydrographic website (https://navigation.usace.army.mil/Survey/Hydro). As described on the site, “Maintenance responsibility for more than 25,000 miles of navigation channels and 400 ports and harbors throughout the United States requires extensive surveying and mapping services, including boundary, topographic, hydrographic, terrestrial lidar, and multispectral and hyperspectral aerial imagery collection as well as airborne topographic and bathymetric lidar acquisition, project-level GIS implementation, development of file-based geodatabases, and GIS tool development.” Survey information is publicly available on this website for the areas maintained by USACE, including those covered under the 2020 SARBO. Surveys are routinely completed on areas dredged under the 2020 SARBO. As stated on the website, these surveys include those in the “National Channel Framework (NCF) - an enterprise geodatabase of information on all 61 USACE-maintained high-tonnage channels - hydrographic surveys, which provide assistance in locating navigable channels, determining dredging requirements, verifying dredging accuracy, and maintaining harbors and rivers.” Surveys completed for projects covered under the 2020 SARBO were performed in compliance with the SARBO geophysical survey PDC requirements.

BOEM continues to execute geophysical and geological surveys in accordance with required conditions outlined in a separate consultation with NMFS. This consultation was conducted as a component of BOEM’s final Environmental Assessment (EA) titled “Sand Survey Activities for BOEM’s Marine Minerals Program, Atlantic and Gulf of Mexico” (April 2019).

Bed-leveling. The USACE has considered and will continue to consider the use of bed-leveling as a risk-minimization measure for hopper dredging projects, to be used in the final stages of work when hopper dredging is difficult to accomplish due to the peaks and valleys of sediment left by dredging. Bed-leveling is used to smooth out those areas to achieve the final dredge depth. The 2020 SARBO identifies specific requirements for bed-leveling equipment. As stated in PDC LEVEL.1 in 2020 SARBO Section 3.4 of Appendix B,

> All support structures must be welded to prevent impingement or “pinch points” for passing ESA-listed species. The design analyzed in the Brunswick Harbor study is approved to meet these requirements (Dodd 2003). Any other design must be documented and photographed and submitted with the pre-construction notification and during the annual review outlined in Section 2.9 of the 2020 SARBO in order to monitor the designs used. Additional designs may be deemed acceptable during the annual review.

USACE reviewed bed-leveling designs prior to each use. On December 12, 2020, SAD denied a bed-leveler design because it did not meet the PDC requirements (see Figure 2-1) due the top and bottom of the structure being open and the potential for an animal

to be trapped in the open box. All others were substantially similar to the Brunswick Harbor study design (Figure 2-1)

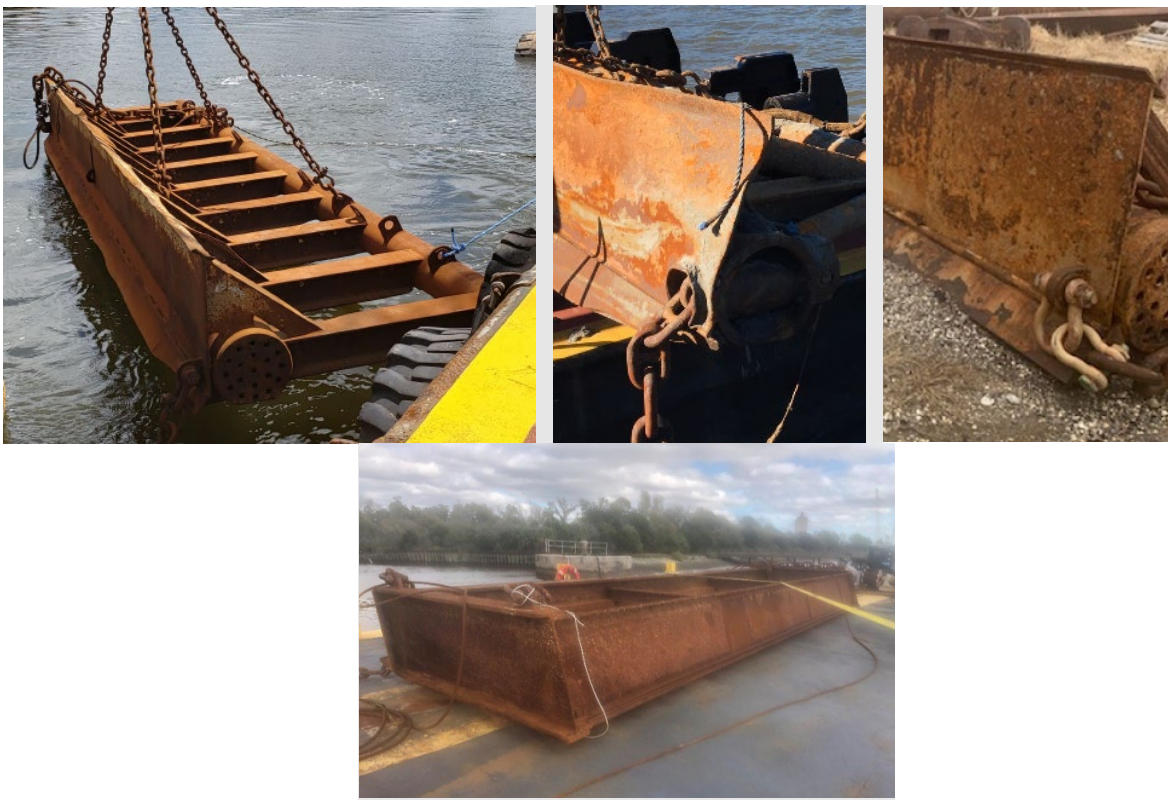

Figure 2-1. Bed-leveler design reviewed under the 2020 SARBO
Top images show the standard design approved and slight variations in attachment points. Bottom image shows the design denied by SAD multiple times..

2.1.3 Hopper dredging with modified or removed inflow screening.

Since take associated with hopper dredging can occur, as documented in the 2020 SARBO, material entering the hopper of the dredge is screened so the NMFS-approved Protected Species Observer(s) (PSO) aboard the vessel can monitor for take. This screening does not minimize or prevent take. The 2020 SARBO also analyzes the potential for take to be observed and assumes that up to half of all take may not be observed, which is evaluated when determining the effects to species populations based on the incidental take statement provided. USACE adhered to all screening requirements set forth in the 2020 SARBO, specifically including those in PDC HOPPER.1. Hopper dredge screening modifications are documented by the PSO, described in the publicly available website “Operations and Dredging Endangered Species System (ODESS),” and summarized below.

Wilmington Harbor maintenance dredging in 2021 and 2022 required a variance in draghead deflector requirements. In 2021, the request was due to rock in the area and concerns of damage to equipment; NMFS approved a supersede request on June 4,

2021. In 2022, the same issue was encountered, and NMFS approved a supersede request on May 11, 2022.

Jacksonville Harbor required increasing screen sizes due to clay and oyster shell in the area clogging screens. This was coordinated with NMFS on June 19, 2021, and screen sizing on the inflow box was increased from 4x4 inch to 8x8 inch.

The St. Lucie County Coastal Storm Risk Management Project within the South Hutchinson Island reach required the use of unexploded ordnance (UXO) screens when dredging in the new St. Lucie shoal offshore borrow area A-1 due to concerns raised about potential munitions in the area. PDC MEC.1 requires NMFS to review the use of UXO screens on the dragheads that have smaller openings to exclude explosives and therefore also reduce the probability of observing take. NMFS approved the supersede request on January 20, 2022. UXO screening also continues to be a consideration as more munitions have been found resulting in greater concerns for vessel and crew safely. USACE and BOEM will continue to work through these issues with NMFS as they arise.

Hopper dredging in Savannah Harbor in FY22 reported clogging issues. In multiple instances, clogging of the inflow screens resulted in an inability to fully observe the contents of the inflow box. However, the project operated in compliance with PDC HOPPER.1 because of the use of 100% overflow screening. This situation was closely monitored by USACE and did not warrant NMFS coordination. FY22 was the first year of dredging in Savannah Harbor since implementation of the 2020 SARBO. If clogging is observed in the same location again in future years, screen modifications may be necessary.

2.1.4 Project activities within the range of ESA-listed corals that required a survey.

All projects within the range of ESA-listed corals require a survey to determine if coral or coral hardbottom are present. Those projects for which ESA-listed corals are identified are closely coordinated with NMFS and documented on the project tracking workbook (a condensed version of this workbook is located in Appendix A).

2.1.5 Activities Requiring Relocation of ESA-listed Corals.

Only the Broward County Shore Protection Projects (Broward Segment II and Broward Segment III) required coral relocation, which was closely coordinated with NMFS.

Broward Segment II consists of four reaches. No corals were relocated in Reach 1 or Reach 3. On November 4, 2021, the coral collection in Segment II, Reach 2 was complete, and a total of 28 colonies were safely collected (27 Acropora cervicornis and 1 Orbicella faveolata) and were provided to Nova Southeastern University for relocation. On December 11, 2021, the coral collection in Segment II, Reach 4 was complete, and a total of 85 Acropora cervicornis colonies were safely collected and provided to Nova Southeastern University.

Broward Segment III consists of two sections. No corals were relocated in the first section along the shoreline of the shoreline along Dr. Von D. Mizell Eula Johnson State Park. The second section is the shoreline Dania, Hollywood, and Hallandale Beaches. A total of 44 *Acropora Cervicornis* and 2 *Orbicella Faveolata* were collected from seven sites and provided to the Nova Southeastern University Coral Nursery for research purposes in June 2022. During the survey, the contractor identified additional ESA-listed corals not previously identified located within 200ft of the ETOF. Therefore, USACE conducted an additional event which was completed February 2023. A total of 75 colonies (all *Acropora cervicornis*) were collected and provided to the University of Miami.

In total, 146 *Acropora Cervicornis* and 3 *Orbicella Faveolata* were relocated. While the determination was made to relocate ESA-listed corals within 200 ft of the ETOF based on guidance provided by NMFS, this was done in abundance of caution. These areas have been routinely nourished within the same footprint and adverse impacts were not anticipated. However, it did allow the opportunity to provide additional corals to coral nurseries to increase the genetic diversity and provide more corals to be grown for future restorations. The 2020 SARBO incidental take limit accounted for the relocation of 1,105 *Acropora Cervicornis* (staghorn corals) every 10 years and 136 *Orbicella Faveolata (*mountainous star corals) every ten years (See 2020 SARBO Table 53). The relocation trawling captures are provided in Appendix E.

2.1.6 Project Activities Located Within the Range of Johnson's Seagrass that Required a Survey.

While Johnson's seagrass was still listed, nine projects were completed within the range of Johnson's seagrass during this reporting period that required a survey, as defined in Appendix D of the 2020 SARBO. Maintenance dredging in Port Everglades included mechanical and hopper dredging in the interior of the port and hopper dredging in portions of the entrance channel. The pre-construction survey for the Port Everglades, Florida Project, which consists of widening and deepening channels and basins, identified Johnson's seagrass within the project's dredging vicinity. To minimize potential impacts to Johnson's seagrass, all 2020 SARBO PDCs were incorporated into the contract specifications, including the use of turbidity curtains as required under PDC JSG.7. There were significant issues encountered during the installation of the turbidity curtains for this project due to the currents in the area. USACE coordinated with NMFS Protected Resources Division (PRD) and Habitat Conservation Division (HCD) staff to determine an appropriate path forward. Ultimately all parties agreed that the use of turbidity curtains when dredging in the entrance channel areas was not practical. In lieu of curtains, USACE offered to conduct extensive water quality monitoring during work and after work was complete for comparison. A contract company was hired to perform the work while SAJ provided significant oversight of the project through multiple site and compliance visits. The final report and lessons learned will be used to inform future maintenance dredging in southeast Florida generally and specifically for future projects in Port Everglades. A post-construction survey was conducted in September – October 2021 to determine if losses to seagrasses occurred, and the results were provided to

NMFS. In summary, SAV beds were in the same location as were observed during the pre-construction survey. Minor differences in acreages and boundaries were observed (a total of -0.127 ac.) across the project area. Three new seagrass beds (Bed 1-0.05 ac., Bed 26A-0.01 ac. and Bed 26 B-0.01 ac.) were located within the project area. Previously identified Bed R (Bed 25) was not located during either mobilization. There was no evidence of disturbance, mechanical or otherwise, observed at any of the seagrass beds within the project area. Changes between the pre- and post-construction evaluations are potentially due to natural seasonal fluctuations that frequently occur in seagrass beds.

SECTION 3 - LESSONS LEARNED.

As required in Section 2.9.4.3, this report includes feedback on the unique situations encountered for projects covered under the 2020 SARBO and how they were resolved. The five specific topics highlighted in the 2020 SARBO under lessons learned are listed below. Feedback regarding these issues was communicated with NMFS during monthly 2020 SARBO Team Meetings or more frequently, when warranted. Lessons learned in FYs20-22 are summarized in this section by species or topic below (e.g., lessons learned implementing the NARW Conservation Plan, Coral PDCs, and Sturgeon PDCs).

1. Corrective action taken during construction of a project.
2. Information gathered during the risk-based adaptive management process including species trends and use of an area; especially if it resulted in more or less take than expected at a specific project location.
3. Lessons learned based on site-specific conditions observed during a project that may be relevant to future projects (e.g., difficulty keeping the hopper dredge drag arm firmly embedded due to site conditions).
4. A summary of successes and challenges encountered during projects conducted under the alternative review process (Section 2.9.5 of the Opinion).
5. Discrepancies observed between USACE Districts on the interpretation of PDCs to determine if a project should be covered under 2020 SARBO and the corrective action taken to resolve the inconsistency.

3.1 CORAL PDC IMPLEMENTATION.

Projects within the range of corals have required the greatest amount of coordination between USACE SAD and NMFS during the implementation of the 2020 SARBO. To date, all dredging associated with these projects has been located within state waters and did not require a BOEM action authorizing use of federal sand resources. The survey requirements and restrictions under the 2020 SARBO for routine beach nourishment projects are a significant shift from past practices and resulted in an increase in USACE workload, costs, and delayed projects. As USACE SAJ, SAD, and NMFS continue to work through this process, the expectation is that project review will become more streamlined and project completion timelines will adequately reflect the necessary coordination needed for these projects. The collaborative relationship between NMFS and USACE SAD has proven valuable and effective at handling the challenges faced while implementing the new 2020 SARBO requirements. The USACE appreciates NMFS cooperation, timely reviews, and continued discussions on how to improve the process.

3.1.1 Coral PDC Updates Requested.

USACE District staff interpreted PDCs differently in determining whether a project should be covered under 2020 SARBO, and SAD took corrective action to resolve the inconsistency. It has been challenging to identify all information that should be provided to NMFS when completing coral reviews because there is some ambiguity in the PDCs. Updating the Coral PDCs to clarify requirements has already been discussed with

NMFS, and all parties agree this is needed during the next update. Specifically, the Coral PDCs reference the 2019 NMFS *ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol*, which provides guidance on completing transect surveys. However, the 2020 SARBO requires comprehensive surveys documenting all ESA-listed coral within a specific area that the coral survey protocol does not provide. This resulted in surveys thought to meet the requirement that lacked the specificity NMFS desired. USACE appreciates NMFS working collaboratively to find solutions for these projects that meet both our missions needs and protection of coral.

3.1.2 Historic Survey Information.

Locating historic survey records proved challenging and delayed projects. USACE SAJ continues to gather this information and store it in a centralized location that is accessible to Regulatory and Civil Works staff. Information has been gathered from sources including Florida Department of Environmental Protection (FDEP), local municipalities, published studies, NMFS PRD, and NMFS HCD. In addition, the types of historic surveys completed and the format in which they were documented has been varied, leading to challenges using the data to understand where hardbottom or coral had previously been identified.

3.1.3 Improving Understanding of the ETOF.

Coastal storm risk management (beach nourishment) projects within the range of ESA-listed corals must consider the distance waterward that sand placed on the beach will settle. This is referred to as the Equilibrium Toe of Fill (ETOF). In the 2020 SARBO, beach nourishment projects within the range of ESA-listed corals must determine if coral hardbottom or corals occur within 500 feet of the ETOF. During the development of the 2020 SARBO, the expectation was that hardbottom and resources beyond the ETOF would not be buried by sand placement. However, it was determined that a better understanding of secondary turbidity and sedimentation effects to nearshore resources in these dynamic environments may need to be considered. These surveys and coordination with NMFS when resources occur within 500 feet of the ETOF allow the agencies to collaborate on protection of ESA-listed corals as our understanding of effects improves. To better understand how the ETOF is calculated, how far effects to coral or hardbottom may extend beyond the ETOF, and if corals within 500 feet of the ETOF should be relocated, numerous meetings were held between the agencies. USACE Regional Sediment Management staff provided NMFS staff training on how the ETOF is calculated and offered to continue to engage in education on this issue, as helpful.

3.1.4 Projects Within the Range of ESA-listed Corals that Required Additional Coordination.

In FY20 through FY22, 17 projects occurred within the range of corals. Of those 17 projects, 10 surveys required coordination with NMFS. USACE developed a form for SAJ to provide the necessary information for NMFS to review projects that are within the range of ESA-listed corals. This form was modified multiple times based on

feedback from SAJ Civil Works biologists, SAJ Regulatory project managers, and NMFS reviewers and will likely continue to be revised to expedite reviews. Thus far, the most effective tool has been to develop a map that includes a recent aerial image of the project area showing the beach fill template, the overlaid ETOF, and location of all hardbottom both within the fill template and at least 500 feet beyond the ETOF. Ideally, the same map or another map also shows all identified coral relative to the ETOF and the extent of fill of prior beach nourishment projects including the prior project ETOF.

3.1.4.1 Mayaguez and Arecibo Harbors, Puerto Rico.

A supersede review of both projects was initiated prior to the completion of the 2020 SARBO to use as a test case for the process. Both projects were scheduled to be completed using mechanical or cutterhead dredging in harbors with fines that exceeded the 10% sediment fines limit in PDC CORAL.5. Surveys that were completed and provided to NMFS showed that the distance from ESA-listed corals was sufficient to approve under SARBO Supersede.

3.1.4.2 Dade County Beach Erosion Control and Hurricane Protection Project, Miami-Dade County, Florida "Dade Contract D: Sunny Isles."

This beach nourishment project required SARBO Supersede review as work was scheduled to begin, but surveys had not been conducted of the nearshore environment within 500 feet of the ETOF. The review was expedited by NMFS based on records provided by the Miami-Dade County Department of Environmental Resources Management. The Department of Environmental Resources Management has conducted hardbottom resource surveys in the project area since 2008 and reports that the area is highly ephemeral. No ESA-listed species were identified in the Department of Environmental Resources Management 2020 survey, and they are confident that there are no ESA-listed species west (shoreward) of the traced habitat edge or approximately 100 feet east of the traced habitat edge. USACE delayed the project from starting by one week while NMFS completed its response to the Supersede request, which was approved on May 26, 2021. SAJ has committed to providing ample time for reviews on future projects and is considering conducting biennial coral surveys of projects that require routine beach nourishment to assure the appropriate information is timely available.

3.1.4.3 Broward Segment II and III (Broward County).

Portions of Broward Segment III were originally coordinated with NMFS in FY20 as a Regulatory project, and NMFS determined that additional surveys were required and that all *Acropora* corals within 200 feet and all Orbicella corals within 500 feet of the ETOF should be relocated or collected and provided to an approved coral nursery. In FY21 discussion resumed for work in the same area that was for a Civil Works project which was scheduled to occur first. Broward County conducted surveys in Segment II Reaches 1 and 3 and all of Segment III. The County surveys did not identify any corals requiring relocation/collection in Segment II Reaches 1 and 3 or in the Dr. Von D. Mizell-Eula Johnson State Park portion of Segment III. The County surveys did identify corals

needing to be relocated/collected in the Hollywood-Hallandale-Dania Beach portion of Segment III. USACE conducted new surveys in Broward Segment II Reaches 2 and 4 and identified ESA-listed corals requiring relocation/ collection. USACE worked closely with NMFS to determine which ones should be relocated/collected. USACE provided training to NMFS on how the ETOF was calculated along with other relevant information. Ultimately, NMFS PRD determined that all *Acropora* and *Orbicella* species within 200 feet of the ETOF should be relocated/collected. Through collaboration with NMFS and FWC, USACE partnered with coral nurseries in the area, specifically Nova Southeastern University, to ensure the corals being collected could be used in restoration projects throughout the area expanding the genetic diversity. On November 4, 2021, the coral collection in Segment II Reach 2 was complete, and a total of 28 colonies were safely collected (27 *Acropora cervicornis* and 1 *Orbicella faveolata*) and were provided to Nova Southeastern University. On December 11, 2021, the coral collection in Segment II Reach 4 was complete, and a total of 85 *Acropora cervicornis* colonies were safely collected and provided to Nova Southeastern University. Coral relocations/collections were not needed in Reach 1 and Reach 3 because beach placement only occurred above the mean high-water line. The Hollywood-Hallandale-Dania Beach (HHD) portion of Segment III had two (2) collection events. The first was completed in June 2022, and a total of 46 colonies (44 *Acropora cervicornis; two (*2) *Orbicella faveolata*) were collected and provided to Nova Southeastern University. During the first collection event, additional ESA-listed corals were observed; therefore, SAJ conducted an additional collection event, which was completed in February 2023. A total of 75 *Acropora cervicornis* were collected and provided to the University of Miami. All coral collection events in Broward Segments II and III were conducted within 200 feet of the ETOF, per coordination with NMFS and FWC. Although this coordination was complex and challenging, it represents the first project USACE and NMFS coordinated regarding coral relocation. However, it resulted in a win for corals through the partnering with coral researchers and nurseries that will ultimately benefit the overall reef while still allowing beach nourishment to occur that is needed for coastal resiliency and used by sea turtles, shorebirds, and other wildlife as well as tourists that are important to the local economy.

3.1.4.4 Palm Beach Inlet and Nearshore Placement (Palm Beach County).

The coral surveys were not completed prior to work beginning due to a miscommunication that resulted in USACE stopping work on the project on October 28, 2020. Though placement had occurred in this project location in the past, the 2020 SARBO does not allow for nearshore placement within the range of ESA-listed corals (Appendix C, Section 2.3 and PDC C-BEACH.1; App B, PDC PLACE.3). Although surveys were not conducted prior to the initiation of work, USACE provided multiple historic survey records and pointed out where this area had been considered in past consultations with NMFS. Based on this information, USACE concluded that there is at least a 500 feet (likely 750 feet) buffer between the furthest extent of the nearshore placement site to the closest documented hardbottom. USACE SAD coordinated with NMFS PRD and PRD agreed work could start again on October 29, 2020. Based on this lesson learned, USACE identified internal processes that needed to be updated to meet

the new requirements under the 2020 SARBO. USACE appreciated NMFS rapid coordination and resolution.

3.2 STURGEON PDC IMPLEMENTATION.

3.2.1 Sturgeon PDC Requirement for Upland Monitoring- Revision to PDC Requested.

Four out of five projects that required upland disposal site monitoring in South Carolina were conducted in accordance with 2020 SARBO. One project that is routinely maintained by cutterhead dredging was not monitored because the USACE dredging contract, which was modified to include this work, was prepared, and issued before the issuance of the 2020 SARBO. As a result, the upland disposal site monitoring requirements were not in the original contract. Future contract modifications will be reviewed and approved by District Planning to ensure that the monitoring requirements are included in the contract. However, based on the information provided below, USACE requests this requirement be reevaluated to determine if the current requirement is necessary and appropriate.

According the 2020 SARBO Section 3.1.1.4.2, NMFS Greater Atlantic Region reported that five shortnose sturgeon takes occurred by cutterhead dredging "…in known overwintering aggregation areas, where 'shortnose sturgeon rest on the bottom and exhibit little movement and may be slow to respond to stimuli such as an oncoming dredge' [reference omitted]." This led to a requirement to monitor upland placement sites where cutterhead dredging was used in sturgeon rivers and environmental conditions may result in sturgeon not responding to the presence of the dredge. While there are no reports of sturgeon take by cutterhead dredging in SAD, the 2020 SARBO states,

> We believe sturgeon in the Southeast exhibit similar "hunkering" behavior in certain rivers during summer months when water temperatures are high and dissolved oxygen (DO) concentrations are low, as discussed in Section 3.1.1. We believe dredging during times when water quality is poor and sturgeon are stressed, that they are at an increased risk of entrainment in cutterhead dredging, similar to what occurred in the Delaware River. To minimize this risk to sturgeon, the Sturgeon PDCs prohibit dredging in known sturgeon seasonal aggregation areas and require monitoring of cutterhead dredging outside of aggregation areas in the sections of sturgeon rivers identified as having poor water quality (identified as sections and times with the letters "B" or "C" Table 56 in the Sturgeon PDCs in Appendix E.

The requirement to monitor take within upland disposal sites seemed like a logical way to verify that the other PDCs were sufficient to protect sturgeon during the development of 2020 SARBO. However, the overall size of many of the upland disposal sites (several hundred acres), and the lack of accessibility when dredged material and water are being hydraulically pumped into these sites, make this PDC difficult to implement. Although designated observers can visually inspect existing outfall structures, this appears to

provide limited, if any, relevant information. Upland disposal sites provide habitat for large numbers of birds and other predators that would consume any evidence of take (fish parts) before they could be observed.

Sturgeon monitoring was conducted for four separate dredging events on the Cooper River during July, August, and September 2021 (a total of 26 dredging days). As described above, USACE is not aware of any juvenile or adult sturgeon being entrained by a hydraulic cutterhead dredge during maintenance dredging. Since it is highly unlikely that a sturgeon would be entrained (and even more unlikely that fish parts would be recovered near one of the existing water control structures), USACE requests that the PDC regarding monitoring upland disposal sites be reconsidered. No fish, or fish parts, of any kind were observed during the upland disposal site monitoring that was conducted during FY21. USACE believes the other PDCs are sufficient to protect sturgeon from cutterhead dredging.

The dredged material management areas on Clouter Island are used to maintain Charleston Harbor in South Carolina. As shown in Figure 3-1, the Middle Cell is relatively large (385 acres) when compared to the berth that was being dredged (3.78 acres). As a result, the total volume of dredged material (12,239 CY) was very small (an average of less than 0.2 inches of sediment) when compared to the total capacity of the dredged material management area. Assuming the dredged material was 90% water by volume, there would an average of less than two (2) inches of water (spread across the entire site). Some of the existing outfalls were surrounded by dried mud, some of the outfalls were not flowing (because the riser boards were slightly higher than other outfalls), and the outfalls that were flowing appeared to be passing clear water because the volume of dredged material was relatively small and it had rained the night before our site inspection.

Figure 3-1. Upland Disposal Area

3.2.2 Sturgeon Handling During Relocation Trawling.

In FY21, USACE discovered that a PSO company was not complying with the handling requirements of sturgeon captured on relocation trawling vessels through standard quality assurance and quality control measures during construction operations. This issue was addressed in coordination with NMFS and BOEM to develop handling protocol that complies with the intent of the PDCs while ensuring safe handling of animals under various project specific scenarios. USACE met with this company multiple times to understand their concerns with transporting sturgeon in holding tanks and the alleged harm this could cause during transport. USACE and NMFS met with sturgeon researchers to try to find an appropriate solution. Ultimately, multiple holding system suggestions that were compliant with the 2020 SARBO were provided to the PSO company and compliance was met. In FY22, USACE monitored this situation, and no further issues were observed or reported. USACE, BOEM, and NMFS continue to discuss issues, such as species handling, and are willing to adjust handling requirements in the 2020 SARBO, if deemed appropriate and necessary.

3.3 NARW CONSERVATION PLAN IMPLEMENTATION.

The NARW Conservation Plan (2020 SARBO Appendix F) outlines a suite of protective measures implemented by USACE to provide additional protections to NARW. The key components of the NARW Conservation Plan include the following:

- USACE and BOEM's commitment to schedule projects anticipated to use vessels over 33 feet in length transiting within the range of NARW when they are not present. This has been confirmed as an appropriate action in the project risk assessments completed by USACE. However, there are restrictions from other agencies that prohibit work from shifting to times when NARW are not present. Therefore, dredging of most of these projects continue to be performed during NARW calving season (15 December to 31 March).

- USACE and BOEM's commitment to implement vessel speed restrictions for vessels over 33 feet when working in areas where NARW's have been identified within 28 nautical miles. The requirements are specific to projects covered under the 2020 SARBO. Other mariners transiting these areas are required to comply with the current or future changes to the NARW Speed Rule (50 CFR 224.105). The 10-knot restriction for vessels greater than or equal to 65 feet in the NARW Speed Rule does not apply to federally funded or permitted projects because Federal agencies are required to determine the appropriate NARW risk minimization measures though the ESA Section 7 consultation process, for which USACE completed in the 2020 SARBO.

- USACE's commitment to fund arial surveys. The surveys are used to minimize the risk of all vessel strikes occurring in the southeast by allowing whale alerts to be sent to mariners alerting them of NARWs in the area.

3.3.1 NARW Surveys Conducted in the Southeast.

USACE co-funds the Early Warning System surveys and fully funds the Mid-Atlantic surveys. USACE also is the primary contributor to support the volunteer sighting network in Florida managed by Marineland, as described in detail below. All NARW sightings and survey track lines are publicly reported to www.whalemap.org, including those funded by USACE.

Early Warning System Surveys (Started mid-1980's)

- December 1- March 31
- Tybee Island, Georgia south to Cape Canaveral, Florida. Two flight teams fly a subset of the track lines daily (shown in Figure 3-2). Actual lines flown are contingent on whale distribution and the needs of USACE, U.S. Navy, and U.S. Coast Guard.
    - Georgia-based flights team funded by NMFS/Georgia Department of Natural Resources (GADNR) under an ESA Section 6 Agreement to GADNR. Performed by GADNR/Clearwater Marine Aquarium Research Institute (CMARI). Surveys flown by CMARI.
    - Florida-based team flights co-funded by USACE, U.S. Coast Guard, and U.S. Navy under a Memorandum of Agreement with NMFS. Performed under a firm-fixed-price contract awarded by NMFS after full and open competition (Contract 1305M2-20-P-NFFN-03). USACE contributes ~$175,000 annually. Performed by Clearwater Marine Aquarium in FY20-22.

Mid-Atlantic Surveys (Started 2020/2021 Calving Season)

- November 15 - April 15
- Tybee Island, Georgia north to North Carolina/Virginia border. Two flight teams fly a subset of the track lines daily (shown in Figure 3-2). Actual lines flown are contingent on whale distribution and to assure coverage of USACE projects completed in the area.
- Fully funded (~$1,500,000 annually) and overseen by USACE
- Historically, surveys were performed by Clearwater Marine Aquarium, contracted by Ho'Olaulima Government Solutions, LLC

Marineland Right Whale Project

- Volunteer Sighting Network from St. Augustine to Ponce de Leon Inlet (~ 50 nmi)
- Provide public outreach and education.
- USACE contributes ~$27,500 annually, which is ~65% of the total operating costs and the rest is provided by donors.

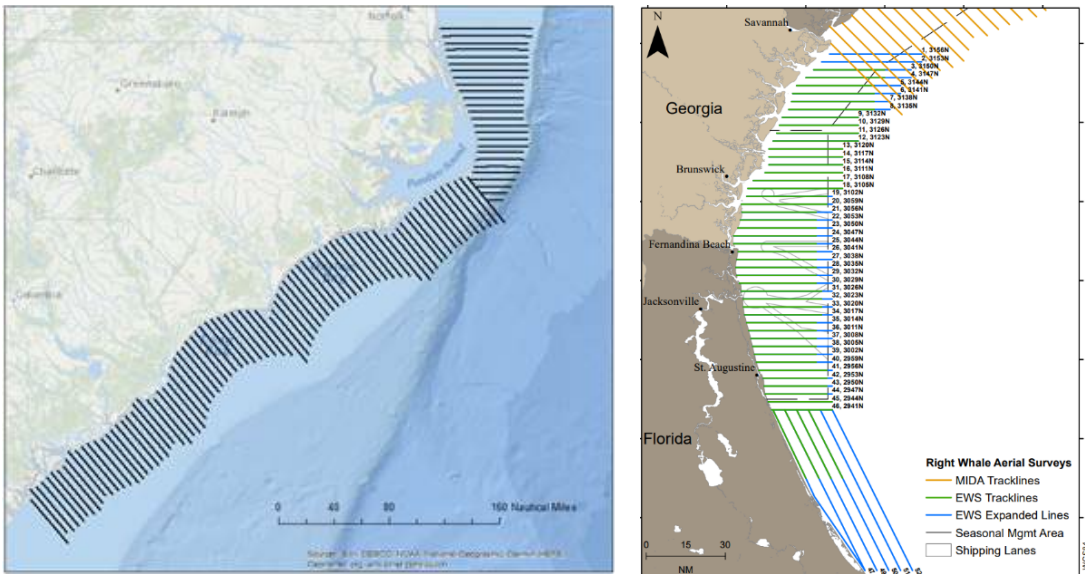

Figure 3-2. NARW Early Warning System Survey Tracklines.
The left image shows the Early Warning System flights in Georgia and Florida and the right image shows the Mid-Atlantic surveys in North Carolina and South Carolina.

3.3.2 NARW Mid-Atlantic Survey Implementation.

Prior to the 2020 SARBO, aerial surveys were not routinely occurring in North and South Carolina where NARW migrate through each season to the calving areas. Identifying whales in these areas was determined to be vital to understanding when they are likely in the area to provide sighting alerts that would reduce the risk of vessel strikes from both vessels operating under the 2020 SARBO and by other mariners. Implementing the first year of NARW aerial surveys for 2020/2021 NARW calving season was delayed due to contracting issues and did not begin until December 22, 2020. However, contracting issues were resolved and aerial surveys started on time for the 2021/2022 NARW calving season.

NARWs observed are reported to the “Whale Alert” system to alert mariners of whale presence in an area to reduce the risk of vessel strikes. Observations are also reported to the public website WhaleMap.org within approximately 24 hours of the observation by the Whale Alert system. Each NARW identified is photographed so it can be identified and catalogued. This information is also important to NARW research and supports ongoing NMFS recovery plan objectives. After each calving season, a report is completed by the survey team that summarizes their observations, and a copy of the report is provided to NMFS. USACE also continues to present survey data at the NARW Southeast Implementation Team meetings, North Atlantic Right Whale Consortium Meeting, and other forums.

During this period, two NARW and calves were only sighted by the North Carolina aerial surveys and would not otherwise have been reported (Catalog #3593 with 2021 calf and Catalog #4180 with 2022 calf). In addition, three NARW and calves were first sighted by South Carolina aerial surveys, which allowed monitoring of these calves sooner in the

season (Catalog #1245, #2753, & #3220 with their 2022 calves). Sightings in January 2022 in North Carolina also led to NMFS enacting a Voluntary Dynamic Management Area[2].

In total, researchers identified 10 NARW calves during calving season 2020/2021 listed as calving year 2020; 20 calves (19 live) in 2021; and 15 calves in 2022 (Figure 3-3)[3]. The 20 calves born in 2021 are remarkable since only 22 births were observed during the previous four calving seasons combined. However, NMFS has stated,

> With the current number of females and the necessary resting time between births, 20 newborns in a calving season would be considered a relatively productive year. However, given the estimated rate of human-caused mortality and serious injury, we need approximately 50 or more calves per year for many years to stop the decline and allow for recovery. The only solution is to significantly reduce human-caused mortality and injuries, as well as stressors on reproduction[4].

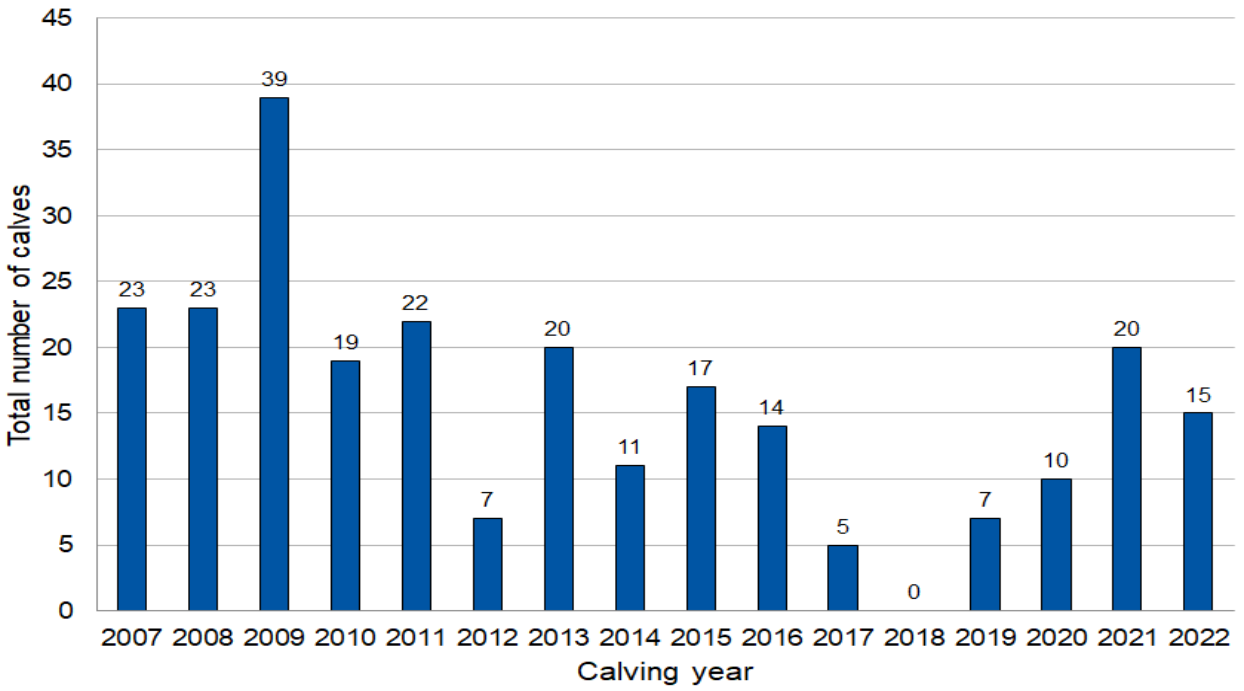

Figure 3-3. The number of NARW births each "calving year" in past years. NARWs typically calve between mid-November and mid-April. Credit: NOAA Fisheries[5].

[2] Vessels receive notifications through the U.S. Coast Guard radio and National Weather Service announcements. From Maine to Virginia, Right Whale Slow Zones are shown online at www.whalemap.org or viewable on the NMFS Whale Alert app, which will automatically notify mariners when they enter one of these areas.

[3] https://www.fisheries.noaa.gov/national/endangered-species-conservation/north-atlantic-right-whale-calving-season-2023.

[4] Provided by email from Barb Zoodsma to Nicole Bonine on March 23, 2022.

[5] https://www.fisheries.noaa.gov/national/endangered-species-conservation/north-atlantic-right-whale-calving-season-2023.

3.3.3 Partnering to Protect NARW.

USACE also coordinates with other federal partners and stakeholders involved in NARW surveys and conservation to assure information about this critically endangered species is relayed to the public through social media outreach.

USACE worked closely with researchers to ensure information gathered could be used in real time research. For example, a NARW acoustically identified by a buoy deployed by the Woods Hole Oceanographic Institution's Mooring Operations and Engineering Group and information relayed by Duke University to the North Carolina aerial survey team funded by USACE was visually identified within six hours of acoustic detection. This confirmation resulted in identification of the whale along with four others observed six miles from the acoustic buoy. Another example of collaboration is the repeated detection of the NARW carcass off North Carolina (named Cottontail) that died due to long term entanglement. This whale was actively predated by great white sharks and knowing its location over time helped researchers studying this unique situation.

3.3.4 SARBO Projects Within the Range of NARW.

No NARW were injured during projects covered during this reporting period. A list of dredging projects that observed and notified Whale Alert of a whale within the area are listed below in Table 3-1. All NARW sightings in FY21 are shown in Figure 5 and those in FY22 are shown in Figure 6, demonstrating the density of this species in areas like Brunswick Harbor and highlighting the concern of work occurring concurrent with NARW present during calving season and, therefore, at risk of vessel strikes from vessels working on these projects. For example, working in Brunswick Harbor in FY22 resulted in vessels during more than half of the dredge days being required to slow to 10 knots to adhere to the speed restrictions in the NARW Conservation Plan because whales were present in the area (~16 out of 31 dredge days). By comparison, dredging vessels during about one-fifth (1/5) of the dredging time in Savannah were required to slow, indicating fewer whales were present when that dredging was performed (~3 out of 15 days). One such sighting was reported by a PSO aboard one of the hopper dredges for Brunswick Harbor. In this instance, the PSO spotted a mother and calf by their ‘blow,’ ~500 yards from the dredge as it was entering into the Ocean Dredged Material Disposal Site (ODMDS). The dredge was already under a 10-knot speed restriction from a sighting earlier that day. While the aerial surveys are important to detect when whales may be in the area and the PSOs are important to watch for them, NARWs are hard to spot even in good conditions, and the numerous sightings in and around dredging projects is of concern to USACE. USACE continues to work through environmental compliance documentation requirements to allow work to be shifted outside of times when this species is most present to reduce the risk of vessel strikes, as also documented in the Regional Harbor Dredge Contract (RHDC) Risk Assessments for FY22 and FY23.

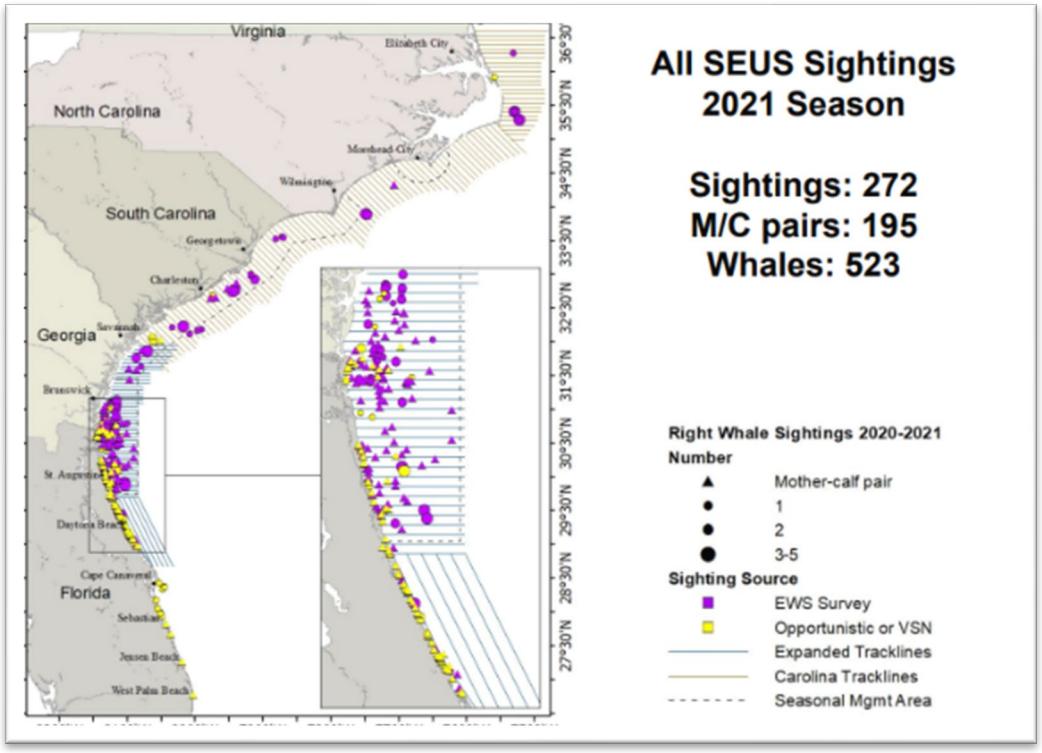

Figure 3-4. NARW Sightings in FY21

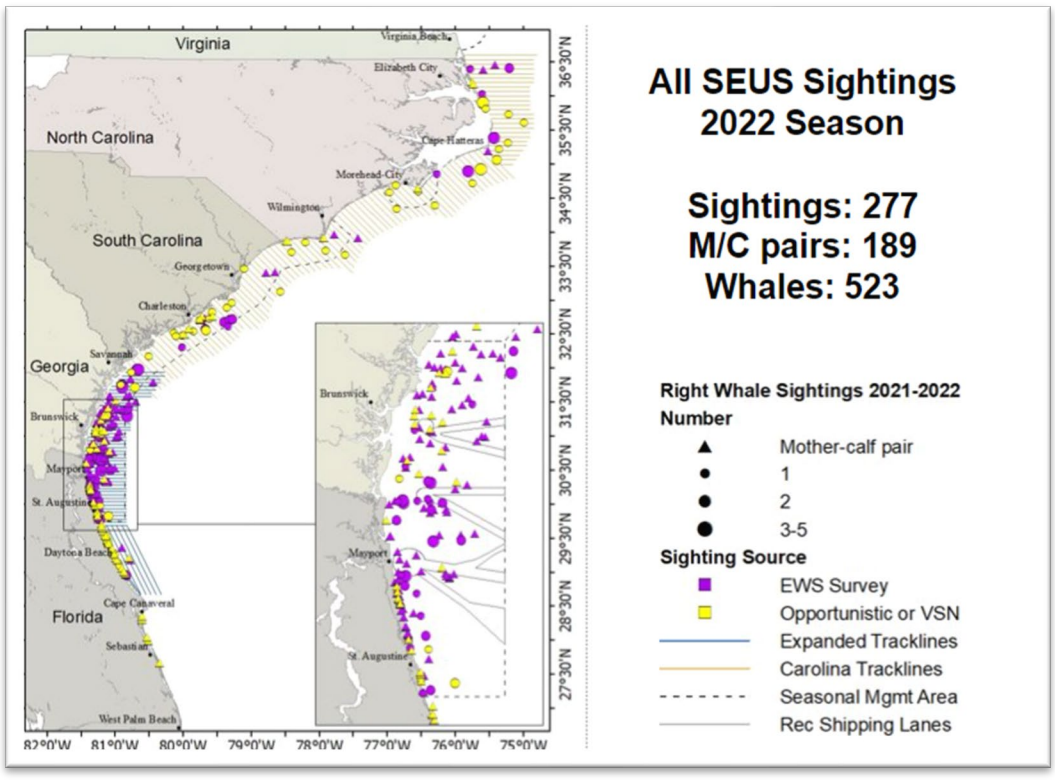

Figure 3-5. NARW Sightings in FY22

Table 3-1. NARW Sightings Reported by Dredging Staff or PSO[6]

Project	Vessel	Date	Time	Location Latitude	Location Longitude	Notes
Brevard County, FL	Stuyvesant	2/15/21	0735-0741	28.375	-80.4567	1 calf, ~800 ft away. fin flapping, blowing, partial breach
Brevard County, FL	Stuyvesant	3/12/21	1755	28.425	-80.5317	1 whale spotted at dredge site, ~740 ft. Multiple tail slap, rolling, pec waves, and head breaches. Surface intervals- 2 minutes.
Brevard County, FL	Stuyvesant	3/12/21	1215	28.1733	-80.5717	1 adult
NA-Transiting to a SARBO Project		12/29/21	1305	35.2217	-75.3566	Spotted by dredge crew enroute to Savannah. No PSO abord while in transit between projects.
Brunswick Harbor, GA	Dodge Island	2/9/22	1715	31.031	81.173	Mother/calf pair spotted by blows and blow holes, ~500 yards. Surfaced multiple times in the same location and didn't appear to be moving. Same pair sighted again at 1820 hours in the same location.
Brunswick Harbor, GA	Dodge Island	2/9/22	1820	31.028	81.176	

3.3.5 Whale Alerts.

The NARW Sightings are sent to mariners, to include USACE vessels and contractor vessels, through Whale Alerts based on the aerial survey sightings, volunteer sightings, and those reported from the public. NMFS coordinates Whale Alerts with Florida Fish & Wildlife Conservation Commission. USACE worked with these agencies to offer suggestions to streamline the system and to address technical issues encountered.

During the FY21 calving season, several concerns were identified with the whale alert and reporting system. USACE worked closely with NMFS, FWC, and Clearwater Marine Aquarium to resolve the concerns. For example, the whale alerts are challenging to decode and respond to quickly, so USACE requested NMFS consider providing the information in a clearer format. NMFS invested significant time in adding and removing persons in the whale alert system, so USACE helped streamline the process by setting up internal mail distributions and requesting that contractors do the same, thus ensuring the correct staff received alerts for specific projects and could quickly respond to them. USACE staff noticed that whale sightings on the whale map app (https://whalemap.org/WhaleMap) do not always match the alerts that had been received. A factor seems to be that NARW sightings by outside entities are not always reported as alerts if the report is not timely enough or cannot be confirmed. It was also noticed that Whale Alerts sent to certain phone providers were either delayed or not

[6] This list does not include other sightings that occurred in FY20 prior to the completion of the 2020 SARBO or sightings from projects not covered under the 2020 SARBO.

received. In addition, alerts of whales in the area that are dead do not necessitate an action by vessels. USACE continues to work with the Whale Alert system to assure notifications are provided to USACE so that appropriate actions can be taken in a timely manner.

3.3.5.1 South Amelia Island.

The South Amelia Island project took longer than expected to complete and ended up with some work in the NARW calving season. The contractor did not originally expect to work during NARW calving season, so it was not tracking the NARW Conservation Plan requirements. USACE contacted the contractor as soon as the surveys observed NARW entering the area and informed the contractor of the PDCs and the need to sign up for alerts. A lesson learned was to ensure constant tracking of all projects working in migration area and ensure all contractors are signed up to receive alerts.

3.3.6 Automatic Identification System.

The NARW Conservation Plan states that all project vessels will carry operational Automatic Identification System transmitters, and NMFS will be provided the vessel name and vessel tracking number (maritime mobile service identities). Furthermore, vessel tracking numbers will be recorded in ODESS and emailed to NMFS for all vessels over 33 feet in length operating from the Virginia/North Carolina border south to Cape Canaveral, Florida, during the NARW migration and calving season (November 1 through April 30). It proved challenging to provide this information on an individual project basis because companies working on these projects often switch vessels between projects. To resolve this issue, USACE provided NMFS a list of USACE survey vessels, modified hoppers, and vessels used by other companies on projects covered under the 2020 SARBO. A system is being developed that can monitor those vessels relative to specified project areas so that the information can more easily be monitored. USACE continues to work closely with contractors and USACE vessel operators to stress the importance of adherence to these speed restrictions to be compliant with the 2020 SARBO and to protect this critically endangered species.

3.3.7 Vessel Speed Requirements.

The new speed restrictions outlined in the NARW Conservation Plan apply to vessels not previously tracked, which led to confusion about how, when, and where to implement the conditions. Aerial surveys began in North and South Carolina on December 22, 2021, and on December 29, 2021, two support vessels working in Charleston Harbor were determined to be non-compliant. USACE immediately alerted the company overseeing the project to ensure vessels followed these important requirements and reported the incident to NMFS. Three other incidents occurred where a vessel was determined to be non-compliant, and corrective actions were taken. These smaller vessels (33 feet to 65 feet) have not previously been required to adhere to any speed restrictions, and contractors and vessel operators did not understand that the NARW Conservation Plan applied to them. USACE continues to stress this requirement and provides information to contractors and USACE operators to highlight the speed

restrictions that must be followed. Information that has been and continues to be clarified includes the following:

- Northern and southern limits. Virginia/North Carolina border south to Cape Canaveral, Florida.

- Shoreline/waterward limit. COLREGS Demarcation Line, which is generally the shoreline but also includes areas inside of jetties even if they extend waterward of the shoreline.

- Timeframe. The NARW Conservation Plan applies from November 1 through April 30; however, the EWS aerial surveys are completed from December 1 to March 31, and the Mid-Atlantic surveys are completed from November 15 to April 15.

- When requirements apply to USACE vs non-USACE owned and operated vessels. Vessels contracted to work on USACE-funded or permitted projects covered under the 2020 SARBO are required to adhere to the NARW Conservation Plan. However, the 2020 SARBO requirements only apply once the vessel arrives at the project site and is working on the project, not when transiting to or from a project that is covered. When transiting to or from the project, the vessel is required to adhere to any other federally mandated NARW protections (for example, 50 CFR 224.105). USACE owned and operated vessels shall adhere to the NARW Conservation Plan throughout the geographic range and during the specified period (e.g., survey vessels surveying a USACE-maintained navigation channel, which is not actively being dredged, to determine the condition of the channel).

- Which Seasonal Management Areas (SMAs) require additional Requirements. As set forth in Table 58, the NARW Conservation Plan requires vessels 33 to 65 feet in length to slow to 10 knots for different amounts of time depending on whether the vessel is within or outside of the SMA. The NARW Conservation Plan specifically lists the Calving and Nursery Grounds located from approximately Sapelo Island in Georgia (latitude 31º27'N) south to Matanzas Inlet in Florida (latitude 29º45'N) and east to longitude 080º51'36"W. This SMA applies from November 15 - April 15. Other current or proposed SMAs do not require an additional restriction. This is consistent with the NARW Conservation Plan since the Calving and Nursery Ground SMA covers the areas where NARW are present for longer periods for calving, and other SMAs are identified for whales migrating through an area that is surveyed with these other SMAs having applicable speed restrictions when whales are sighted in the area.

3.4 GEOPHYSICAL SURVEY PDC IMPLEMENTATION.

In furtherance of the policy set forth in Executive Order 13795, “Implementing an America-First Offshore Energy Strategy,” NMFS and BOEM assembled a team to consider which active acoustic sources may or may not result in incidental take of marine mammals. Since 2019, a group of technical experts from United States Geological Survey (USGS), BOEM, and National Oceanic and Atmospheric

Administration (NOAA) Center for Coastal and Ocean Mapping has completed a thorough analysis of active acoustic sources, ranging from seismic airguns to multibeam echosounders to sub-bottom profilers. The analysis indicates that most sources used in high resolution geophysical surveys (including those analyzed in the 2020 SARBO) can be deemed to result in de minimus effects (i.e., unable to result in incidental take of marine mammals, would not require consultation with NMFS under the Marine Mammal Protection Act of 1972, and would be considered not likely to adversely affect under the ESA). As of October 21, 2021, the team submitted its analysis for peer review. NMFS is in the process of writing a policy that will address whether NMFS concurs with the findings of the paper, and NMFS is finalizing relevant mitigation protocols. BOEM is preparing a technical briefing for NMFS staff that will summarize the findings and then present the findings to the SARBO team. These findings are expected to demonstrate that the acoustic effects to species are less than were evaluated in the 2020 SARBO and may warrant changes to certain SARBO PDCs.

3.5 PSO PDC IMPLEMENTATION.

3.5.1 Determining Recovered Dead versus Take.

The PSO is responsible for examining the condition of each specimen and using the PSO PDCs to determine whether a sea turtle or Atlantic sturgeon is considered a lethal take. Since the PSOs are approved by NMFS to be qualified to serve in this position and are experts in the field, USACE and BOEM do not question NMFS's determination. If the PSO is unsure or the information reported is unclear, another expert must be consulted, typically the state sea turtle coordinator or Atlantic sturgeon expert. If the specimen is provided to the state sea turtle coordinator or any other expert in the field who then questions the determination, the NOAA veterinarian should be consulted for the final determination. All take is reported to NMFS, and NMFS reserves the right to question all determinations regarding whether a specific take is counted as lethal take or recovered dead. For example, a loggerhead sea turtle observed while hopper dredging on May 22, 2021, at Oak Island was determined to be "recovered dead" - meaning that it was already decomposed and would not be counted as lethal take by the PSO. The remains were provided to the state sea turtle coordinator who questioned the determination and contacted the NOAA veterinarian. Based on the NOAA veterinarian's evaluation, the specimen was determined to be fresh dead and counted as a lethal take covered by the 2020 SARBO. Species recovered dead and not counted as take are documented in Table 3-2.

Table 3-2. Reported Observed Hopper Dredging Captures Not Counted as Take under the 2020 SARBO

Date	Project	Species	Notes
6/14/2020	Morehead City Harbor	Loggerhead	Severely decomposed; therefore, not a take and entered in ODESS as an incident.
5/3/2020	Wilmington Harbor	Loggerhead	Moderately Decomposed; therefore, not a take and entered in ODESS as an incident.
5/4/2020	Wilmington Harbor	Leatherback	Moderately Decomposed; therefore, not a take and entered in ODESS as an incident. Believed to be pieces of leatherback lethal take previous day.
3/4/2021	Kings Bay	Loggerhead sea turtle	Moderately Decomposed; therefore, not a take and entered in ODESS as an incident. Two pieces that fit together counted as one animal.
3/11/2021	Kings Bay	Loggerhead sea turtle	
3/14/2021	Kings Bay	Kemp's ridley sea turtle	Live hopper capture, rehabilitated and released on August 24, 2021. Initially recorded as lethal take and revised to non-lethal take once released.
3/15/2021	Kings Bay	Atlantic sturgeon	Moderately Decomposed; therefore, not a take and entered in ODESS as an incident.
3/17/2021	Bogue Banks	Kemp's ridley sea turtle	Live hopper capture, rehabilitated and released on July 7, 2021. Initially recorded as lethal take and revised to non-lethal take once released.
4/6/2021	Bogue Banks	Kemp's ridley sea turtle	Live hopper capture, rehabilitated and released on July 7, 2021. Initially recorded as lethal take and revised to non-lethal take once released.
1/30/2022	Brunswick Harbor	Kemp's ridley sea turtle	Moderately Decomposed; therefore, not a take and entered in ODESS as an incident.
2/7/22 to 4/12/22	Palm Beach	species unknown	27 loads recovered fragments of sea turtle skeletons.
2/17/2022	Brunswick Harbor	Kemp's ridley sea turtle	Moderately Decomposed; therefore, not a take and entered in ODESS as an incident.
3/25/2022	Kings Bay	Kemp's ridley sea turtle	Moderately Decomposed; therefore, not a take and entered in ODESS as an incident.
3/26/2022	Holden Beach, NC	Loggerhead	Moderately decomposed.
4/3/2022	Charleston Harbor	Kemp's ridley sea turtle	Moderately Decomposed; therefore, not a take and entered in ODESS as an incident.
4/19/2022	Wilmington Harbor	Loggerhead sea turtle	Moderately Decomposed; therefore, not a take and entered in ODESS as an incident.

3.5.2 Atlantic Sturgeon Genetic Testing and Distinct Population Segment (DPS) Composition.

USACE hired the Engineer Research and Development Center (ERDC) to perform the genetic testing of Atlantic Sturgeon samples to determine the DPS. This new process required coordination with NMFS and USGS. USACE developed an internal protocol to handle the genetic samples. Starting in FY21, due to concerns about samples being lost in the mail, all genetic samples collected are divided and only one set is mailed at a time to ensure that the other set is available for testing if there are any issues. As required by the 2020 SARBO, a portion of each sample is also provided to USGS to be maintained in the national genetic sample repository.

There are five DPSs and Section 8.5 of the 2020 SARBO estimated the percent of each sturgeon likely to be encountered annually on projects under 2020 SARBO (Table 3-3). Atlantic sturgeon genetic samples collected during hopper dredging and relocation trawling are processed to determine the DPS of each fish captured. Since the percent composition of each DPS that may be encountered was the first estimate provided by NMFS using updated data, the genetic analysis completed by USACE is intended to help verify information on the DPSs. Though the composition of DPSs differs from NMFS estimates in the 2020 SARBO, the composition is expected to vary from year to year based on the location and timing of projects, and the Incidental Take was provided by DPS on a three-year average for this reason. The Atlantic sturgeon captured during hopper dredging are documented in Appendix D and those captured during relocation trawling are documented in Appendix E.

Table 3-3. Atlantic Sturgeon Percent Composition of DPSs Encountered

Atlantic Sturgeon DPS	% DPS Composition Estimated in SARBO	FY21 Captures (lethal)	FY21 Captures (non-lethal)	FY22 Captures (lethal)	FY22 Captures (non-lethal)	Total Captures	% DPS Composition of Captures
South Atlantic (SA)	52.90%	4	31	6	27	68	65%
Carolina	33.80%	0	4	1	13	18	17%
Chesapeake Bay	9.60%	0	3	0		3	3%
New York Bight	3.60%	0	3	0	0	3	3%
Gulf of Maine	0.10%	0	0	0	0	0	0%
Canadian Rivers	Not estimated- No take required for foreign fish	0	1	0	0	1	1%
DPS Unknown	0	0	8	2	2	12	11%
Total		4	50	9	42	105	100%

In FY21, one fish was captured at Bogue Banks that was determined to be from Canada and not protected under the ESA according to NMFS. Therefore, this capture did not count as a take. USGS also helped confirm the Atlantic sturgeon captured at Bogue Banks was from Canada. As USGS noted, sturgeon are capable of very long-distance migrations, but this is the first evidence USGS has seen of a fish traveling south of Cape Hatteras. NMFS and USGS agree that the genetic information is adding to the understanding of Atlantic sturgeon.

The genetic information also can be used to determine if the tissues from different samples submitted at the same time are likely to belong to a single fish, based on the microsatellite data (identical genotype, where alleles are the same across all 12 loci). In FY21, two samples were taken of two pieces collected on the same load on March 15, 2021, while hopper dredging at Kings Bay. They were assumed to be the same fish for take reported and later genetics confirmed the two pieces to be the same fish. In FY22, three sturgeon pieces were collected while hopper dredging at Kings Bay that were assumed to be the same fish, but initially counted as three separate lethal takes. These included a head collected in load 29 on February 18, 2022. Then the middle section was collected in load 31 and the tail section in load 34, both on February 19, 2022. Later, genetics determined the three samples were the same fish and the three lethal take was revised to reflect one lethal take. Only the first piece collected in load 29 is reported in Appendix D. In FY21, eight fish were not able to have genetic samples taken and therefore the DPS is unknown. When multiple fish are collected in the same tow or it is determined the safety of the fish or crew does not allow the sample to be taken, the PSO is able to forgo sampling. In FY22, another three fish samples were not submitted and therefore the DPS was not able to be determined.

☑ All pit tags information for Atlantic sturgeon tagged or recaptured during hopper dredging or trawling were submitted to the U.S. Fish and Wildlife Service national database. This allows researchers to know when tagged fish are recaptured and the size and location of the fish for each capture. USACE submitted the tag numbers for work completed during this reporting period and awaits the results.

☑ In addition to the Atlantic sturgeon genetic samples collected on projects covered under the 2020 SARBO, USACE proactively also processed all genetic samples from the Charleston Harbor deepening project (often referred to as Post-45) to ensure that the sampling process was functioning properly and to improve our understanding of Atlantic sturgeon in the southeast. This information was also shared with NMFS and USGS for their records.

3.6 SARBO RISK ASSESSMENT/ PROJECT ASSESSMENT IMPLEMENTATION.

Perhaps the biggest lesson learned in implementing the 2020 SARBO was how to gather data clearly and effectively on projects, species, and lessons learned and document decisions concisely that meet the expectations of and needs of USACE staff, other agencies involved, and stakeholders. As discussed throughout this report, USACE reporting evolved as the 2020 SARBO was implemented allowing project and take information to be documented in spreadsheets that could be routinely shared with

NMFS and used to update publicly available resources to meet stakeholders needs. USACE continues to work to update websites and databases to provide more information publicly.

Initially, USACE evaluated risks related to project completion on an individual project basis. These project-specific assessments were informally documented for USACE internal reference, as agreed to by NMFS. Due to the majority of take being associated with larger harbor maintenance projects that are completed by hopper dredging, USACE SAD began completing a formal risk assessment for those projects covered each year under the RHDC, starting for work anticipated in FY22 (RHDC 5.0) and again for work anticipated in FY23 (RHDC 6.0). For FY23, all projects were reviewed as part of a comprehensive regional risk assessment that USACE SAD documented in the "U.S. Army Corps of Engineers, South Atlantic Division FY23 and FY24 SARBO Project Assessment Recommendations for Projects Covered under the 2020 SARBO".

Generally, the risk assessment process required in 2020 SARBO created significant confusion for stakeholders and partners. This is likely due to the generic use of the term "risk assessment" and preconceived expectations associated with it. To alleviate this confusion, the RHDC risk assessment for FY23 documented the steps considered in a generic risk assessment and compared them to those required in 2020 SARBO. This information was also presented to stakeholders in October 2022 and is being incorporated into future documents. Going forward, USACE will use a different term when referring to the risk assessment documentation outlined in the 2020 SARBO by calling it the "SARBO Project Assessment" instead of a risk assessment.

3.6.1 Sea Turtle Density and Probability of Take.

Review of prior project and take data shows that areas with high densities of sea turtles may not result in high take depending on the time of year and likely way turtles are using the area. For example, sea turtle nesting areas or migratory areas are assumed to be areas of higher density of animals, so USACE considered if areas of loggerhead sea turtle's critical habitat (79 FR 39855) designated for nesting beaches (nearshore reproductive habitat), breeding areas, and migratory pathways would have a higher risk of lethal take by hopper dredging. Waters off the outer banks of North Carolina are designated as a constricted migratory pathway for loggerhead sea turtles migrating to northern foraging grounds in summer months and back in the fall and an overwintering site south of Cape Hatteras. Both key areas demonstrate abundance of sea turtles in waters off the North Carolina coast yet work completed in these areas during high abundance in 2022 resulted in a decrease in lethal take by hopper dredging.

Figure 7 shows all FY22 hopper dredging lethal take observed and relocation trawling captures for projects covered under 2020 SARBO. While the majority of lethal take by hopper dredging and relocation of sea turtles occurred in March, work continued in North Carolina in navigation channels and along beaches in areas with a high density of turtles, as evident by the number of relocation trawling captures. However, lethal take by hopper dredging virtually stopped. In North Carolina, Holden Beach hopper dredging resulted in four sea turtle lethal takes (three Kemp's ridley and one loggerhead) in

March and April while other similar beach projects using hopper dredging later in the year were completed with no take. Similarly, dredging in Wilmington Harbor in March resulted in two lethal sea turtle takes, and work that resumed in May did not result in lethal take. The relocation trawling records confirm that sea turtles, including Kemp's ridley sea turtles captured in record numbers in FY22 earlier in the year, remained in the areas where hopper dredging was occurring without lethal take. While the reasoning for the drop in take later in the year is not clearly understood, it does demonstrate that turtle presence is not the only factor that leads to take, and working outside historic cold weather timeframes may lead to equal or less take occurring because turtles are using the area differently or behaving in a way that decreases the probability of lethal take by the dragheads located at the sea floor. This also has been observed at other projects where colder timeframes resulted in higher turtle take by hopper dredging compared to warmer timeframes for the same projects or where hopper dredging occurred in areas with a high density of turtles yet minimal to no take occurred.

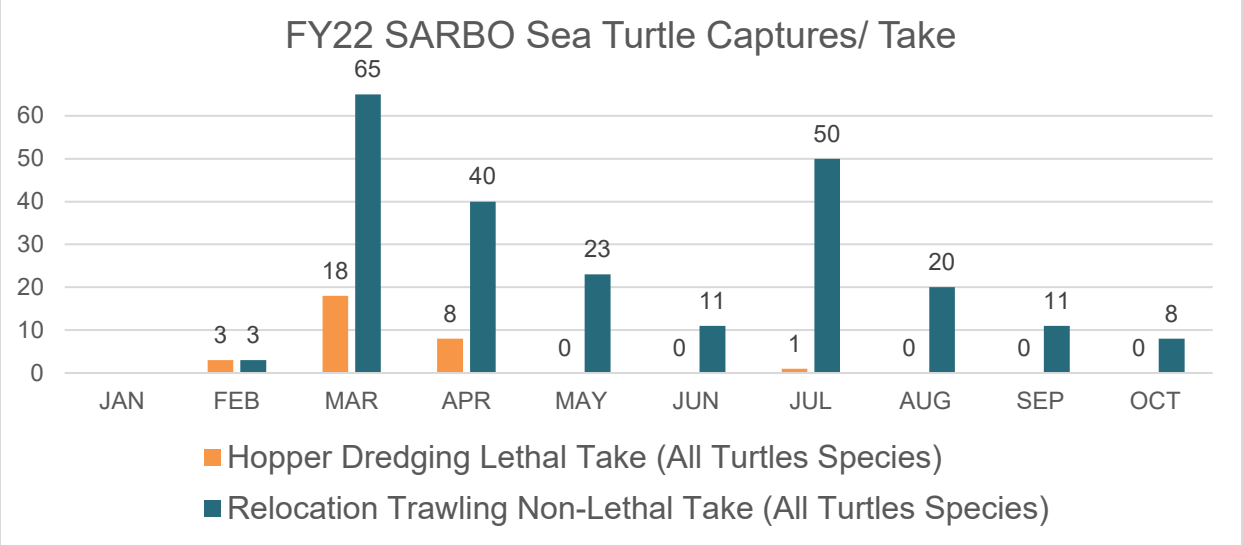

Figure 3-6. Sea Turtles Captured during Hopper Dredging and Relocation Trawling under 2020 SARBO in FY22

3.6.2 Sea Turtle Species Composition.

A comparison by species of hopper dredging lethal take in FY22 under the 2020 SARBO showed that take of the endangered Atlantic sturgeon was higher than take of either the threatened green or loggerhead sea turtles. FY22 also resulted in a historic number of Kemp's ridley sea turtle lethal take. All lethal take remained within the ITS provided in the 2020 SARBO.

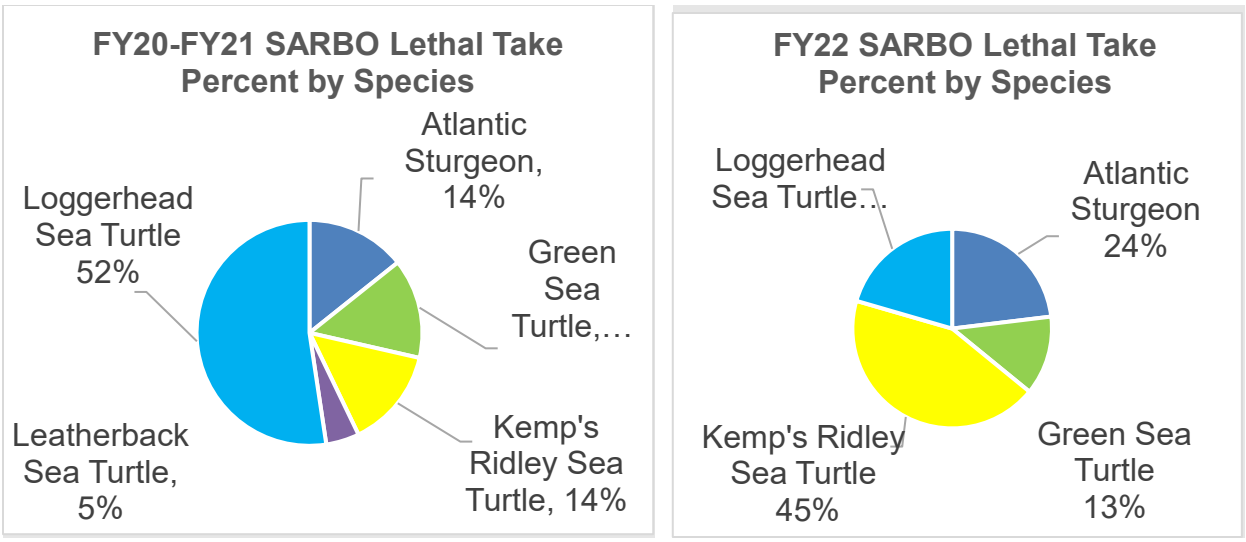

Figure 3-7. Hopper Dredging Lethal Take Showing Percent of Each Species

3.6.3 Leatherback Capture.

One leatherback sea turtle lethal take occurred during hopper dredging in Wilmington Harbor in FY20. The 2020 SARBO did not provide lethal take for this species based on the assumption that it was not at risk from hopper dredging as no prior reports of a leatherback take by hopper dredging had been identified. USACE coordinated with NMFS after this take and determined that reinitiation of consultation was not required due to the rarity of this event.

3.6.4 NARW Sightings and Probability of Encounter.

The NARW Conservation Plan states that the USACE and BOEM (as appropriate) will implement the plan within the Atlantic coastal action area extending from the Virginia/North Carolina border south to Cape Canaveral, Florida, during the NARW migration and calving season from November 1 to April 30. However, aerial survey coverage from Brunswick, Georgia through North Carolina is only required from November 15 through April 15, and NARW Early Warning System surveys are conducted from December 1 to March 31. Based on available data from the beginning of calving season in 2018 (November 1, 2018) to the end of calving season in 2022 (April 30, 2022) from North Carolina to Florida (2020 SARBO action area), sightings are rare after March 15 (Figure 9). Only two sightings have been recorded in April and both were in North Carolina in early April as whales migrated back north (April 6, 2020, and April 4, 2022). Based on this information, USACE concludes the risk of encountering NARW after April 1 is very low, which has been supported in conversations with NMFS staff other organizations involved in NARW protection.

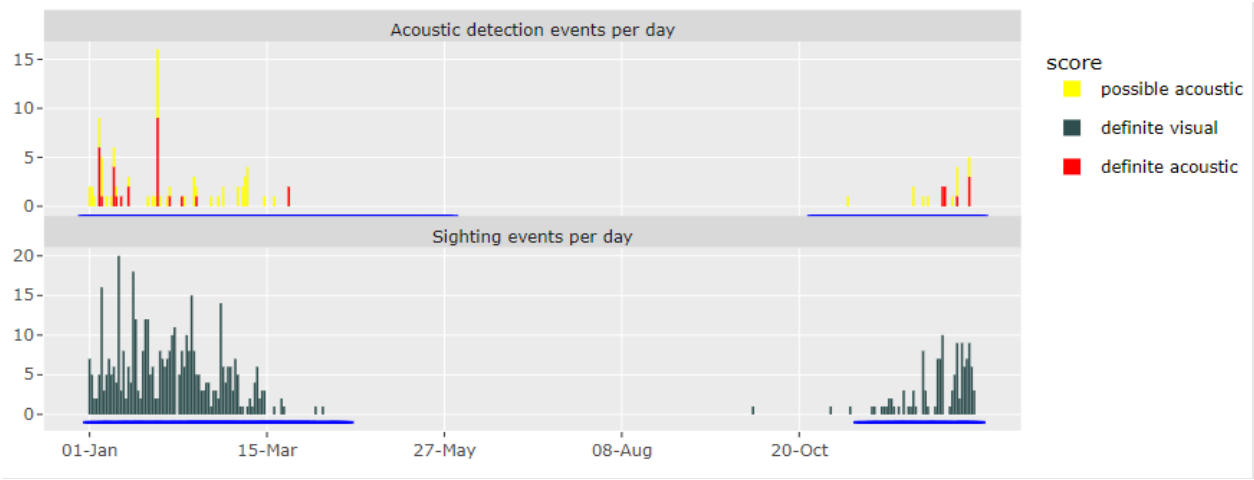

Figure 3-8. NARW sightings from 1 November 2018 to April 30, 2022.
This figure shows acoustic and visual sightings along the east coast of North Carolina, South Carolina, Georgia, and Florida. The blue line at the bottom of each table indicates days with survey effort. Map from https://whalemap.org.

3.6.5 Concentration of Take at a Limited Number of Projects.

It is of interest to USACE that the most significant number and percent of lethal hopper dredging take is limited to the same few projects covered under 2020 SARBO, as analyzed in the "U.S. Army Corps of Engineers, South Atlantic Division Documentation of SARBO Project Assessment for Dredging and Material Placement in Fiscal Year 2023, Fiscal Year 2024, and Subsequent Fiscal Years" that was singed June 2023. Table 5 of the assessment documented the take occurring on SARBO projects from 2010 to 2022 and showed that Savannah Harbor, Brunswick Harbor, Kings Bay, Jacksonville Harbor, and Mayport accounted for 54% of all sea turtle take and 90% of all sturgeon take. These projects all occur within a limited range of coastline covered under the 2020 SARBO. They have all had timing restrictions to protect sea turtles that coincide with the presence of NARW during calving season and Atlantic sturgeon use of the areas, yet they have resulted in higher sea turtle take compared to other areas.

Large numbers of sea turtles and Atlantic sturgeon have been successfully relocated when work was limited to historic dredging timeframes, indicating an abundance even during historic timeframes. USACE concludes that moving hopper dredging outside this timeframe may be more protective of Atlantic sturgeon, NARW, and even sea turtles as observed in other projects that adjusted project timing. However, project timeframes are currently dictated by environmental compliance requirements that are being addressed.

3.7 NON-ESA-LISTED SPECIES INCIDENTALLY CAPTURED (BYCATCH).

USACE continues to work on the development of computer application software designed to track bycatch during hopper dredging and relocation trawling. For hopper dredging, there currently are limited details being tracked regarding bycatch. Many projects completed during the implementation period did not have sufficient time to adjust the contract or permitting conditions to require reporting of bycatch. However,

many projects did provide this information on paper reporting forms. USACE and BOEM are working with USGS to have historic trawling records digitized that includes bycatch information. USACE, BOEM, USGS, and NMFS are coordinating internally and with partners to determine how best to use this new information to inform future decisions.

USACE continues to work with NMFS HCD and state agencies to identify the species of greatest concern to monitor so that risk across species can be assessed. Since numerous species may be captured in a single hopper dredging load or relocation trawling tow, it is important to prioritize recording of specific species while continuing to keep the focus on handling and protecting ESA-listed species that may be captured. Many projects completed in FY22 recorded bycatch digitally, and the data is being provided to NMFS HCD to coordinate a review.

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APPENDIX A. FY20-FY22 PROJECT TRACKING WORKBOOK

Project Name	Critical Habitat	Dates		District	Dredge Type			Placement Type			Total Volume (cubic yards)		Equipment Type				
		Start	End		Maintenance dredging	Borrow	Beach	Nearshore placement	ODMDS	Upland	Dredge	Placement	Hopper	Modified Hoper	Cutterhead	Mechanical	Relocation Trawling
Oregon Inlet, NC		03/01/20	03/08/20	SAW CW	X			X			42,456	15,534		X			
Big Foot Slough, NC		03/10/20	03/15/20	SAW CW	X						16,040	15,086		X			
Carolina Beach Inlet, NC		03/28/20	04/05/20	SAW CW	X						16,715	16,715		X			
Wilmington Harbor	NARW	04/02/20	05/08/20	SAW CW	X				X		951,649	0	X				
New River Inlet, NC		04/10/20	04/28/20	SAW CW	X						27,264	42,456		X			
Oregon Inlet, NC		04/16/20	05/05/20	SAW CW	X						15,534	16,040		X			
AIWW, NC (LFI Crossing)	NARW	05/02/20	05/14/20	SAW CW	X						6,426	27,264		X			
Lockwood Folly Inlet, NC	NARW	05/02/20	05/14/20	SAW CW	X						4,790	6,426		X			
Oregon Inlet, NC		05/15/20	05/17/20	SAW CW	X						16,040	4,790		X			
Lockwood Folly Inlet, NC	NARW	05/22/20	05/31/20	SAW CW	X						27,264	19,605		X			
Carolina Beach Inlet, NC		05/30/20	06/09/20	SAW CW	X						19,605	20,710		X			
Bulkhead Channel, NC		06/01/20	06/02/20	SAW CW	X						4,840	4,840		X			
Lockwood Folly Inlet, NC	NARW	06/10/20	06/14/20	SAW CW	X			X			20,710	7,914		X			
Bulkhead Channel, NC		06/11/20	06/16/20	SAW CW	X						15,898	15,898		X			
Oregon Inlet, NC		06/17/20	07/05/20	SAW CW	X			X			4,840	32,490		X			
Walter Slough, NC (USCG)		06/18/20	06/19/20	SAW CW	X						2,360	2,360		X			
Arecibo Harbor	Acropora	07/18/20	08/11/20	SAJ CW	X		X		X		93,396	0				X	
Oregon Inlet, NC		07/20/20	07/22/20	SAW CW	X						7,914	5,442		X			
Rollinson Channel, NC*		07/23/20	09/02/20	SAW CW	X						15,898	27,540		X			
South Ferry Channel, NC		07/24/20	08/25/20	SAW CW	X						32,490	49,428		X			
Mayaguez Harbor	Acropora	08/12/20	09/01/20	SAJ CW	X				X		94,843	0				X	
Carolina Beach Inlet, NC		09/05/20	09/14/20	SAW CW	X						2,360	24,934		X			

Project Name	Critical Habitat	Dates		District	Dredge Type			Placement Type			Total Volume (cubic yards)		Equipment Type				
		Start	End		Maintenance dredging	Borrow	Beach	Nearshore placement	ODMDS	Upland	Dredge	Placement	Hopper	Modified Hoper	Cutterhead	Mechanical	Relocation Trawling
Oregon Inlet, NC		09/05/20	09/11/20	SAW CW	X						4,790	4,685		X			
Jacksonville Harbor O&M Lower Terminal Channel		09/14/20	09/22/20	SAJ CW	X					X	159,775	0	X				
Big Foot Slough, NC		09/23/20	09/30/20	SAW CW	X						5,442	19,375		X			
Big Foot Slough, NC		10/01/20	10/03/20	SAW CW	X						27,540	6,375		X			
Oregon Inlet, NC		10/16/20	11/29/20	SAW CW	X						49,428	16,985		X			
Savannah Inner Harbor Maintenance Dredging	Atlantic Sturgeon	10/17/20	10/06/21	SAS CW	X					X	3,200,684	3,200,684			X		
Wilmington Harbor Anchorage Basin		10/20/20	01/16/21	SAW CW	X					X	1,493,971	0			X		
Palm Beach Harbor		10/27/20	12/10/20	SAJ CW	X		X				168,026	0	X				
Carolina Beach Inlet, NC		10/30/20	11/13/20	SAW CW	X						20,710	31,950		X			
Brunswick Inner Harbor/Cedar Hammock*	NARW	11/01/20	12/31/20	SAS CW	X				X	X	547,228	639,544			X		
Bulkhead Channel, NC		11/14/20	11/17/20	SAW CW	X						6,680	6,680		X			
Georgia Ports Authority East River Terminal Maintenance Dredging		11/19/20	11/21/20	SAS Reg	X					X	50,000	20,000			X		
Big Foot Slough, NC		11/19/20	11/29/20	SAW CW	X						15,086	550		X			
Port Everglades O&M	Acropora	11/24/20	03/05/21	SAJ CW	X		X				209,467	0	X				
Hatteras Ferry, NC		12/01/20	12/15/20	SAW CW	X						24,934	2,684		X			
Oregon Inlet, NC		12/01/20	01/05/21	SAW CW	X						32,490	27,335		X			
South Ferry Channel, NC		12/03/20	12/19/20	SAW CW	X						4,685	29,833		X			
Charleston Marine Manufacturing Company Pier J*		12/09/20	12/15/20	SAC Reg	X					X	15,911	42,000			X		
Joint Base Charleston		12/16/20	04/08/21	SAC Reg	X					X	1,580,036	0			X		
Oregon Inlet, NC		12/17/20	12/18/20	SAW CW	X						5,442	550		X			

Project Name	Critical Habitat	Dates		District	Dredge Type			Placement Type			Total Volume (cubic yards)		Equipment Type				
		Start	End		Maintenance dredging	Borrow	Beach	Nearshore placement	ODMDS	Upland	Dredge	Placement	Hopper	Modified Hoper	Cutterhead	Mechanical	Relocation Trawling
OWW Reach 3 & 4		12/22/20	06/17/21	SAJ CW	X					X	52,488	0			X		
North County Comprehensive Shore Protection Project Segment III*		12/23/20	03/10/21	SAJ Reg	X		X				990,472	0	X				
Lockwood Folly Inlet, NC	NARW	12/28/20	01/22/21	SAW CW	X						19,375	42,772		X			
Atlantic Intracoastal Waterway North		12/30/20	04/22/21	SAW CW	X		X			X	307,892				X		
Morehead City Harbor Cutoff, Range A, Range B		01/06/21	03/17/21	SAW CW	X		X				1,111,417	0			X		
Atlantic Intracoastal Waterway		01/07/21	04/28/21	SAW CW	X		X			X	198,153	0			X		
Jupiter Island*		01/13/21	03/16/21	SAJ Reg	X		X				663,000	0	X				
Wilmington Harbor Inner Ocean Bar	NARW	01/22/21	04/15/21	SAW CW	X		X				1,569,242	0			X		
Lockwood Folly Inlet, NC	NARW	02/01/21	02/09/21	SAW CW	X						6,375	18,648		X			
Kings Bay Entrance Channel	Atlantic Sturgeon, NARW	02/07/21	03/24/21	SAJ Reg	X		X	X	X		703,845	0	X				X
Atlantic Intracoastal Waterway South	NARW	02/08/21	04/15/21	SAW CW	X		X			X	251,296				X		
Oregon Inlet, NC		02/10/21	03/01/21	SAW CW	X						16,985	31,932		X			
Oregon Inlet, NC		02/16/21	02/25/21	SAW CW	X						4,685	12,580		X			
Bathtub Reef Beach Park Nourishment & Sailfish Point Restoration		02/26/21	04/22/21	SAJ Reg	X		X				183,000	80			X		
Bogue Banks		02/26/21	04/26/21	SAW Reg		X	X				945,500	0	X				X
Carolina Beach Inlet, NC		02/28/21	03/15/21	SAW CW	X			X			24,934	44,090		X			
Hatteras Ferry, NC		03/02/21	03/17/21	SAW CW	X						31,950	13,167		X			
South Ferry Channel, NC		03/04/21	03/18/21	SAW CW	X						6,680	13,596		X			

Project Name	Critical Habitat	Dates		District	Dredge Type			Placement Type			Total Volume (cubic yards)		Equipment Type				
		Start	End		Maintenance dredging	Borrow	Beach	Nearshore placement	ODMDS	Upland	Dredge	Placement	Hopper	Modified Hoper	Cutterhead	Mechanical	Relocation Trawling
Phipps Beach		03/06/21	04/28/21	SAJ Reg		X	X				495,000	0	X				
Military Ocean Terminal Sunny Point*	NARW	03/16/21	06/10/21	SAW CW	X				X		836,095	0				X	
Big Foot Slough, NC		03/18/21	04/07/21	SAW CW	X						16,715	9,015		X			
Brevard County Shoreline Protection Plan*	NARW	03/21/21	04/14/21	SAJ CW		X	X				519,901	0	X				
Oregon Inlet, NC		03/26/21	03/26/21	SAW CW	X						550	1,218		X			
Hatteras Ferry, NC		03/28/21	03/31/21	SAW CW	X						2,684	4,329		X			
South Ferry Channel, NC		03/29/21	04/02/21	SAW CW	X						27,335	2,967		X			
Oak Island Beach Nourishment	NARW	04/08/21	05/26/21	SAW Reg			X				1,153,840	0	X				X
South Ferry Channel, NC		04/09/21	04/20/21	SAW CW	X						49,428	8,155		X			
Big Foot Slough, NC		04/10/21	04/20/21	SAW CW	X						29,833	23,043		X			
Big Foot Slough, NC / Emergency Dredging		04/14/21	04/21/21	SAW CW	X						14,780	12,015		X			
Ft. Pierce Beach Renourishment*		04/16/21	05/14/21	SAJ CW		X	X				503,429	0	X				
South Ferry Channel, NC		04/22/21	04/24/21	SAW CW	X						550	7,212		X			
Folly Beach, SC	NARW	04/27/21	05/25/21	SAC CW	X						39,000	39,000		X			
Oregon Inlet, NC		05/11/21	05/19/21	SAW CW	X						42,772	12,995		X			
Dade County Beach Erosion Control and Hurricane Protection Project	Acropora	05/18/21	09/24/21	SAJ CW			X					269,944					
AIWW, NC (Bogue Sound)		05/21/21	05/28/21	SAW CW	X						18,648	14,565		X			
Wilmington Harbor	NARW	05/23/21	08/11/21	SAW CW	X				X		672,661	1,806,569	X				
AIWW, NC (Snows Cut)		05/26/21	05/26/21	SAW CW	X			X			155	155		X			

Project Name	Critical Habitat	Dates		District	Dredge Type			Placement Type			Total Volume (cubic yards)		Equipment Type				
		Start	End		Maintenance dredging	Borrow	Beach	Nearshore placement	ODMDS	Upland	Dredge	Placement	Hopper	Modified Hoper	Cutterhead	Mechanical	Relocation Trawling
Jacksonville Harbor O&M, 40 Foot Project, Cut 55 and Lower Terminal Channel	NARW	05/27/21	06/11/21	SAJ CW	X					X	95,181	85,205	X			X	
Morehead City Harbor		05/28/21	06/15/21	SAW CW	X				X		342,363	342,363	X				X
Carolina Beach Inlet, NC		05/30/21	06/09/21	SAW CW	X						31,932	20,120		X			
South Ferry Channel, NC		06/12/21	6/15/21	SAW CW	X						12,580	6,010		X			
Hatteras Ferry, NC		06/16/21	06/16/21	SAW CW	X						44,090	600		X			
Mayport Entrance Channel*	NARW	06/17/21	09/17/21	SAJ Reg	X				X		491,926	491,926	X				X
Oregon Inlet, NC		06/17/21	06/23/21	SAW CW	X						13,167	9,425		X			
Hatteras Ferry, NC		06/24/21	06/30/21	SAW CW	X						13,596	10,818		X			
Charleston Marine Manufacturing Company		06/25/21	07/02/21	SAC Reg	X					X	83,504	42,000			X		
South Amelia Island Beach Renourishment*	NARW	06/25/21	01/16/22	SAJ Reg		X	X				1,900,000	1,860,000			X		
Oregon Inlet, NC		07/01/21	07/14/21	SAW CW	X						9,015	17,515		X			
Charleston Marine Manufacturing Company		07/02/21	07/23/21	SAC Reg	X					X	112,983	42,000			X		
Carolina Beach Inlet, NC		07/06/21	07/20/22	SAW CW	X						1,218	25,805		X			
Big Foot Slough, NC / Emergency Dredging		07/15/21	7/25/21	SAW CW	X						4,329	20,218		X			
South Ferry Channel, NC		07/26/21	07/28/21	SAW CW	X						2,967	2,220		X			
Hatteras Ferry, NC*		07/27/21	07/27/21	SAW CW	X						8,155	550		X			
Lockwood Folly Inlet, NC	NARW	08/11/21	09/05/21	SAW CW	X						23,043	50,030		X			
Charleston Marine Manufacturing Company		08/16/21	08/21/21	SAC Reg	X					X	39,801	42,000			X		
Kinder Morgan Bulk Terminals, Inc.		08/26/21	09/04/21	SAC Reg	X					X	55,109	55,109			X		
Oregon Inlet, NC		08/26/21	08/30/21	SAW CW	X						16,985	8,500		X			

Project Name	Critical Habitat	Dates		District	Dredge Type			Placement Type			Total Volume (cubic yards)		Equipment Type				
		Start	End		Maintenance dredging	Borrow	Beach	Nearshore placement	ODMDS	Upland	Dredge	Placement	Hopper	Modified Hoper	Cutterhead	Mechanical	Relocation Trawling
Carolina Beach Inlet, NC		09/06/21	09/24/21	SAW CW	X						12,015	22,765		X			
Charleston Marine Manufacturing Company		09/07/21	09/10/21	SAC Reg	X					X	12,239	42,000			X		
New River Inlet, NC		09/09/21	09/11/21	SAW CW	X						7,212	6,590		X			
Bogue Inlet, NC		09/26/21	09/30/21	SAW CW	X						39,000	9,125		X			
Oregon Inlet, NC		09/27/21	09/30/21	SAW CW	X						27,335	5,130		X			
Bogue Inlet, NC		10/01/21	10/04/21	SAW CW	X						12,995	7,365		X			
Oregon Inlet, NC		10/01/21	10/01/21	SAW CW	X			X			1,595	1,595		X			
South Ferry Channel, NC		10/03/21	10/06/21	SAW CW	X						29,833	5,635		X			
Hatteras Ferry, NC		10/06/21	10/08/21	SAW CW	X						14,565	3,435		X			
Bulkhead Channel, NC		10/07/21	10/11/21	SAW CW	X						12,540	12,540		X			
Savannah Inner Harbor Maintenance Dredging	Atlantic Sturgeon	10/10/21	07/24/22	SAS CW	X					X	3,194,282	3,194,282			X		
Carolina Beach Inlet, NC		10/11/21	10/12/21	SAW CW	X						31,950	1,750		X			
Oregon Inlet, NC		10/13/21	11/01/21	SAW CW	X						155	32,835		X			
Georgia Ports Authority East River Terminal Maintenance Dredging		10/17/21	11/01/21	SAS Reg	X					X	20,000	20,000			X		
Brunswick Inner Harbor Maintenance Dredging	NARW	10/24/21	11/17/21	SAS CW	X					X	315,504	315,504			X		
Hatteras Ferry, NC		11/03/21	11/17/21	SAW CW	X						20,120	7,675		X			
Broward County Shore Protection Project Segment II	Acropora	11/05/21	04/29/22	SAJ CW			X					390,882					
Atlantic Intracoastal Waterway	Atlantic Sturgeon	11/05/21	03/22/22	SAS CW	X					X	292,368	292,368			X		
Ft. Pierce Inlet Sand Bypass		11/11/21	07/31/22	SAJ Reg	X				X		90,675	90,675				X	
South Ferry Channel, NC		11/11/21	11/21/21	SAW CW	X						6,010	17,540		X			

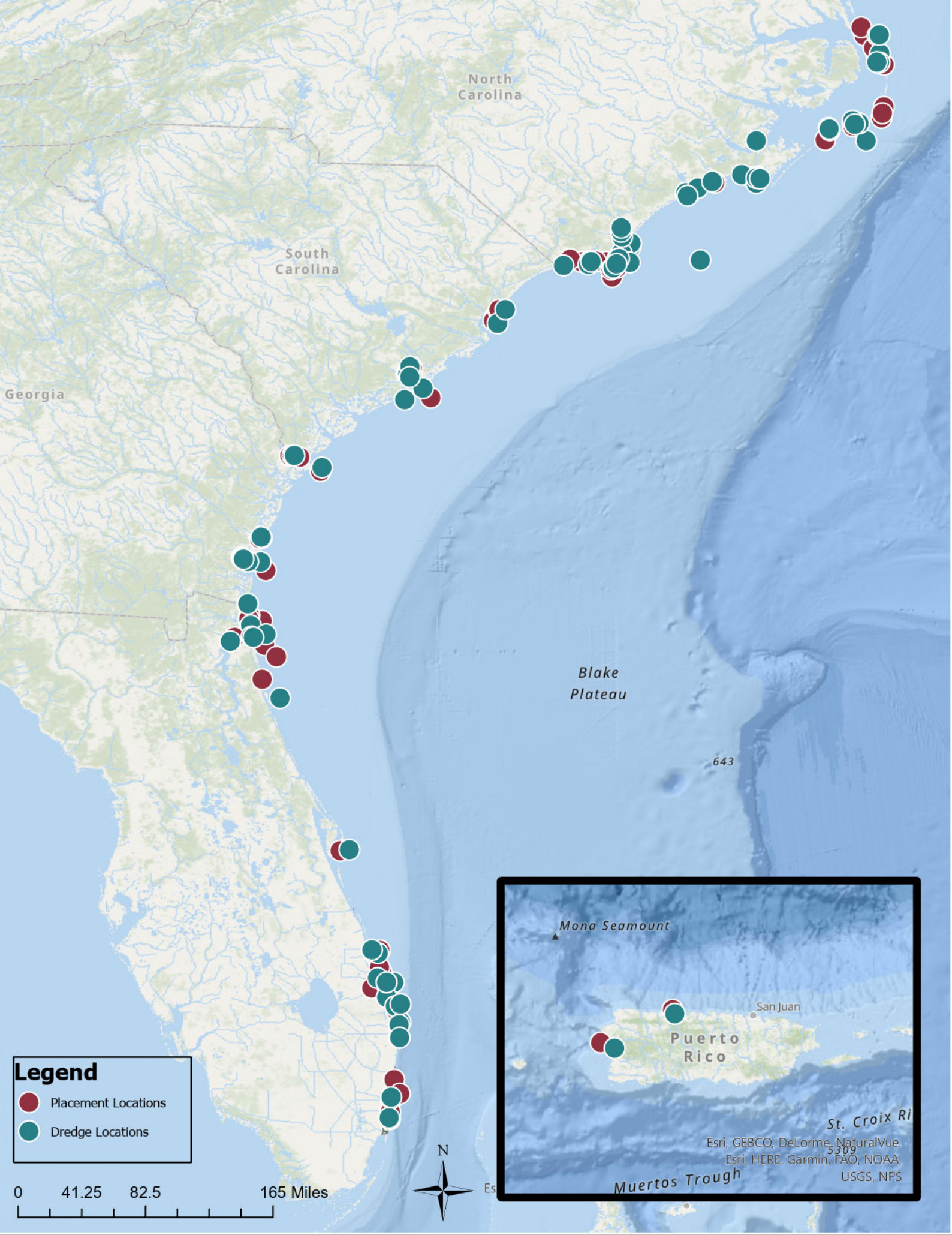
Project Name	Critical Habitat	Dates		District	Dredge Type			Placement Type			Total Volume (cubic yards)		Equipment Type				
		Start	End		Maintenance dredging	Borrow	Beach	Nearshore placement	ODMDS	Upland	Dredge	Placement	Hopper	Modified Hoper	Cutterhead	Mechanical	Relocation Trawling
Military Ocean Terminal Sunny Point / Wilmington Harbor Mid River	NARW	11/27/21	06/02/22	SAW CW	X				X		1,174,413	1,174,413				X	
Oregon Inlet, NC		11/27/21	12/05/21	SAW CW	X						600	14,780		X			
Wilmington Harbor Anchorage Basin		12/01/21	03/12/22	SAW CW	X					X	1,064,858	1,064,858			X		
Town of Sunset Beach Dredging Project		12/04/21	03/30/22	SAW Reg	X					X	89,100	16,894			X		
Broward County Shore Protection Project Segment III	Acropora	12/07/21	05/31/22	SAJ CW			X					253,918					
North County Comprehensive Shoreline Protection Project Segment I		12/08/21	01/11/22	SAJ Reg		X	X				409,711	409,711	X				
Carolina Beach Inlet, NC		12/15/21	12/21/21	SAW CW	X						9,425	7,880		X			
Lockwood Folly Inlet, NC	NARW	12/16/21	12/18/21	SAW CW	X			X			19,605	3,245		X			
South Ferry Channel, NC		12/29/21	01/06/22	SAW CW	X						10,818	5,785		X			
Savannah Harbor Entrance Channel O&M Dredging	NARW	12/31/21	01/17/22	SAS CW	X				X		576,159	419,342	X				
Hatteras Ferry, NC		01/02/22	01/06/22	SAW CW	X						17,515	6,595		X			
Holden Beach Central Reach Renourishment*	NARW	01/07/22	04/12/22	SAW Reg		X	X				1,850,604	1,850,604	X				X
Charleston Marine Manufacturing Company		01/10/22	01/19/22	SAC Reg	X					X	57,301				X		
Lockwood Folly Inlet, NC	NARW	01/10/22	01/28/22	SAW CW	X						25,805	28,635		X			
Brunswick Harbor Entrance Channel O&M	NARW	01/18/22	03/24/22	SAS CW	X				X		1,617,444	639,544	X				X
Bal Harbour 2021 Beach Erosion Control and Hurricane Protection Project Beach Renourishment*	Acropora	01/22/22	04/09/22	SAJ CW	X		X				112,228	144,219			X		

Project Name	Critical Habitat	Dates		District	Dredge Type			Placement Type			Total Volume (cubic yards)		Equipment Type				
		Start	End		Maintenance dredging	Borrow	Beach	Nearshore placement	ODMDS	Upland	Dredge	Placement	Hopper	Modified Hoper	Cutterhead	Mechanical	Relocation Trawling
NCDOT Sloop Channel Dredging		01/27/22	05/01/22	SAW Reg	X					X	73,226	52,446				X	
Hatteras Ferry, NC		01/31/22	02/09/22	SAW CW	X						20,218	16,900		X			
Kings Bay Entrance Channel*	Atlantic Sturgeon, NARW	02/12/22	03/31/22	SAJ Reg	X		X	X	X		860,176	860,176	X				X
Oak Island Renourishment Project	NARW	02/20/22	04/20/22	SAW Reg		X	X				1,153,840	768,063	X				
St. Lucie Inlet Maintenance Dredging		03/02/22	04/15/22	SAJ Reg	X			X			465,153	447,339			X	X	
Carolina Beach/Kure Beach CSRM*		03/02/22	05/30/22	SAW CW		X	X				1,901,039	0			X		
Hatteras Ferry, NC		03/03/22	03/10/22	SAW CW	X						2,220	9,705		X			
Rollinson Channel, NC		03/03/22	03/10/22	SAW CW	X						550	9,705		X			
Debidue Island Beach Nourishment (and Groin Project)*	NARW	03/05/22	06/03/22	SAC Reg		X	X				670,558	670,558			X		
Southport Ferry Basin and entrance channel maintenance		03/07/22	05/03/22	SAW Reg	X					X	25,572	2,572			X		
Oregon Inlet, NC		03/11/22	04/01/22	SAW CW	X						50,030	29,920		X			
Charleston Harbor Entrance Channel O&M Dredging*	NARW	03/18/22	04/03/22	SAC CW	X				X		350,329	350,329	X				X
Big Foot Slough, NC		03/22/22	04/03/22	SAW CW	X						7,880	13,845		X			
South Ferry Channel, NC		04/02/22	05/06/22	SAW CW	X						8,500	31,100		X			
Wilmington Harbor	NARW	04/05/22	05/31/22	SAW CW	X				X		1,806,569	1,806,569	X				X
St. Lucie County (South) CSRM Project		04/09/22	05/09/22	SAJ CW		X	X				387,035	0	X				
Sloop Channel, NC		04/16/22	05/01/22	SAW CW	X						22,765	15,130		X			

Project Name	Critical Habitat	Dates		District	Dredge Type			Placement Type			Total Volume (cubic yards)		Equipment Type				
		Start	End		Maintenance dredging	Borrow	Beach	Nearshore placement	ODMDS	Upland	Dredge	Placement	Hopper	Modified Hoper	Cutterhead	Mechanical	Relocation Trawling
South Ponte Vedra Beach Restoration Project	NARW	04/25/22	06/09/22	SAJ Reg		X	X				733,122	0	X				
Sloop Channel, NC		05/15/22	05/19/22	SAW CW	X						6,590	5,650		X			
South Litchfield Beach Restoration Project	NARW	05/27/22	07/20/22	SAC Reg		X	X				455,551	0			X		
Oregon Inlet, NC		05/29/22	06/04/22	SAW CW	X						9,125	7,880		X			
Hatteras Ferry, NC		06/05/22	06/12/22	SAW CW	X						5,130	16,095		X			
Oregon Inlet, NC		06/13/22	06/15/22	SAW CW	X						7,365	3,480		X			
Kill Devil Hills*		06/13/22	07/22/22	SAW Reg		X	X				527,800	527,800	X				X
Big Foot Slough, NC		06/17/22	06/27/22	SAW CW	X						1,595	23,315		X			
Avon		06/19/22	07/27/22	SAW Reg		X	X				1,000,333	1,000,333	X				X
Oregon Inlet, NC		06/29/22	06/30/22	SAW CW	X						5,635	1,700		X			
Buxton*		06/29/22	08/16/22	SAW Reg		X	X				1,200,000	1,201,923	X				X
Morehead City Harbor		07/03/22	08/02/22	SAW CW	X				X		390,923	390,923	X				X
Nags Head Beach Renourishment Project*		07/22/22	08/27/22	SAW Reg		X	X				614,106	614,106	X		X		X
Hatteras Ferry, NC		07/23/22	08/03/22	SAW CW	X						3,435	25,400		X			
Oregon Inlet Manteo Shallowbag Bay Emergency Dredging		08/06/22	09/28/22	SAW CW	X						13,940	0		X			
Oregon Inlet, NC		08/06/22	08/19/22	SAW CW	X						12,540	18,845		X			
Bulkhead Channel, NC		08/07/22	08/11/22	SAW CW	X						7,630	7,630		X			
Big Foot Slough, NC		08/12/22	08/14/22	SAW CW	X						3,245	9,055		X			
Oregon Inlet, NC		08/13/22	08/24/22	SAW CW	X						5,785	9,912		X			
Kitty Hawk		08/24/22	10/18/22	SAW Reg		X	X				2,280,000	758,088	X				X
Oregon Inlet, NC		08/25/22	9/13/222	SAW CW	X						1,750	24,120		X			
Hatteras Ferry, NC		09/01/22	09/07/22	SAW CW	X						17,540	14,090		X			

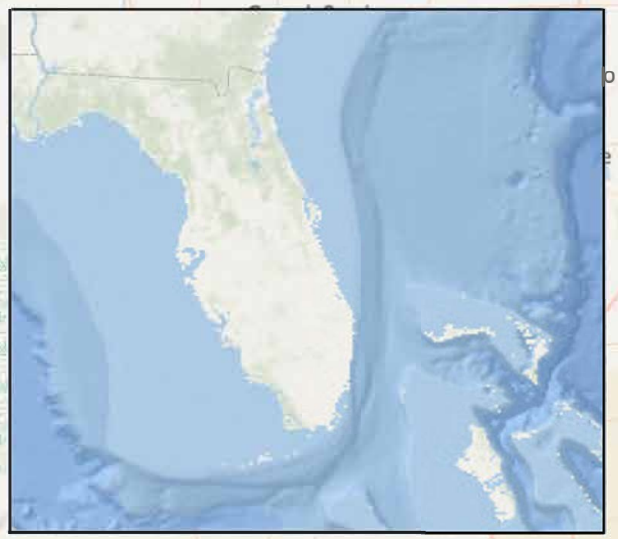
Project Name	Critical Habitat	Dates		District	Dredge Type			Placement Type			Total Volume (cubic yards)		Equipment Type				
		Start	End		Maintenance dredging	Borrow	Beach	Nearshore placement	ODMDS	Upland	Dredge	Placement	Hopper	Modified Hoper	Cutterhead	Mechanical	Relocation Trawling
Oregon Inlet, NC		09/04/22	09/20/22	SAW CW	X						6,595	13,940		X			
Carolina Beach Inlet, NC		09/17/22	09/20/22	SAW CW	X						32,835	5,280		X			
Oregon Inlet, NC		09/24/22	09/28/22	SAW CW	X						7,675	8,710		X			

APPENDIX B. MAPS OF PROJECT LOCATIONS AND CRITICAL HABITAT



Projects completed in FY20-FY22 using the South Atlantic Regional Biological Opinion

Layer Credits: ESRI, NOAA



Lighthouse Point
Pompano Beach
North Andrews Gardens
Oakland Park
Wilton Manors
Lauderhill
Plantation
Fort Lauderdale
North New River Canal
South New River Canal
Davie
Dania Beach
Pembroke Pines
Hollywood
Miramar
Hallandale
Aventura
Snake Creek Canal
Sunny Isles Beach
Keystone Islands

Legend

Placement Locations

Project_Name

- Bal Harbour 2021 Beach Erosion Control and Hurricane Protection Project Beach Renourishment*
- Broward County Shore Protection Project Segment II
- Broward County Shore Protection Project Segment III
- Dade County Beach Erosion Control and Hurricane Protection Project
- Port Everglades O&M

Dredge Locations

Project_Name

- Bal Harbour 2021 Beach Erosion Control and Hurricane Protection Project Beach Renourishment*
- Port Everglades O&M

Coral Elkhorn Critical Habitat

Unit

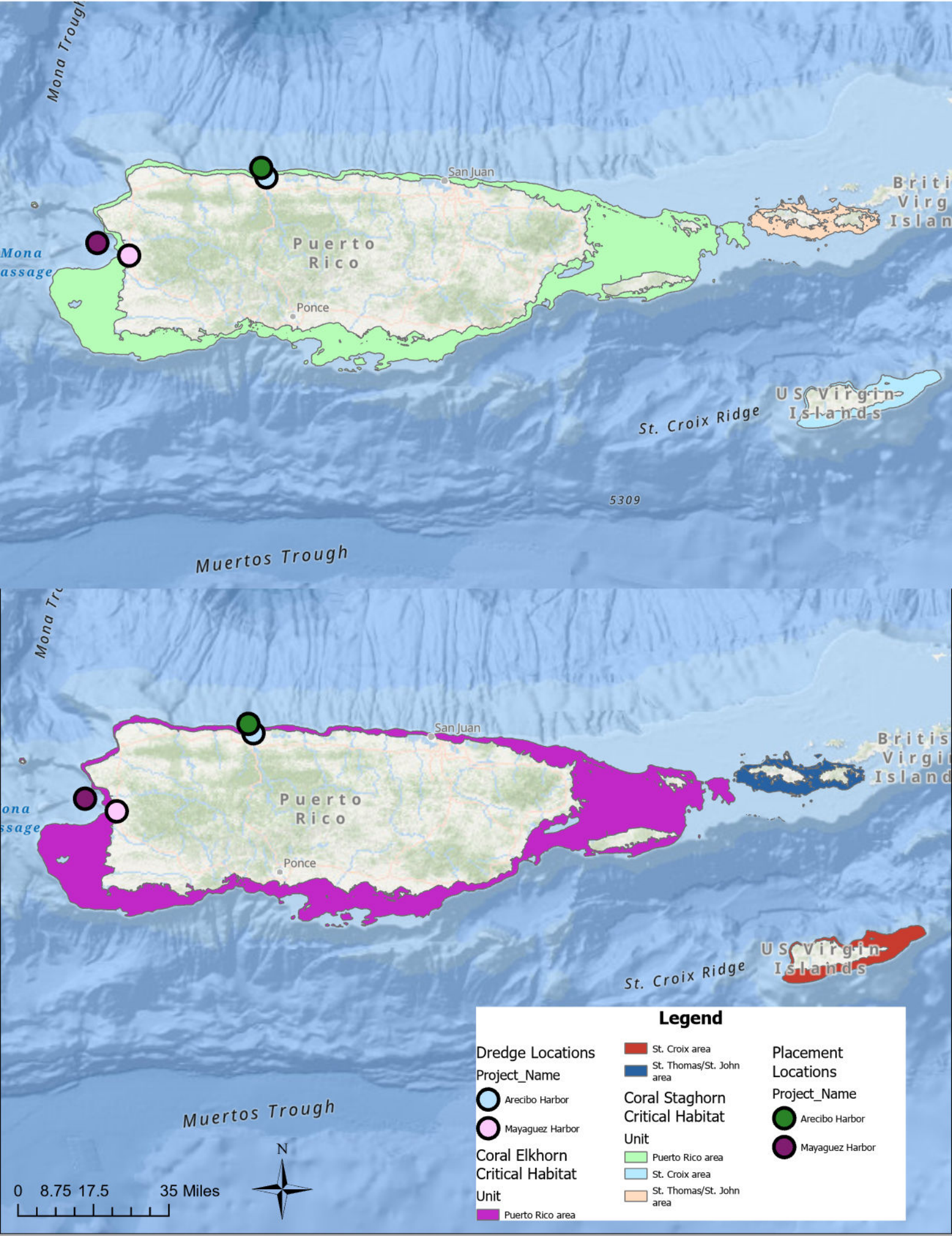
- Florida area

Coral Staghorn Critical Habitat

Unit

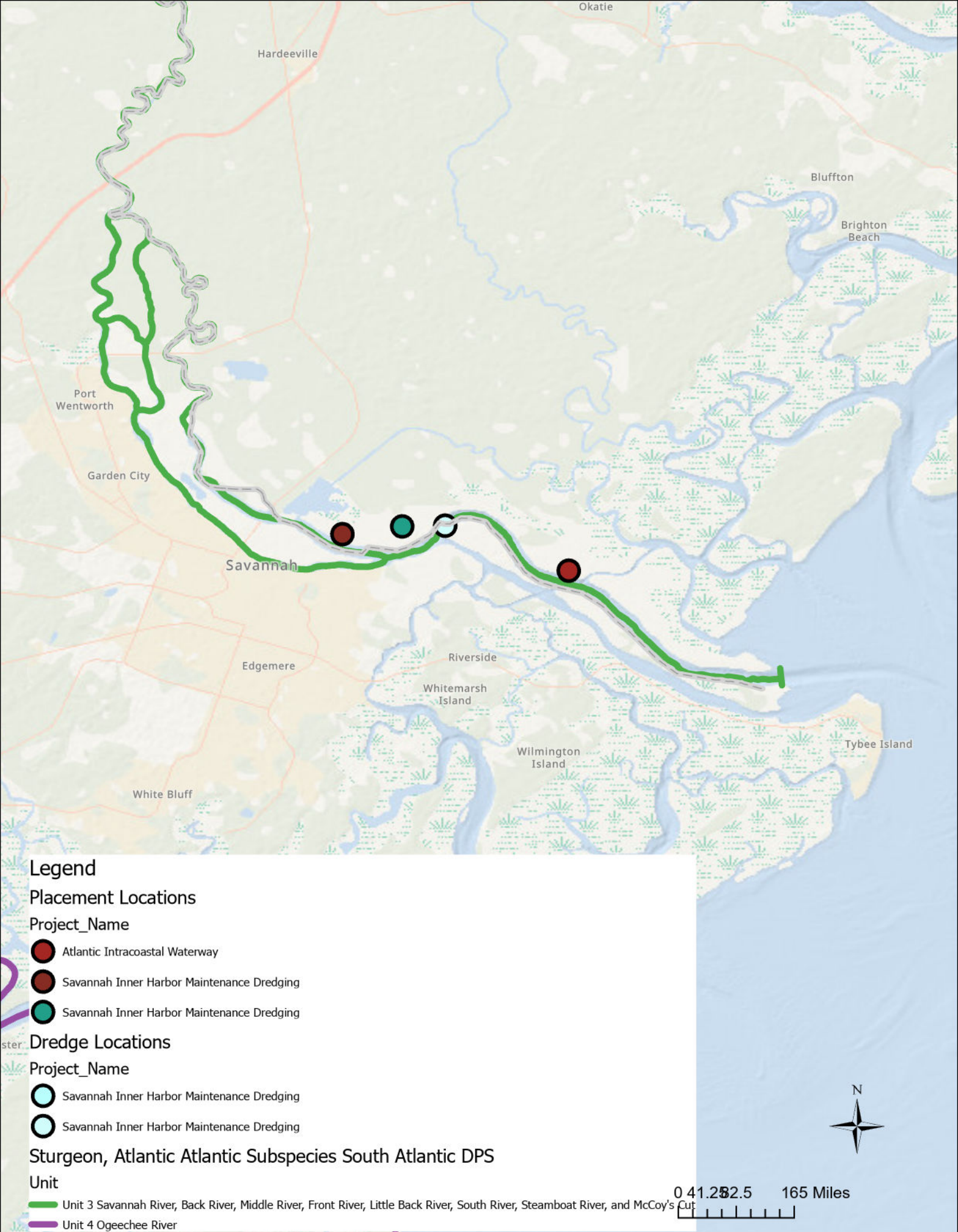
- Florida area

FY20-22 Projects in Acropora Critical Habitat



Esri, GEBCO, DeLorme, NaturalVue, Esri, HERE, Garmin, FAO, NOAA, USGS, NPS

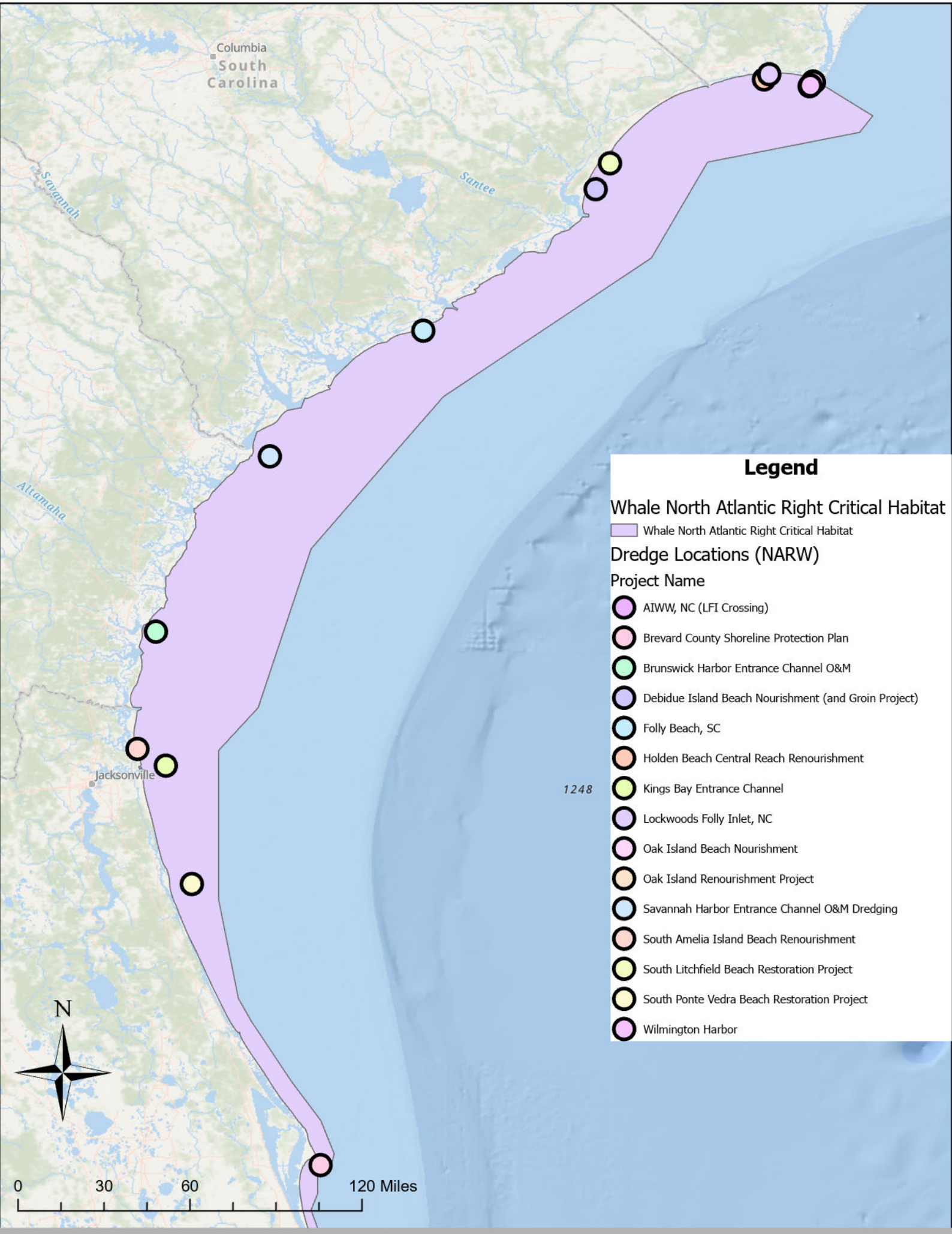
FY20-22 Projects in Acropora Critical Habitat



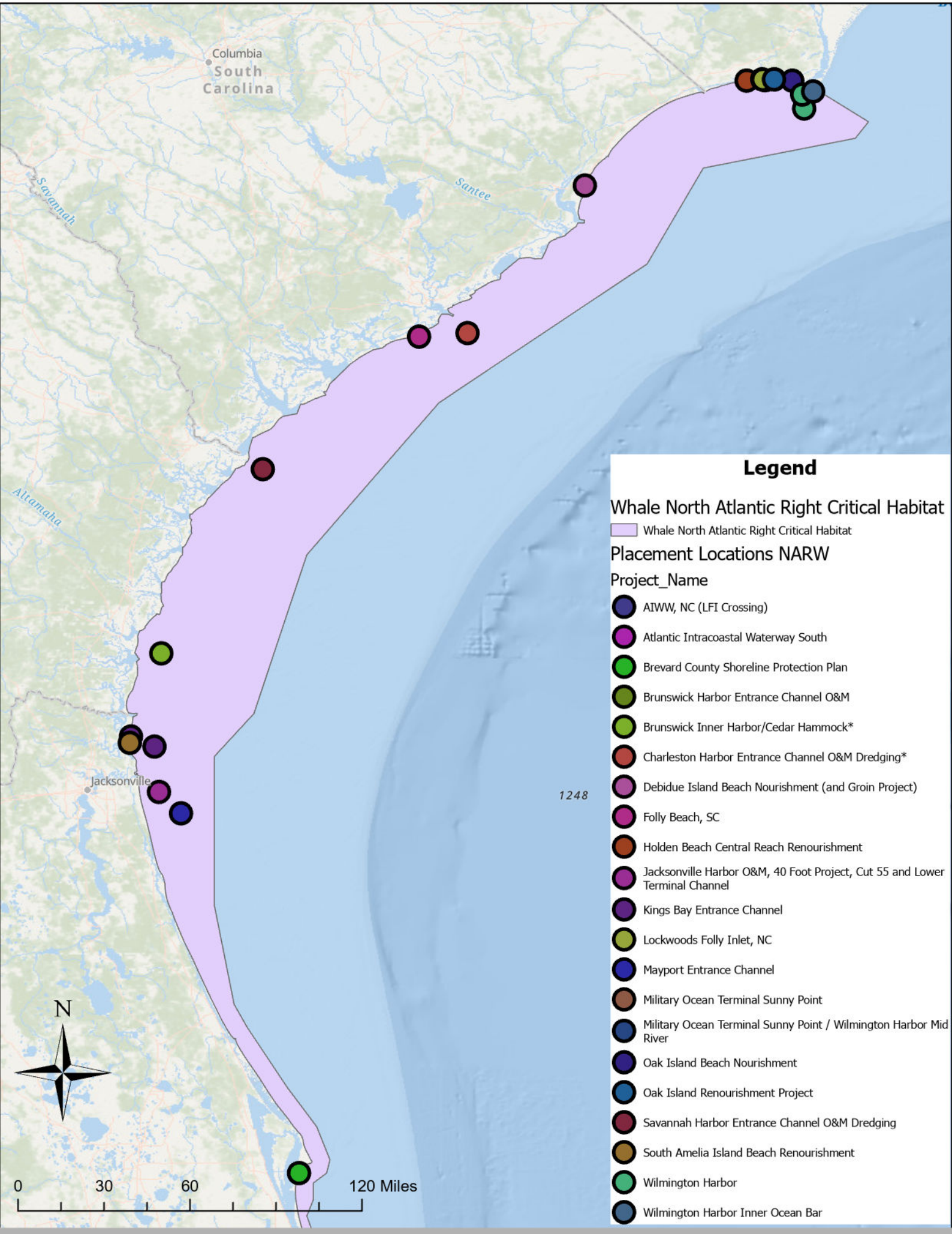
FY20-22 Projects in Atlantic Sturgeon Critical Habitat

FY20-22 Projects in Atlantic Sturgeon Critical Habitat

FY20-22 Projects in Atlantic Sturgeon Critical Habitat

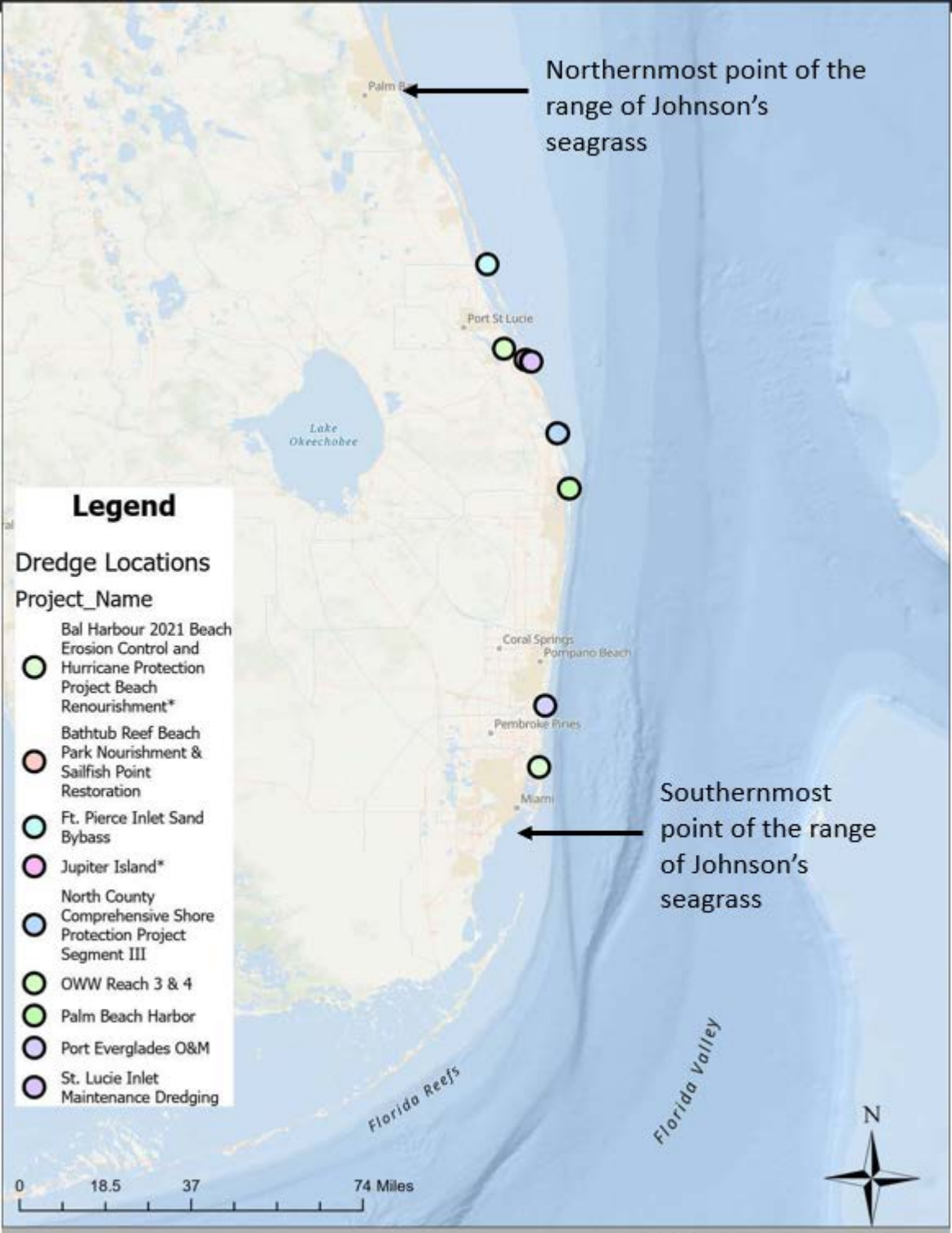


Dredge Locations of Projects in FY20-22, North Atlantic Right Whale Critical Habitat

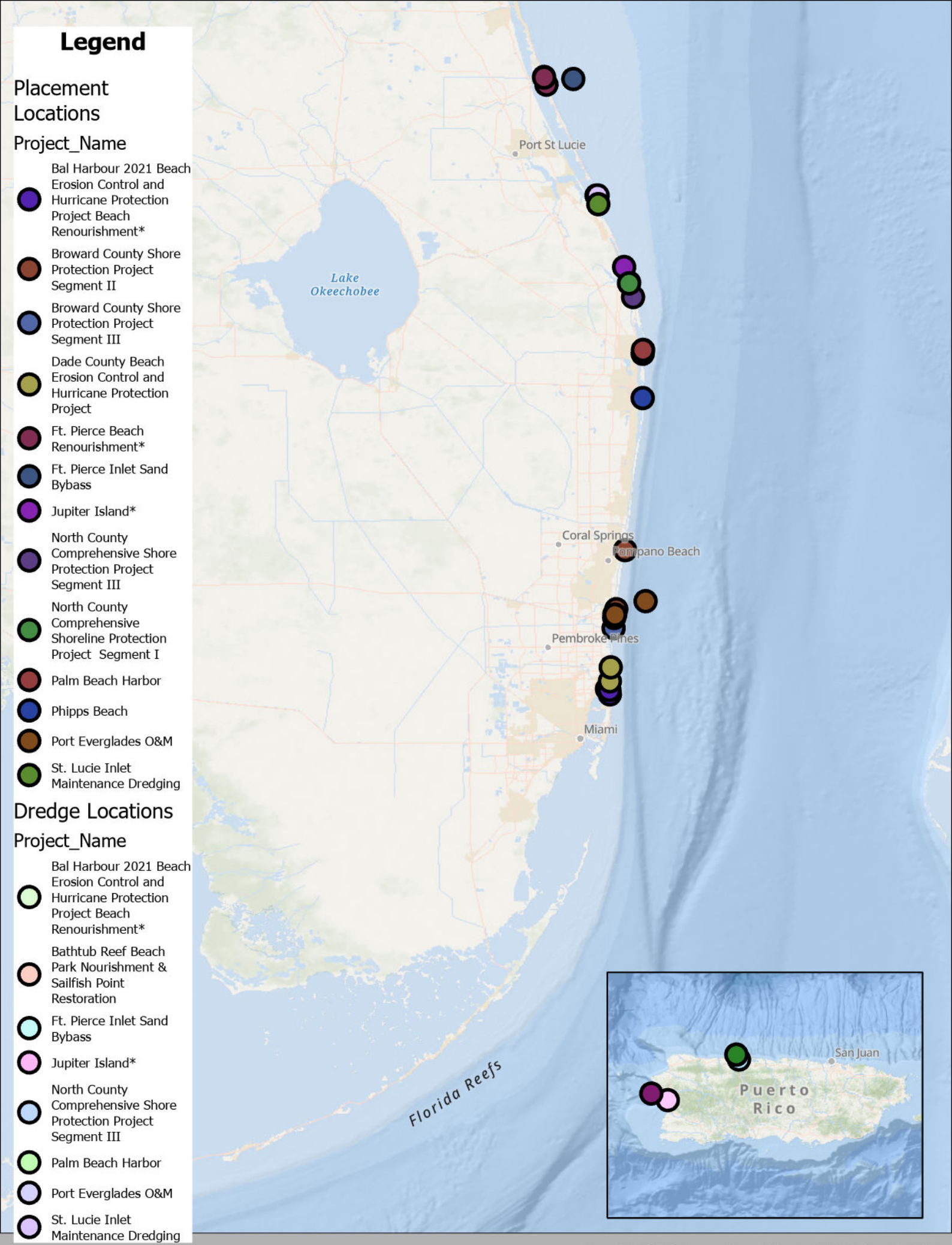


Placement Locations of Projects in FY20-22, North Atlantic Right Whale Critical Habitat

APPENDIX C. MAP OF PROJECT LOCATIONS AND AREAS THAT REQUIRED ADDITIONAL PDCS



FY20-22 Projects in the Range of Johnson's Seagrass



FY20-22 Projects in the Range of Coral

APPENDIX D. FY20-FY21 HOPPER DREDGING EFFORT AND TAKE

Table D-1. Hopper Dredge Effort

District	Year	Area	Dredge	Start	End	Surface Temp (˚C)	Load #s	~Dredge Days	Comments
SAW	FY20	Wilmington Harbor	Terrapin Island	4/2/20	5/5/20			33	
SAW	FY20	Wilmington Harbor	Ellis Island	5/1/20	5/5/20			4	
SAJ	FY20	Jacksonville Harbor	Terrapin Island	9/14/20	9/24/20			10	
SAJ	FY21	Palm Beach Harbor	Atchafalaya	10/27/20	12/10/20			37	no work 11/17-23
SAJ	FY21	Brevard Co. Shoreline Protection Plan	Stuyvesant	11/30/20	3/15/21			106	
SAJ	FY21	North Co. Comprehensive Shore Protection Project Segment III*	Liberty Island	12/23/20	2/21/21			60	
SAJ	FY21	Jupiter Island*	B.E. Lindholm	1/12/21	3/20/21			67	
SAJ	FY21	Port Everglades O&M	R.N. Weeks	2/12/21	3/8/21			24	
SAJ	FY21	Kings Bay Entrance Channel	Dodge Island	2/12/21	3/19/21			35	
SAJ	FY21	Kings Bay Entrance Channel	Padre Island	2/14/21	3/24/21			38	
SAW	FY21	Bogue Banks	Liberty Island	2/26/21	4/26/21			59	
SAW	FY21	Bogue Banks	Ellis Island	3/16/21	4/26/21			41	
SAJ	FY21	Brevard Co. Shoreline Protection Plan	Dodge Island	3/21/21	4/14/21			25	
SAJ	FY21	Brevard Co. Shoreline Protection Plan	Padre Island	3/25/21	4/15/21			21	
SAJ	FY21	Ft. Pierce Beach Renourishment*	Padre Island	4/16/21	5/14/21			28	
SAJ	FY21	Ft. Pierce Beach Renourishment*	Dodge Island	4/16/21	5/1/21			15	
SAW	FY21	Oak Island Beach Nourishment	Dodge Island	5/6/21	5/23/21			17	
SAW	FY21	Wilmington Harbor	Dodge Island	5/24/21	6/30/21			36	
SAJ	FY21	Jacksonville Harbor	Padre Island	5/27/21	6/4/21			8	
SAJ	FY21	Morehead City Harbor	Liberty Island	5/30/21	6/15/21			16	
SAW	FY21	Wilmington Harbor	Padre Island	6/6/21	6/16/21			6	no work 6/7-11
SAJ	FY21	Jacksonville Harbor	Liberty Island	6/17/21	9/4/21			61	Multiple starts/stops
SAJ	FY21	Mayport Entrance Channel*	Liberty Island	7/5/21	9/10/21			20	Multiple starts/stops
SAW	FY21	Wilmington Harbor	Liberty Island	8/8/21	8/11/21			3	

District	Year	Area	Dredge	Start	End	Surface Temp (˚C)	Load #s	~Dredge Days	Comments
SAS	FY22	Savannah	Padre Island	12/31/21	1/17/22	12.9 - 17.6	1 - 101	15.5	
SAS	FY22	Savannah	Dodge Island	1/3/22	1/17/22	12.9 - 17.6	1 - 69	12	
SAW	FY22	Holden Beach	B.E. Lindholm	1/9/22	4/9/22	14-18	7-445	90	
SAJ	FY22	North Co. Comprehensive Shoreline Protection Project, Segment I	12/08/21	1/11/22					
SAS	FY22	Brunswick	Padre Island	1/18/22	2/19/22	10.2 - 16.3	102 - 215	28	
SAS	FY22	Brunswick	Dodge Island	1/18/22	2/20/22	10.2 - 16.3	70 - 187	28	
SAJ	FY22	Palm Beach	Atchafalaya	1/27/22	5/31/22			124	
SAJ	FY22	Kings Bay	Newport	2/12/22	3/16/22	12.9 - 18.7	1 - 141	32	
SAJ	FY22	Kings Bay	Bayport	2/15/22	3/31/22	13.1 - 20.0	1 - 159	38	
SAW	FY22	Oak Island	Dodge Island	2/22/22	4/21/22	13-17.8	5-223	56	
SAW	FY22	Oak Island	Padre Island	2/23/22	4/6/22	12-16.1	14-175	42	
SAC	FY22	Charleston	Ellis Island	3/18/22	3/20/22	17.7 - 18.2	1 - 5	2.5	
SAS	FY22	Brunswick	Ellis Island	3/21/22	3/24/22	18.1 - 19.2	6 - 23	3.5	
SAC	FY22	Charleston	Ellis Island	3/27/22	4/3/22	17.1 - 18.3	24 - 39	7	
SAW	FY22	Holden Beach	RN Weeks	3/29/22	4/12/22	16-17	302-451	7	
SAW	FY22	Wilmington	Ellis Island	4/5/22	4/20/22	16.1 - 18.7	40 - 119	15	
SAJ	FY22	St. Lucie Co. (South), Florida Coastal Storm Risk Management Project-	Padre Island	4/9/22	5/7/22	22.1 - 27.0	1 - 119	17.5	Docked 4/20 - 4/30
SAW	FY22	Wilmington Harbor	Dodge Island	4/21/22	4/21/22	17.9	188 - 192	1	
SAJ	FY22	St. Lucie Co. (South), Florida Coastal Storm Risk Management Project-	Dodge Island	4/25/22	5/6/22	24.9 - 26.0	1-56	9	No work 4/29-30
SAW	FY22	Wilmington Harbor	Dodge Island	5/9/22	5/14/22	20.8 - 21.2	193 - 225	6	
SAW	FY22	Wilmington Harbor	Padre Island	5/10/22	5/30/22	20.8 - 24.4	216 - 386	21	
SAJ	FY22	South Ponte Vedra Beach Restoration Project	04/25/22	6/9/22					
SAW	FY22	Kill Devil Hills	RN Weeks, B.E. Lindholm	6/13/22	7/20/22	22.2-26.4	1-261	40	
SAW	FY22	Avon/Buxton	Ellis Island	6/19/22	7/18/22	25.0-27.2	1 -89	29	
SAW	FY22	Morehead City	Liberty Island	7/2/22	7/7/22	27.1 - 28.8	1-32	5	
SAW	FY22	Avon/Buxton	Liberty Island	7/8/22	8/16/22	25.0-28.8	1-246	36	
SAW	FY22	Morehead City	Dodge Island	7/16/22	8/1/22	28.0 - 29.7	226 - 343	15	
SAW	FY22	Morehead City	Padre Island	7/18/22	8/2/22	28.0 - 29.7	387 - 458	9	

District	Year	Area	Dredge	Start	End	Surface Temp (˚C)	Load #s	~Dredge Days	Comments
SAW	FY22	Nags Head	Ellis Island	7/22/22	8/1/22	27.1-27.9	Jan-49	11	
SAW	FY22	Avon/Buxton	Ellis Island	8/2/22	8/9/22	26.6-27.3	90-115	8	
SAW	FY22	Nags Head	Liberty Island	8/17/22	8/25/22	22.3-26.5	Jan-42	8	
SAW	FY22	Kitty Hawk	RN Weeks, B.E. Lindholm	8/25/22	10/16/22	20.1-26.8	1-280	54	

Table D-2. Hopper Dredging Take

District	FY	Project	Vessel	Load #	Date	Species	Take Conditions
SAW	FY20	Wilmington Harbor Ocean Bar	Terrapin Island	56	04/15/20	GREEN	Fresh Dead
SAW	FY20	Wilmington Harbor Ocean Bar	Ellis Island	7	05/03/20	LEATHERBACK	Fresh Dead
SAW	FY20	Morehead City Harbor	Padre Island	636	07/18/20	LOGGERHEAD	Fresh Dead
SAW	FY20	Morehead City Harbor	Padre Island	638	07/19/20	LOGGERHEAD	Fresh Dead
SAJ	FY21	North County Comprehensive SPP	Liberty Island	192	02/10/21	LOGGERHEAD	Fresh Dead
SAJ	FY21	Kings Bay Entrance Channel	Padre Island	94	03/13/21	ATLANTIC STURGEON	Fresh Dead
SAJ	FY21	Kings Bay Entrance Channel	Padre Island		03/14/21	KEMP'S RIDLEY	Alive
SAJ	FY21	Kings Bay Entrance Channel	Dodge Island	109	03/14/21	GREEN	Fresh Dead
SAJ	FY21	Kings Bay Entrance Channel	Padre Island	97	03/14/21	ATLANTIC STURGEON	Fresh Dead
SAJ	FY21	Kings Bay Entrance Channel	Padre Island	98	03/15/21	ATLANTIC STURGEON	Fresh Dead
SAJ	FY21	Kings Bay Entrance Channel	Padre Island	100	03/15/21	KEMP'S RIDLEY	Fresh Dead
SAW	FY21	Bogue Banks	Liberty Island	69	03/17/21	KEMP'S RIDLEY	Alive
SAJ	FY21	Kings Bay Entrance Channel	Padre Island	117	03/24/21	LOGGERHEAD	Fresh Dead
SAW	FY21	Bogue Banks	Ellis Island	48	04/01/21	LOGGERHEAD	Fresh Dead
SAW	FY21	Bogue Banks	Liberty Island		04/06/21	KEMP'S RIDLEY	Alive
SAW	FY21	Oak Island	Dodge Island	82	05/22/21	LOGGERHEAD	Fresh Dead
SAW	FY21	Morehead City Harbor	Liberty Island	4	05/31/21	KEMP'S RIDLEY	Fresh Dead
SAW	FY21	Morehead City Harbor	Liberty Island	43	06/06/21	KEMP'S RIDLEY	Fresh Dead
SAW	FY21	Morehead City Harbor	Liberty Island	78	06/14/21	LOGGERHEAD	Fresh Dead
SAJ	FY21	Jacksonville Harbor	Liberty Island	10	06/23/21	GREEN	Fresh Dead
SAJ	FY21	Mayport Harbor	Liberty Island	68	07/08/21	LOGGERHEAD	Fresh Dead

District	FY	Project	Vessel	Load #	Date	Species	Take Conditions
SAJ	FY21	Mayport Harbor	Liberty Island	68	07/08/21	LOGGERHEAD	Fresh Dead
SAW	FY21	Wilmington Harbor	Liberty Island	8	08/09/21	LOGGERHEAD	Fresh Dead
SAJ	FY21	Mayport Harbor	Liberty Island	283	09/08/21	LOGGERHEAD	Fresh Dead
SAS	FY22	Brunswick Harbor	Dodge Island	83	01/23/22	ATLANTIC STURGEON	Fresh Dead
SAS	FY22	Brunswick Harbor	Dodge Island	132	02/08/22	ATLANTIC STURGEON	Fresh Dead
SAS	FY22	Brunswick Harbor	Dodge Island	151	02/13/22	GREEN	Fresh Dead
SAS	FY22	Brunswick Harbor	Padre Island	200	02/16/22	ATLANTIC STURGEON	Fresh Dead
SAS	FY22	Brunswick Harbor	Padre Island	202	02/16/22	ATLANTIC STURGEON	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Newport	29	02/18/22	ATLANTIC STURGEON	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Newport	36	02/19/22	ATLANTIC STURGEON	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Newport	47	02/22/22	ATLANTIC STURGEON	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Newport	51	02/23/22	ATLANTIC STURGEON	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Bayport	28	02/24/22	GREEN	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Newport	62	02/25/22	GREEN	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Bayport	51	03/01/22	KEMP'S RIDLEY	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Newport	75	03/02/22	KEMP'S RIDLEY	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Newport	119	03/10/22	KEMP'S RIDLEY	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Newport	133	03/13/22	KEMP'S RIDLEY	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Newport	136	03/14/22	GREEN	Fresh Dead
SAJ	FY22	Kings Bay Entrance Channel	Bayport	115	03/19/22	KEMP'S RIDLEY	Fresh Dead
SAS	FY22	Brunswick Harbor	Ellis Island	15	03/23/22	KEMP'S RIDLEY	Fresh Dead
SAS	FY22	Brunswick Harbor	Ellis Island	15	03/23/22	KEMP'S RIDLEY	Fresh Dead
SAW	FY22	Holden Beach, NC	R.N. Weeks	281	03/24/22	LOGGERHEAD	Fresh Dead
SAS	FY22	Brunswick Harbor	Ellis Island	23	03/24/22	KEMP'S RIDLEY	Fresh Dead
SAS	FY22	Brunswick Harbor	Ellis Island	23	03/24/22	KEMP'S RIDLEY	Fresh Dead
SAS	FY22	Brunswick Harbor	Ellis Island	23	03/24/22	KEMP'S RIDLEY	Fresh Dead
SAS	FY22	Brunswick Harbor	Ellis Island	23	03/24/22	KEMP'S RIDLEY	Fresh Dead
SAW	FY22	Oak Island	Padre Island	127	03/25/22	KEMP'S RIDLEY	Fresh Dead
SAC	FY22	Charleston Harbor	Ellis Island	25	03/27/22	LOGGERHEAD	Fresh Dead

District	FY	Project	Vessel	Load #	Date	Species	Take Conditions
SAC	FY22	Charleston Harbor	Ellis Island	30	03/30/22	KEMP'S RIDLEY	Fresh Dead
SAW	FY22	Holden Beach, NC	R.N. Weeks	302	03/30/22	KEMP'S RIDLEY	Fresh Dead
SAC	FY22	Charleston Harbor	Ellis Island	39	04/03/22	KEMP'S RIDLEY	Fresh Dead
SAC	FY22	Charleston Harbor	Ellis Island	39	04/03/22	LOGGERHEAD	Fresh Dead
SAC	FY22	Charleston Harbor	Ellis Island	39	04/03/22	LOGGERHEAD	Fresh Dead
SAC	FY22	Charleston Harbor	Ellis Island	39	04/03/22	ATLANTIC STURGEON	Fresh Dead
SAW	FY22	Holden Beach, NC	R.N. Weeks	303	04/12/22	KEMP'S RIDLEY	Fresh Dead
SAJ	FY22	Palm Beach Harbor	Atchafalaya	222	04/15/22	LOGGERHEAD	Fresh Dead
SAW	FY22	Wilmington Harbor	Ellis Island	83	04/15/22	LOGGERHEAD	Fresh Dead
SAW	FY22	Wilmington Harbor	Ellis Island	97	04/17/22	KEMP'S RIDLEY	Fresh Dead
SAW	FY22	Oak Island	Dodge Island	210	04/18/22	LOGGERHEAD	Fresh Dead
SAW	FY22	Dare County, NC - Town of Kill Devil Hills	R.N. Weeks	152	07/18/22	GREEN	Fresh Dead

APPENDIX E. FY22 RELOCATION TRAWLING EFFORT AND CAPTURES

Table E-1. Relocation Trawling Effort

FY	Project	District	Area	Trawler	Start Date	End Date	Surface Temp Range (°C)	Tow #'s	~ Trawl Days	Loggerhead	Kemp's	Green	Atlantic	Sturgeon	Comments
FY21	Bogue Banks	SAW	ODMDS	Lady Paige	2/21/21	4/26/21	10.6 - 18.7	78	56	9	4	0	16	16	
FY21	Kings Bay	SAJ	Channel	Jessica Marie	3/15/21	3/24/21	15.5 - 16.7	1 - 143	7	8	4	1	31	31	No trawling 03/21-22: adverse weather
FY21	Bogue Banks	SAW	ODMDS	Reva Rose	3/16/21	4/24/21	13.3 - 18.7	1 - 1102	33	5	6	0	1	1	
FY21	Oak Island	SAW	Jay Bird Shoals Zone 2	Jessica Marie	5/1/21	5/22/21	19.7 - 23.3	1 - 505	18	15	19	0	2	2	
FY21	Morehead City	SAW	Reach A	Jessica Marie/ Reva Rose	5/27/21	6/15/21	23.1 - 25.9	1 - 465	16	6	3	0	0	0	Reva Rose replaced Jessica Marie 05/30/21
FY21	Mayport	SAJ	Channel	Reva Rose	8/12/21	9/9/21	27.2 - 30.0	1 - 729	27	10	1	0	0	0	
FY22	Holden Beach	SAW	Borrow Area 1 & 2	Brenda K	1/3/22	1/30/22	8.9 - 14.5	1 - 184	20	0	0	0	0	0	Open Net Trawling
FY22	Holden Beach	SAW	Borrow Area 1 & 2	Jessica Marie	1/6/22	1/30/22	8.9 - 13.6	1 - 161	15	0	0	0	0	0	Open Net Trawling
FY22	Oak Island	SAW	Jay Bird Shoals/ Central Reach Borrow Areas	Lady Paige	2/16/22	4/7/22	10.0 - 16.7	1 - 1491	43	4	5	0	24	5	0
FY22	Kings Bay	SAJ	Entrance Channel	Shawna Lucille	2/20/22	3/31/22	13.0 - 20.0	1 - 826	34	5	28	1	6	28	
FY22	Kings Bay	SAJ	Entrance Channel	Lady Ann	3/4/22	3/23/22			19	2	5	0	0	5	
FY22	Charleston Harbor	SAC	Entrance Channel Station	Kensley Grace	3/18/22	3/18/22	16.4	1 - 20	1	0	0	0	0	0	

FY	Project	District	Area	Trawler	Start Date	End Date	Surface Temp Range (°C)	Tow #'s	~ Trawl Days	Loggerhead	Kemp's	Green	Atlantic	Sturgeon	Comments
FY22	Brunswick Harbor	SAS	Entrance Channel	Kensley Grace	3/20/22	3/24/22	18.1 - 19.2	1 - 100	4	3	9	0	0	9	
FY22	Charleston Harbor	SAC	Entrance Channel	Kensley Grace	3/26/22	4/4/22	17.1 - 18.6	21 - 170	9	1	4	0	0	4	
FY22	Holden Beach	SAW	Borrow Area 2	Brenda K	3/26/22	4/5/22	15.6 - 16.7	1 - 208	7	3	2	0	3	2	
FY22	Holden Beach	SAW	Borrow Area 2	Jessica Marie	3/26/22	4/7/22	15.6 - 16.7	1 - 261	9	2	3	0	7	3	
FY22	Wilmington Harbor	SAW	Bald Head Shoals Reach 3	Jessica Marie	5/9/22	5/30/22	20.8 - 24.4	349 - 773	17	20	1	2	1	1	
FY22	Kill Devil Hills	SAW	Borrow Area A	Jessica Marie/ Simple Man	6/12/22	7/19/22	22.2 - 26.4	1 - 783	32	15	0	1	0	0	
FY22	Avon/Buxton	SAW	Borrow Area	Simple Man, Jessica Marie	6/18/22	8/16/22	25.0-28.3	1-1079	38	15	14	0	0	14	
FY22	Morehead City Harbor	SAW	MHC, Reach A	Shawna Lucille	7/1/22	8/2/22	27.1 - 29.7	1 - 452	24	13	6	0	0	6	Delays: weather, resupply, etc. ~24 days of trawling
FY22	Nags Head	SAW	Borrow Area	#1 Jessica Marie	7/22/22	8/25/22	22.3-27.9	1-532	19	0	1	4	0	1	
FY22	Kill Devil Hills	SAW	Borrow Area A	Simple Man,	8/20/22	10/6/22	20.6 - 26.8	784 - 1629	33	8	0	0	0	0	Work in FY23 in FY23 Report.
FY22	Kill Devil Hills	SAW	Borrow Area A	Mister B	9/17/22	10/6/22	20.6 - 25.4	1 - 293	10	3	0	0	0	0	Work in FY23 in FY23 Report.
FY22	Brunswick Harbor	SAS	Entrance Channel	Kensley Grace	3/20/22	3/24/22	18.1 - 19.2	1 - 100	4	3	9	0	0	9	

FY	Project	District	Area	Trawler	Start Date	End Date	Surface Temp Range (°C)	Tow #'s	~ Trawl Days	Loggerhead	Kemp's	Green	Atlantic	Sturgeon	Comments
FY22	Wilmington Harbor	SAW	Bald Head Shoals Reach 3	#1 Brenda K/ My Girls/ Lady Paige	4/5/22	4/21/22	16.1 - 18.7	1 - 348	13	3	1	1	1	1	My Girls replaced Brenda K 04/08/22. Lady Paige replaced My Girls 04/21/22.
FY22	Avon/Buxton	SAW	Borrow Area	Mister B	7/7/22	8/10/22	25.0-27.8	1-939	32	1	0	0	0	0	

Table E-2. Relocation Trawling Captures[7]

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Avon-Buxton	Simple Man	6/21/22	84	804	834	35.3558	-75.4547	25	Cc	83	FFG663	FFG664	989001039936188	
Avon-Buxton	Simple Man	6/22/22	117	618	636	35.3622	-75.4447	26.1	Cc	103.8	FFG665	FFG666	989001039936168	Male
Avon-Buxton	Simple Man	6/24/22	170	124	154	35.3574	-75.4542	25.6	Cc	98.8	FFG667	FFG669	407B63A29	Previously PIT tag- another project.
Avon-Buxton	Simple Man	6/25/22	215	737	807	35.3567	-75.4528	25.6	Cc	74.7	FFG670	FFG671	989002011330594	
Avon-Buxton	Simple Man	6/30/22	387	505	535	35.2586	-75.4833	25.6	Lk	61.9	FFG672	FFG673	989001040620443	
Avon-Buxton	Simple Man	7/4/22	460	1118	1148	35.2585	-75.4805	26.1	Lk	55.3	FFG674	FFG675	989001039936175	
Avon-Buxton	Simple Man	7/5/22	502	1744	1814	35.2591	-75.4786	26.1	Cc	102	FFG680	FFG681	989001039936256	Male. Missing ~50% LFF Wound is healing.

[7] Green sea turtle (Chelonia mydas [Cm]), (Kemp's Ridley sea turtle (Lepidochelys kempii [Lk]), leatherback sea turtle (Dermochelys coriacea [DC]), loggerhead sea turtle (Caretta caretta [Cc]), Atlantic sturgeon (AO), Distinct Population Segment (DPS), South Atlantic, left front flipper (LFF), right front flipper (RFF)

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Avon-Buxton	Simple Man	7/5/22	503	1825	1855	35.2606	-75.4800	26.1	Lk	67.5	FFG682	FFG683	989001039936177	
Avon-Buxton	Mister B	7/7/22	3	1816	1845	35.3580	-75.4410	26.7	Cc	97.5	FFG507	FFG508	989001039936212	
Avon-Buxton	Simple Man	7/8/22	533	747	817	35.2550	-75.4814	27.1	Lk	62.4	FFG519	FFG520	989001040620530	
Avon-Buxton	Simple Man	7/8/22	548	2050	2120	35.2547	-75.4701	27.1	Lk	59.5	FFG531	FFG532	989001040620482	
Avon-Buxton	Simple Man	7/10/22	569	1003	1033	35.2535	-75.4778	26.9	Lk	56.9	FFG533	FFG534	989001040620523	Missing left rear flipper. Old wound, healed.
Avon-Buxton	Simple Man	7/17/22	695	645	715	35.2599	-75.4807	27.3	Cc	99.4	FFG535	FFG536	989001040620527	Notches out of beach, upper and lower
Avon-Buxton	Simple Man	7/17/22	697	1015	1045	35.2589	-75.4741	27.3	Lk	53.4	FFG522	FFG523	989001040620507	
Avon-Buxton	Simple Man	7/17/22	707	2140	2210	35.2611	-75.4787	27.3	Cc	91.2	FFG524	FFG525	989001040620529	
Avon-Buxton	Jessica Marie	8/4/22	789	1435	1505	35.3566	-75.4581	27.1	Cc	65.4	FFL212	FFL213	989001040620453	
Avon-Buxton	Simple Man	8/4/22	783	924	954	35.3542	-75.4560	27.1	Cc	89.8	FFL210	FFL211	989001040620455	
Avon-Buxton	Jessica Marie	8/6/22	845	1430	1500	35.3577	-75.4574	26.7	Cc	89.8	FFL214	FFL211	989001040620455	Recapture from 08/04/22, Tow #783. Relocated 5+ miles from the Borrow Area.
Avon-Buxton	Jessica Marie	8/6/22	852	2310	2340	35.3587	-75.4564	26.7	Cc	111.9	FFL215	FFL216	989001040620456	
Avon-Buxton	Jessica Marie	8/8/22	885	131	159	35.3568	-75.4588	26.6	Cc	74.3	FFG670	FFG671	989001039936162*	Recapture from 06/25/22, Tow #215. *PIT Tag # read is different than was applied.
Avon-Buxton	Jessica Marie	8/11/22	918	603	633	35.2622	-75.4737	27.3	Lk	66.5	FFL217	FFL218	989001040620544	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Avon-Buxton	Jessica Marie	8/11/22	935	1941	2011	35.2513	-75.4739	27.3	Cc	83.3	FFL219	FFL220	989001040620472	
Avon-Buxton	Jessica Marie	8/12/22	956	1625	1655	35.2570	-75.4774	27.4	Lk	56.3	FFL221	FFL259	989001040620477	
Avon-Buxton	Jessica Marie	8/12/22	958	1952	2022	35.2526	-75.4794	27.4	Cc	103.5	FFL260	FFL263	989001040620466	Male
Avon-Buxton	Jessica Marie	8/13/22	969	418	448	35.2545	-75.4746	27.6	Lk	65	FFL264	FFL265	989001040620464	
Avon-Buxton	Jessica Marie	8/14/22	1025	2004	2034	35.2566	-75.4775	27.7	Lk	64.3	FFL266	FFL267	989001040620473	
Avon-Buxton	Jessica Marie	8/15/22	1039	735	805	35.2556	-75.4834	28	Lk	65.5	FFL268	FFL269	989001040620452	Carapace-moderate deformities with bone structure. Turtle healthy/ full mobility.
Avon-Buxton	Jessica Marie	8/15/22	1056	2049	2119	35.2516	-75.4778	28	Lk	63.4	FFL270	FFL272	989001040620513	Male
Avon-Buxton	Jessica Marie	8/16/22	1069	757	827	35.2578	-75.4772	28.3	Cc	104.8	FFL280	FFL281	989001040620460	Male
Avon-Buxton	Jessica Marie	8/16/22	1077	1426	1456	35.2522	-75.4767	28.3	Lk	64.6	FFL282	FFL283	989001040620541	
Bogue Banks	Lady Paige	2/24/21	84	0444	0514	34.6395	-76.6952	10.6	Ao Carolina DPS	153	-	-	-	Not tagged-tagging kit delayed by ice storm across SE.
Bogue Banks	Lady Paige	2/27/21	207	0607	0637	34.6433	-76.6991	11.7	Ao NY Bight DPS	108	-	-	900067000008127	Previously tagged - another project.
Bogue Banks	Lady Paige	3/2/21	331	1243	1313	34.6437	-76.6971	12.2	Ao SA DPS	107	-	-	989001032046457	
Bogue Banks	Lady Paige	3/5/21	459	1736	1806	34.6448	-76.6878	12.2	Ao Chesapeake DPS	120.7	-	-	989001032046440	
Bogue Banks	Lady Paige	3/10/21	655	1500	1530	34.6487	-76.7002	11.7	Cc	58.3	KKS967	KKS968	989001033214091	PIT tag applied in right front shoulder.

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag- LFF	Flipper Tag- RFF	PIT Tag	Comments
Bogue Banks	Lady Paige	3/12/21	729	1200	1230	34.6399	-76.7018	12.8	Ao Chesapeake DPS	180.0	-	-	900118001183745	Previously PIT tag- another project.
Bogue Banks	Lady Paige	3/13/21	776	1617	1647	34.6433	-76.6863	12.8	Ao SA DPS	85.1	-	-	989001033214066	
Bogue Banks	Lady Paige	3/15/21	831	0251	0321	34.6459	-76.6871	13.3	Cc	70.3	KKS969	KKS967	989001033214074	PIT tag applied in right front shoulder.
Bogue Banks	Lady Paige	3/16/21	869	0250	0320	34.6473	-76.7044	13.3	Lk	49.4	KKS977	KKS978	989001033217074	PIT tag- right front shoulder.
Bogue Banks	Reva Rose	3/21/21	95	2136	2206	34.6459	-76.6849	12.8	Lk	42.3	KKT734	KKT735	989001032046452	PIT tag- right front shoulder.
Bogue Banks	Lady Paige	3/22/21	993	0923	0953	34.6445	-76.6962	12.8	Lk	43.5	KKS979	KKS980	989001033214067	PIT tag- right front shoulder.
Bogue Banks	Reva Rose	3/27/21	235	0708	0738	34.6372	-76.6923	16.0	Cc	71.8	KKT736	KKT737	989001032046381	PIT tag applied in right front shoulder.
Bogue Banks	Reva Rose	3/27/21	244	1442	1512	34.6403	-76.7053	16.0	Lk	30.2	KKT738	KKT739	989001032046367	PIT tag- right front shoulder.
Bogue Banks	Lady Paige	3/28/21	1147	0851	0921	34.6393	-76.6892	16.8	Cc	62.4	KKS981	KKS983	989001033214110	
Bogue Banks	Lady Paige	3/29/21	1159	1314	1344	34.6420	-76.6882	17.0	Ao Canadian River DPS	206.4	-	-	989001033214160	
Bogue Banks	Lady Paige	3/29/21	1160	1503	1533	34.6422	-76.6877	17.0	Ao NY Bight DPS	216.9	-	-	989001033214000	
Bogue Banks	Lady Paige	3/30/21	1175	0156	0226	34.6427	-76.6839	17.0	Cc	68.5	KKS984	KKS985	989001033214030	
Bogue Banks	Lady Paige	3/31/21	1238	2152	2222	34.6390	-76.6944	17.5	Ao Chesapeake DPS	167.0	-	-	989001032046370	
Bogue Banks	Lady Paige	4/2/21	1275	1041	1111	34.6477	-76.6953	16.3	Cc	79.9	KKS986	KKS987	989001033214017	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag- LFF	Flipper Tag- RFF	PIT Tag	Comments
Bogue Banks	Reva Rose	4/3/21	455	0829	0901	34.6394	-76.7025	16.0	Cc	82.7	KKT740	KKT741	989001033214111	PIT tag applied- right front shoulder
Bogue Banks	Lady Paige	4/6/21	1406	1109	1139	34.6441	-76.6981	16.0	Cc	66.3	KKS988	KKS989	989001033214171	
Bogue Banks	Lady Paige	4/7/21	1449	1910	1939	34.6406	-76.6987	16.2	Ao SA DPS	209.1	-	-	989001033214127	
Bogue Banks	Lady Paige	4/9/21	1510	1224	1254	34.6477	-76.6853	17.4	Cc	72.2	KKS990	KKS991	989001033214022	
Bogue Banks	Lady Paige	4/9/21	1524	2321	2351	34.6376	-76.7040	17.4	Ao Carolina DPS	189.3	-	-	989001033214068	
Bogue Banks	Lady Paige	4/10/21	1528	0248	0318	34.6443	-76.7032	17.4	Ao SA DPS	166.2	-	-	989001033214088	
Bogue Banks	Lady Paige	4/10/21	1530	0456	0526	34.6456	-76.6858	17.4	Cc	77.2	KKS992	KKS993	989001033214078	
Bogue Banks	Reva Rose	4/10/21	716	1748	1818	34.6393	-76.7039	17.2	Lk	60.1	KKT742	KKT743	989001033214100	PIT tag- right front shoulder.
Bogue Banks	Lady Paige	4/13/21	1589	0045	0115	34.6462	-76.7060	18.2	Ao SA DPS	189.2	-	-	-	PIT tag not applied - needle tip snapped off while tagging
Bogue Banks	Lady Paige	4/13/21	1595	0517	0547	34.6491	-76.6998	18.2	Ao SA DPS	174.1	-	-	989001033214018	
Bogue Banks	Lady Paige	4/13/21	1595	0517	0547	34.6491	-76.6998	18.2	Lk	54.2	KKS994	KKS995	989001033214104	
Bogue Banks	Lady Paige	4/13/21	1600	1006	1036	34.6474	-76.6817	18.2	Ao Carolina DPS	110.9	-	-	989001033214096	
Bogue Banks	Reva Rose	4/14/21	825	1952	2022	34.6459	-76.6997	18.6	Lk	52.3	KKH938	KKH939	989001033213988	
Bogue Banks	Reva Rose	4/16/21	858	1106	1134	34.6395	-76.6943	18.2	Ao NY Bight DPS	246.0	-	-	989001032046361	
Bogue Banks	Lady Paige	4/17/21	1729	1623	1652	34.6489	-76.7005	18.2	Ao SA DPS	184	-	-	989001033214048	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag- LFF	Flipper Tag- RFF	PIT Tag	Comments
Bogue Banks	Reva Rose	4/18/21	920	0508	0538	34.6429	-76.6852	18.5	Lk	62.1	KKH940	KKH941	989001033214064	
Bogue Banks	Reva Rose	4/18/21	921	0820	0850	34.6468	-76.6819	18.5	Cc	70	KKH944	KKH945	989001033214063	2 of 2 turtles- same tow.
Bogue Banks	Reva Rose	4/18/21	921	0820	0850	34.6468	-76.6819	18.5	Lk	63.2	KKH942	KKH943	989001032046335	1 of 2 turtles same tow.
Bogue Banks	Reva Rose	4/19/21	968	1901	1931	34.6389	-76.6940	18.6	Cc	75.8	KKH946	KKS964	989001033214003	
Bogue Banks	Lady Paige	4/21/21	1859	0547	0616	34.6377	-76.6956	18.5	Cc	93.1	KKS996	KKS997	989001033214104	
Bogue Banks	Reva Rose	4/22/21	1041	1549	1620	34.6476	-76.6896	18.6	Cc	82.2	KKT744	KKT745	989001033213990	
Bogue Banks	Lady Paige	4/23/21	1914	1334	1404	34.6465	-76.6913	18.2	Lk	25.5	-	-	989001032046302	Too small for inconel tags.
Brunswick	Kensley Grace	3/20/22	11	2257	2327	31.0838	-81.3099	18.1	Lk	34.3	FFG405	FFG406	989001039936201	
Brunswick	Kensley Grace	3/21/22	32	1513	1543	31.0836	-81.3133	18.1	Lk	43.7	FFG607	FFG608	989001039936255	
Brunswick	Kensley Grace	3/21/22	34	1722	1740	31.0831	-81.3082	18.1	Lk	50.3	FFG409	FFG410	989001039936182	
Brunswick	Kensley Grace	3/21/22	36	2017	2031	31.1018	-81.3429	18.1	Lk	40.2	FFG411	FFG412	989001039936169	
Brunswick	Kensley Grace	3/21/22	39	2313	2343	31.1085	-81.3519	18.1	Cc	67.1	FFG413	FFG414	989001039936249	
Brunswick	Kensley Grace	3/22/22	44	330	400	31.1032	-81.3425	18.1	Lk	47.8	FFG415	FFG416	989001039936233	
Brunswick	Kensley Grace	3/22/22	49	644	714	31.0949	-81.3312	18.1	Cc	71.5	FFG417	FFG418	989001039936178	
Brunswick	Kensley Grace	3/22/22	53	1035	1105	31.0840	-81.3125	18.1	Cc	63.9	FFG419	FFG420	989001039936181	
Brunswick	Kensley Grace	3/22/22	53	1035	1105	31.0840	-81.3125	18.1	Lk	30	FFG421	FFG422	989001039936163	
Brunswick	Kensley Grace	3/22/22	61	1622	1652	31.0816	-81.3088	18.1	Lk	46.2	FFG423	FFG424	989001039936218	
Brunswick	Kensley Grace	3/23/22	74	216	245	31.0783	-81.3030	19.1	Lk	56.6	FFG425	FFG426	989001039936167	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Brunswick	Kensley Grace	3/23/22	77	420	450	31.0949	-81.3312	19.1	Lk	24.3	-	-	989001039936213	
Charleston	Kensley Grace	3/26/22	21	701	731	32.7172	-79.7860	17.6	Lk	51.2	FFG 427	FFG428	989001039936180	
Charleston	Kensley Grace	4/1/22	108	1502	1532	32.7198	-79.7928	18.6	Lk	34.7	FFA 855	FFA 856	989001039936166	
Charleston	Kensley Grace	4/2/22	128	744	814	32.7074	-79.7701	17.8	Lk	34.9	FFA 864	FFA 865	989001039936190	
Charleston	Kensley Grace	4/3/22	156	1652	1708	32.7010	-79.7733	17.8	Cc	77.1	FFG 431	FFG 432	989001039936237	
Charleston	Kensley Grace	4/4/22	166	257	327	32.6978	-79.7475	17.8	Lk	28.4	FFG 433	FFG 434	989001039936194	
Holden Beach	Brenda K	3/26/22	1	1202	1232	33.8650	-78.2832	16.7	Cc	78	FFA821	FFA822	989001039936349	
Holden Beach	Jessica Marie	3/26/22	1	1214	1244	33.8798	-78.2922	16.7	Ao Carolina DPS	176.9	-	-	989001039936321	
Holden Beach	Jessica Marie	3/26/22	13	2122	2152	33.8791	-78.2886	16.7	Ao SA DPS	189	-	-	989001039936325	
Holden Beach	Brenda K	3/27/22	25	538	606	33.8637	-78.2828	16.1	Ao DPS unknown - sample not received	133.2	-	-	0A181B478E	Previously tagged - another project.
Holden Beach	Jessica Marie	3/27/22	44	2122	2152	33.8753	-78.2895	16.1	Ao SA DPS	148.8	-	-	900236000056215	Previously tagged - another project.
Holden Beach	Brenda K	3/28/22	60	1024	1054	33.8653	-78.2876	16.1	Cc	71	FFA823	FFA824	989001039936356	
Holden Beach	Jessica Marie	3/28/22	56	645	715	33.8760	-78.2801	16.1	Ao SA DPS	188.5	-	-	989001039936353	
Holden Beach	Brenda K	3/29/22	84	413	443	33.8783	-78.2846	15.6	Cc	60.2	FFA825	FFA826	989001039936331	
Holden Beach	Jessica Marie	3/29/22	103	1608	1638	33.8771	-78.2909	15.6	Ao Carolina DPS	206.9	-	-	989001039936289	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Holden Beach	Brenda K	3/30/22	128	1135	1205	33.8792	-78.2875	15.6	Ao SA DPS	173.5	-	-	989001039097759	
Holden Beach	Brenda K	3/30/22	131	1500	1530	33.8763	-78.2847	15.6	Lk	35	-	-	989001039097830	Too small for flipper tags.
Holden Beach	Jessica Marie	3/30/22	122	641	711	33.8715	-78.2859	15.6	Ao SA DPS	108.7	-	-	989001039936318	
Holden Beach	Jessica Marie	3/30/22	134	1605	1635	33.8771	-78.2855	15.6	Cc	73.9	FFG551	FFG552	989001039936285	
Holden Beach	Brenda K	4/1/22	148	1238	1308	33.8709	-78.2841	15.6	Lk	28.1	-	-	989001039936355	Too small for flipper tags.
Holden Beach	Jessica Marie	4/1/22	151	1206	1236	33.8670	-78.2823	15.6	Ao Chesapeake DPS	99.3	-	-	989001039097834	
Holden Beach	Jessica Marie	4/1/22	151	1206	1236	33.8670	-78.2823	15.6	Lk	46.2	FFA659	FFA660	989001039936252	
Holden Beach	Jessica Marie	4/3/22	188	1343	1413	33.8729	-78.2905	16.1	Lk	44.3	FFA661	FFA662	989001039097776	
Holden Beach	Brenda K	4/4/22	188	2011	2041	33.8794	-78.2853	16.1	Ao Carolina DPS	207.4	-	-	989001039936316	
Holden Beach	Jessica Marie	4/4/22	234	2042	2112	33.8662	-78.2814	16.1	Lk	52.3	FFG609	FFG610	989001039097780	
Holden Beach	Jessica Marie	4/5/22	253	1110	1140	33.8764	-78.2902	16.1	Cc	68.5	FFG553	FFG554	989001039936235	
Holden Beach	Jessica Marie	4/5/22	253	1110	1140	33.8764	-78.2902	16.1	Cc	68.5	FFG553	FFG554	989001039936235	
Holden Beach	Jessica Marie	4/8/22	267	1235	1304	33.8757	-78.2911	16.5	Lk	67.3	FFG555	FFG556	989001039936345	
Holden Beach	Jessica Marie	4/10/22	290	1651	1722	33.8732	-78.2857	16.7	Cc	82.3	FFG557	FFG558	989001039936347	
Holden Beach	Jessica Marie	4/10/22	294	2051	2121	33.8665	-78.2878	16.7	Lk	50.2	FFG568	FFG569	989001039936288	
Holden Beach	Jessica Marie	4/11/22	307	722	752	33.2815	-78.2894	16.7	Lk	67.7	FFG570	FFG571	989001039936292	
Holden Beach	Jessica Marie	4/11/22	323	1910	1940	33.8660	-78.2829	16.7	Lk	42.8	FFG572	FFG573	989001039936187	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Holden Beach	Brenda K	4/12/22	288	1627	1657	33.8710	-78.2804	16.7	Lk	24.7	-	-	989001039936297	Too small for flipper tags.
Kill Devil Hills	Jessica Marie	6/23/22	275	1757	1827	36.0087	-75.5473	23.1	Cc	96.7	FFG564	FFG565	989001039936311	Male
Kill Devil Hills	Jessica Marie	7/2/22	458	553	623	36.0145	-75.5477	24.7	Cc	84.2	FFG566	FFG567	989001039936275	
Kill Devil Hills	Jessica Marie	7/13/22	624	1141	1210	36.0100	-75.5573	25	Cc	96.9	FFL234	FFL235	989001040620459	
Kill Devil Hills	Jessica Marie	7/14/22	646	1109	1138	36.0170	-75.5484	24.8	Cc	71.4	FFL236	FFL237	989001040620468	
Kill Devil Hills	Jessica Marie	7/14/22	650	1500	1530	36.0156	-75.5556	24.8	Cc	105.1	FFL238	FFL239	989001040620493	
Kill Devil Hills	Jessica Marie	7/15/22	685	1701	1731	36.0316	-75.5530	24.7	Cc	111.5	FFL240	FFL241	989001040620451	
Kill Devil Hills	Jessica Marie	7/16/22	701	810	840	36.0346	-75.5507	24.8	Cc	107.4	FFL242	FFL243	989001040620508	
Kill Devil Hills	Jessica Marie	7/16/22	703	1100	1129	36.0345	-75.5520	24.8	Cc	72.7	FFL203	FFL244	989001040620462	
Kings Bay	Jessica Marie	3/15/21	4	1052	1122	30.7161	-81.3571	15.5	Lk	37	KKT732	KKT733	989001031359153	Healing scars on carapace and plastron
Kings Bay	Jessica Marie	3/15/21	8	1325	1351	30.7112	-81.3558	15.5	Ao SA DPS	134	-	-	989001031359064	
Kings Bay	Jessica Marie	3/15/21	8	1325	1351	30.7112	-81.3558	15.5	Ao UNK DPS	112	-	-	989001006688115	Previously tagged - another project.
Kings Bay	Jessica Marie	3/16/21	24	312	342	30.7107	-81.3767	16.7	Cc	73	KKT730	KKT731	989001033214027	
Kings Bay	Jessica Marie	3/16/21	26	607	637	30.7103	-81.3533	16.7	Ao UNK DPS	122	-	-	989001028493165	
Kings Bay	Jessica Marie	3/16/21	27	708	738	30.7104	-84.7006	16.7	Ao UNK DPS	107	-	-	989001033214004	1 of 4- Time constraints, no genetic sample or tags applied.
Kings Bay	Jessica Marie	3/16/21	27	708	738	30.7104	-84.7006	16.7	Ao UNK DPS	133	-	-		4 of 4-Time constraints-no

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
														genetic sample or tags applied.
Kings Bay	Jessica Marie	3/16/21	27	708	738	30.7104	-84.7006	16.7	Ao UNK DPS	160	-	-		3 of 4-Time constraints-no genetic sample or tags applied.
Kings Bay	Jessica Marie	3/16/21	27	708	738	30.7104	-84.7006	16.7	Ao UNK DPS	197	-	-		2 of 4- Time constraints-no genetic sample or tags applied.
Kings Bay	Jessica Marie	3/16/21	27	708	738	30.7104	-84.7006	16.7	Cc	66	KKH982	KKH983	989001028493083	
Kings Bay	Jessica Marie	3/16/21	28	849	919	30.7120	-81.3653	16.7	Ao SA DPS	137	-	-	989001001956734	Previously Pit Tagged
Kings Bay	Jessica Marie	3/16/21	29	1007	1037	30.7114	-81.3657	16.7	Ao SA DPS	146	-	-	989001031359079	
Kings Bay	Jessica Marie	3/16/21	30	1112	1142	30.7115	-81.3672	16.7	Ao SA DPS	107	-	-	989001004299301	Previously tagged, 1 of 2 in this tow
Kings Bay	Jessica Marie	3/16/21	30	1112	1142	30.7115	-81.3672	16.7	Ao SA DPS	107	-	-	989001033214008	2 of 2 in this tow
Kings Bay	Jessica Marie	3/16/21	30	1112	1142	30.7115	-81.3672	16.7	Lk	24	-	-	989001029735129	Caught with 2 sturgeon. Too small for inconel tags
Kings Bay	Jessica Marie	3/16/21	32	1337	1407	30.7120	-81.3431	16.7	Ao SA DPS	219	-	-	989001033214042	
Kings Bay	Jessica Marie	3/16/21	33	1450	1521	30.7118	-81.3509	16.7	Ao SA DPS	180	-	-	989001033214040	
Kings Bay	Jessica Marie	3/16/21	33	1450	1521	30.7118	-81.3509	16.7	Ao UNK DPS	148	-	-	A13092E4F	Previously tagged, 1 of 2 in tow
Kings Bay	Jessica Marie	3/16/21	34	1609	1639	30.7109	-81.3617	16.7	Cc	74	KKS954	KKS955	989001033214036	
Kings Bay	Jessica Marie	3/16/21	39	2100	2130	30.7106	-81.3413	16.7	Ao SA DPS	145	-	-	989001033214050	1 of 2 in this tow

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Kings Bay	Jessica Marie	3/16/21	39	2100	2130	30.7106	-81.3413	16.7	Ao SA DPS	200	-	-	989001033214021	
Kings Bay	Jessica Marie	3/16/21	39	2100	2130	30.7106	-81.3413	16.7	Cc	90	KKH984	KKH985	989001033214045	
Kings Bay	Jessica Marie	3/16/21	40	2330	2355	30.7116	-81.3485	16.7	Ao SA DPS	162	-	-	989001033214069	1 of 2 in this tow
Kings Bay	Jessica Marie	3/16/21	40	2330	2355	30.7116	-81.3485	16.7	Ao SA DPS	176	-	-	989001033214072	2 of 2 in this tow
Kings Bay	Jessica Marie	3/17/21	47	510	540	30.7107	-81.3816	16.1	CM	32	-	-	989001033213982	Too small for flipper tags
Kings Bay	Jessica Marie	3/17/21	51	906	937	30.7118	-81.3535	16.1	Ao SA DPS	161	-	-	989001033214016	
Kings Bay	Jessica Marie	3/17/21	53	1100	1130	30.7112	-81.3794	16.1	Ao SA DPS	107	-	-	989001033214054	
Kings Bay	Jessica Marie	3/17/21	55	1249	1320	30.7117	-81.3556	16.1	Ao SA DPS	99	-	-	989001033214059	2 of 2 in this tow
Kings Bay	Jessica Marie	3/17/21	55	1249	1320	30.7117	-81.3556	16.1	Ao SA DPS	108	-	-	989001004299370	1 of 2 in this tow
Kings Bay	Jessica Marie	3/17/21	60	1641	1712	30.7115	-81.3534	16.1	Cc	72	KKS956	KKS957	989001033214039	
Kings Bay	Jessica Marie	3/17/21	61	1718	1748	30.7119	-81.3273	16.1	Ao SA DPS	166	-	-	A4A0D73237C	Previously tagged
Kings Bay	Jessica Marie	3/17/21	66	2145	2215	30.7105	-81.3342	16.1	Ao SA DPS	165	-	-	989001033213991	
Kings Bay	Jessica Marie	3/18/21	72	228	258	30.7128	-81.3228	16.7	Lk	53	KKS958	KKS959	989001033213986	
Kings Bay	Jessica Marie	3/18/21	75	605	637	30.7084	-81.3729	16.7	Ao SA DPS	91	-	-	989001033213979	
Kings Bay	Jessica Marie	3/18/21	75	605	637	30.7084	-81.3729	16.7	Cc	89	KKS960	KKS961	989001033213995	
Kings Bay	Jessica Marie	3/18/21	79	919	949	30.7105	-81.3874	16.7	Lk	37	-	-	989001033214002	Too small for flipper tags
Kings Bay	Jessica Marie	3/18/21	83	1306	1336	30.7100	-81.3350	16.7	Cc	92	KKS962	KKS963	989001033213984	
Kings Bay	Jessica Marie	3/18/21	84	1901	1932	30.7119	-81.3500	16.7	Ao SA DPS	103	-	-	989001033214057	2 of 3 caught in this tow

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Kings Bay	Jessica Marie	3/18/21	84	1901	1932	30.7119	-81.3500	16.7	Ao SA DPS	104	-	-	989001033213981	1 of 3 caught in this tow
Kings Bay	Jessica Marie	3/18/21	84	1901	1932	30.7119	-81.3500	16.7	Ao UNK DPS	150	-	-		3 of 3 caught, time limit prevented work up of fish. Est length.
Kings Bay	Jessica Marie	3/18/21	89	2113	2145	30.7097	-81.3668	16.7	Ao SA DPS	98	-	-	989001033214026	
Kings Bay	Jessica Marie	3/19/21	112	1533	1604	30.7115	-81.3533	15.5	Ao SA DPS	152	-	-	989000033214040	
Kings Bay	Jessica Marie	3/19/21	114	1727	1758	30.7125	-81.3395	15.5	Cc	69	KKS965	KKS966	989001033214007	
Kings Bay	Jessica Marie	3/23/21	130	1754	1824	30.7094	-81.3785	14.4	Ao SA DPS	126	-	-	989001033213998	
Kings Bay	Shawna Lucille	2/21/22	13	455	525	30.7118	-84.7424	15.1	Cc	59.3	FFG 601	FFG 602	989001039936236	
Kings Bay	Shawna Lucille	2/21/22	15	742	807	30.7100	-81.4220	15.1	Ao SA DPS	148.3	-	-	989001039936203	
Kings Bay	Shawna Lucille	2/21/22	21	1304	1329	30.7090	-81.3616	15.1	Ao SA DPS	123.9	-	-	989001039936253	
Kings Bay	Shawna Lucille	2/21/22	29	2010	2040	30.7110	-81.4161	13	Ao SA DPS	95.2	-	-	989001039936248	
Kings Bay	Shawna Lucille	2/22/22	34	45	115	30.7113	-81.3688	13.1	Ao SA DPS	96.9	-	-	989001039936245	
Kings Bay	Shawna Lucille	2/23/22	80	1512	1542	30.7119	-81.3534	13.6	Lk	49.3	FFG 603	FFG 604	989001039936221	
Kings Bay	Shawna Lucille	2/24/22	110	1422	1452	30.7098	-81.4101	13.6	Lk	40.5	FFG 605	FFG 606	989001039936250	
Kings Bay	Shawna Lucille	2/25/22	141	1401	1431	30.7145	-81.3887	13.6	Ao SA DPS	182	-	-	989001039936205	
Kings Bay	Shawna Lucille	3/3/22	247	255	325	30.7122	-81.3493	14.8	Lk	36.5	FFG 607	FFG 608	989001039936329	
Kings Bay	Shawna Lucille	3/3/22	260	1538	1618	30.7122	-81.3493	14.8	Ao SA DPS	114.8	-	-	989001039097762	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Kings Bay	Shawna Lucille	3/4/22	279	1102	1142	30.7141	-81.3498	15.3	Cc	70.5	FFA 603	FFA 604	989001039097829	
Kings Bay	Shawna Lucille	3/5/22	292	255	335	30.7116	-81.3644	15.5	Lk	36.2	FFA 605	FFA 606	989001039097807	
Kings Bay	Shawna Lucille	3/5/22	298	947	1023	30.7145	-81.3532	15.5	Lk	33.7	-	-	985113004543332	
Kings Bay	Shawna Lucille	3/5/22	299	1033	1113	30.7147	-81.3565	15.5	Lk	51.7	FFA 607	FFA 608	989001039097758	
Kings Bay	Lady Anna	3/6/22	76	1635	1705	30.7110	-81.4161	15	Lk	43	FFB 730	FFB 731	-	
Kings Bay	Shawna Lucille	3/6/22	313	200	240	30.7116	-81.3540	15.2	Cc	75.4	FFA 657	FFA 658	989001039936217	
Kings Bay	Shawna Lucille	3/6/22	324	1233	1313	30.7131	-81.3773	15.2	Lk	33.2	-	-	989001039097764	
Kings Bay	Shawna Lucille	3/7/22	344	734	814	30.7131	-81.3773	16.7	Lk	33.5	-	-	989001039936232	
Kings Bay	Shawna Lucille	3/7/22	355	1821	1901	30.7087	-81.3712	16.7	Lk	36.3	-	-	989001039936260	
Kings Bay	Shawna Lucille	3/9/22	376	2050	2120	30.7415	-81.4827	18.5	Lk	49.5	FFG 615	FFG 616	989001039936231	
Kings Bay	Lady Anna	3/10/22	231	2135	2205	30.7110	-81.4161	15	Cc	-	-	-	-	
Kings Bay	Lady Anna	3/10/22	231	2135	2205	30.7110	-81.4161	15	Lk	-	-	-	-	
Kings Bay	Shawna Lucille	3/11/22	408	1259	1329	30.7097	-81.4166	16.9	Lk	31.6	-	-	989001039936226	Too small for flipper tags
Kings Bay	Shawna Lucille	3/11/22	417	2001	2030	30.7132	-81.3933	16.9	Lk	43.1	FFG 624	FFG 625	989001039936238	Notch in left posterior marginal scutes healed
Kings Bay	Shawna Lucille	3/11/22	417	2001	2030	30.7132	-81.3933	16.9	Lk	58.1	FFG 617	FFG 618	989001039936243	
Kings Bay	Lady Anna	3/12/22	289	730	800	30.7116	-81.3758	15	Cc	73	FFB 770	FFB 771	-	
Kings Bay	Shawna Lucille	3/12/22	422	30	100	30.7102	-81.3922	16.3	Lk	40.3	FFG 622	FFG 623	989001039936211	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Kings Bay	Shawna Lucille	3/12/22	425	245	315	30.7001	-81.3549	16.3	Lk	47.9	FFG 619	FFG 620	989001039936165	
Kings Bay	Shawna Lucille	3/13/22	441	1744	1814	30.7092	-81.3553	16.3	Lk	44.6	FFG 626	FFG 627	989001039936229	
Kings Bay	Lady Anna	3/14/22	371	1920	1950	30.7190	-80.4787	15	Lk	45.5	FFB 768	FFB 769	-	
Kings Bay	Shawna Lucille	3/14/22	467	1342	1412	30.7139	-81.3690	16.3	Lk	25.4	-	-	989001039936216	Too small for flipper tags
Kings Bay	Shawna Lucille	3/15/22	475	320	350	30.7120	-81.3428	15.7	Lk	25.9	-	-	989001039936207	Too small for flipper tags
Kings Bay	Shawna Lucille	3/15/22	475	320	350	30.7120	-81.3428	15.7	Lk	49.5	FFG 628	FFG 629	989001039936191	
Kings Bay	Shawna Lucille	3/15/22	482	910	940	30.7114	-81.3695	15.7	Lk	26.8	-	-	989001039936254	Too small for flipper tags
Kings Bay	Shawna Lucille	3/16/22	500	820	850	30.7383	-81.4855	15.7	Lk	21.2	-	-	989001039936219	Too small for flipper tags
Kings Bay	Shawna Lucille	3/17/22	513	50	120	30.7120	-81.3539	16.5	Lk	46.7	FFG 621	FFG 630	989001039936244	
Kings Bay	Shawna Lucille	3/17/22	526	1517	1547	30.7145	-81.3876	17.7	Lk	42.9	FFG 634	FFG 635	989001039936223	
Kings Bay	Shawna Lucille	3/17/22	526	1517	1547	30.7145	-81.3876	17.7	Lk	46.5	FFG 632	FFG 633	989001039936240	
Kings Bay	Shawna Lucille	3/17/22	528	1640	1710	30.7094	-81.3600	17.7	Lk	57	FFG 651	FFG 652	989001039936196	
Kings Bay	Lady Anna	3/19/22	494	1845	1915	30.7108	-81.3998	15	Lk	31	FFB 712	FFB 713	-	
Kings Bay	Lady Anna	3/20/22	494	1845	1915	30.7117	-81.3785	15	Lk	53.5	FFB 710	FFB 711	-	
Kings Bay	Shawna Lucille	3/20/22	584	1156	1223	30.7406	-81.4846	18.3	Cm	34.4	-	-	989001039936209	Too small for flipper tags
Kings Bay	Shawna Lucille	3/22/22	634	815	845	30.7410	-81.4842	19.2	Lk	26.4	-	-	989001039936176	Too small for flipper tags.
Kings Bay	Shawna Lucille	3/24/22	686	1938	1952	30.7151	-81.3611	18.4	Lk	52.7	FFG 636	FFG 637	989001039936241	
Kings Bay	Shawna Lucille	3/25/22	706	1620	1649	30.7102	-81.3448	18.1	Cc	66.5	FFG 676	FFG 677	989001039936242	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag- LFF	Flipper Tag- RFF	PIT Tag	Comments
Kings Bay	Shawna Lucille	3/26/22	723	808	838	30.7123	-81.3760	19	Lk	38	FFG 678	FFG 679	989001039936259	
Kings Bay	Shawna Lucille	3/30/22	818	1042	1112	30.7120	-81.3899	20	Cc	61.1	FFG638	FFG639	989001039936172	
Kitty Hawk	Simple Man	8/24/22	861	200	230	36.0137	-75.5531	25	Dc	~165	FFG611	FFG612	989001039936276	Male. Not taken out of net or brought abord. Genetic sample taken and released.
Kitty Hawk	Simple Man	9/2/22	1115	1726	1747	36.0290	-75.5581	26.8	Cc	98.8	FFG613	FFG614	989001040620457	
Kitty Hawk	Simple Man	9/3/22	1132	1013	1043	36.0164	-75.5572	26.8	Cc	65.3	FFG574	FFG575	989001039936310	
Kitty Hawk	Simple Man	9/5/22	1185	1102	1132	36.0278	-75.5571	26.6	Cc	72.7	FFL232	FFL233	989001039936281	
Kitty Hawk	Simple Man	9/20/22	1464	1250	1320	36.0271	-75.5553	25.1	Cc	106.4	FFG545	FFG546	989001040620531	
Kitty Hawk	Simple Man	9/25/22	1530	1518	1548	36.0378	-75.5451	23.3	Cc	86.5	FFG547	FFG548	989001040620536	
Kitty Hawk	Mister B	9/26/22	208	1010	1040	36.0257	-75.5562	23.3	Cc	79	FFL076	FFL077	989001040620356	
Kitty Hawk	Simple Man	9/26/22	1568	2218	2248	36.0317	-75.5443	23.5	Cc	74.4	-	FFG549	989001040620519	Missing half of LFF part of left rear flipper and many surface scratches. All wounds healing well, turtle healthy weight/ energetic.
Kitty Hawk	Simple Man	9/27/22	1584	1133	1203	36.0340	-75.5444	23.7	Cc	80.9	FFG684	FFG685	989001039097823	
Mayport	Reva Rose	8/13/21	22	347	408	30.3966	-81.3613	30	Cc	174	FFA801	FFA802	989001038168971	PIT tag to right shoulder
Mayport	Reva Rose	8/15/21	75	202	232	30.3966	-81.3445	28.9	Cc	70	FFA805	FFA806	989001038168925	PIT tag to right shoulder

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Mayport	Reva Rose	8/15/21	76	431	501	30.3958	-81.3529	28.9	Cc	77	FFA807	FFA808	989001038168895	PIT tag to right shoulder
Mayport	Reva Rose	8/15/21	78	847	917	30.3971	-81.3645	28.9	Cc	68	FFA803	FFA804	989001038168923	PIT tag to right shoulder
Mayport	Reva Rose	8/16/21	104	811	841	30.3957	-81.3560	28.4	Cc	74	FFA809	FFA810	989001038168876	PIT tag to right shoulder
Mayport	Reva Rose	8/17/21	124	1314	1344	30.3992	-81.3526	28.9	Cc	74	FFA809	FFA810	989001038168876	RECAPTURE of turtle from 8/16 on this project
Mayport	Reva Rose	8/18/21	135	252	321	30.3971	-81.3432	28.3	Cc	82	FFA811	FFA812	989001038168892	PIT tag to right shoulder
Mayport	Reva Rose	8/19/21	159	0	30	30.4019	-81.3533	28.3	Cc	94	FFA813	FFA914	989001038168884	PIT tag to right shoulder
Mayport	Reva Rose	8/24/21	315	814	844	30.3973	-81.3616	28.3	Cc	82	FFA815	FFA816	989001038168898	PIT tag to right shoulder
Mayport	Reva Rose	9/7/21	669	1527	1557	30.3981	-81.3488	27.8	Lk	61	FFA817	FFA818	989001033214015	PIT tag applied to right shoulder
Mayport	Reva Rose	9/8/21	702	1658	1728	30.3997	-81.3525	27.8	Cc	88	FFA819	FFA820	989001038168953	PIT tag to right shoulder
Morehead City	Shawna Lucille	7/1/22	8	1653	1723	34.6505	-76.6758	27.5	Lk	52.4	FFL151	FFL152	989001040620400	
Morehead City	Shawna Lucille	7/3/22	15	737	807	34.6437	-76.6774	27.1	Lk	51.2	FFL153	FFL154	989001040620422	
Morehead City	Shawna Lucille	7/3/22	16	1004	1034	34.6765	-76.6692	27.1	Cc	98.3	FFL155	FFL156	989001040620426	
Morehead City	Shawna Lucille	7/4/22	44	2035	2105	34.6584	-76.6751	27.5	Lk	68.1	FFL157	FFL158	989001040620433	
Morehead City	Shawna Lucille	7/7/22	86	950	1020	34.6705	-76.6675	28.8	Lk	44.3	FFL159	FFL160	989001040620386	
Morehead City	Shawna Lucille	7/10/22	107	953	1023	34.6423	-76.6750	28	Cc	91	FFL161	FFL162	989001040620479	
Morehead City	Shawna Lucille	7/11/22	133	1619	1649	34.6701	-76.6689	28	Cc	97.4	FFL163	FFL164	989001040620487	
Morehead City	Shawna Lucille	7/14/22	157	1157	1227	34.6324	-76.6795	28	Cc	78.9	FFL165	FFL166	989001040620361	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Morehead City	Shawna Lucille	7/15/22	189	2207	2237	34.6226	-76.6746	28	Cc	80	FFL167	FFL168	989001040620379	
Morehead City	Shawna Lucille	7/16/22	199	1330	1358	34.6639	-76.6721	28	Cc	97	FFL174	FFL175	989001040620355	Male
Morehead City	Shawna Lucille	7/16/22	203	2329	2359	34.6236	-76.6970	28	Lk	63.3	FFL172	FFL173	989001040620444	
Morehead City	Shawna Lucille	7/18/22	234	749	808	34.6444	-76.6772	28	Cc	62.9	FFL170	FFL171	989001040620382	
Morehead City	Shawna Lucille	7/19/22	239	1238	1308	34.6371	-76.6783	28	Cc	96.6	FFL176	FFL177	989001040620424	
Morehead City	Shawna Lucille	7/22/22	257	1214	1244	34.6367	-76.6791	28	Cc	90.9	FFL178	FFL179	989001038168975	
Morehead City	Shawna Lucille	7/23/22	270	637	707	34.6381	-76.6747	28	Cc	78.9	FFL165	FFL166	989001040620361	Recapture from 07/14/22, Tow #157.
Morehead City	Shawna Lucille	7/23/22	270	637	707	34.6381	-76.6747	28	Cc	95.4	FFL180	FFL181	989001040620380	
Morehead City	Shawna Lucille	7/23/22	281	1640	1710	34.6480	-76.6792	28.9	Cc	79.6	FFL182	FFL183	989001040620396	
Morehead City	Shawna Lucille	7/24/22	302	1513	1543	34.6319	-76.6768	28.6	Lk	44.4	FFL184	FFL185	989001040620363	
Morehead City	Shawna Lucille	7/26/22	335	845	915	34.6677	-76.6741	28.6	Cc	105.9	FFL186	FFL187	989001040620492	
Morehead City	Jessica Marie	5/27/21	4	1647	1717	34.6396	-76.6799	25.4	Cc	72.2	FFA926	FFA927	989001039097949	
Morehead City	Reva Rose	5/30/21	46	2005	2025	34.6553	-76.6713	24.6	Cc	77.7	FFA701	FFA702	989001039097940	
Morehead City	Reva Rose	6/4/21	182	2054	2124	34.6434	-76.6745	24.4	Lk	60.4	FFA703	FFA704	989001039097884	
Morehead City	Reva Rose	6/4/21	183	2144	2214	34.6465	-76.6733	24.4	Lk	42.0	FFA705	FFA706	989001039097928	3 large indents on right marginals 9,10, 11 & 12. Evenly spaced indicating previous net entanglement.

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Morehead City	Reva Rose	6/5/21	185	0100	0130	34.6657	-76.6720	24.2	Lk	47.9	FFA707	FFA708	989001039097887	
Morehead City	Reva Rose	6/5/21	198	1123	1153	34.6483	-76.6753	24.2	Cc	77.3	FFA709	FFA710	989001039097831	
Morehead City	Reva Rose	6/6/21	236	1906	1936	34.6672	-76.6718	24.4	Cc	101.5	FFA711	FFA712	989001039097908	Male
Morehead City	Reva Rose	6/7/21	270	1846	1916	34.6460	-76.6759	24.6	Cc	97.1	FFA713	FFA714	989001039097848	Male
Morehead City	Reva Rose	6/13/21	408	0809	0839	34.6573	-76.6740	25.7	Cc	76.3	FFA715	FFA716	989001039097857	
Nags Head	Jessica Marie	7/27/22	118	1703	1730	35.8738	-75.5392	27.7	Lk	55.8	FFL204	FFL205	989001040620461	Missing left rear flipper.
Nags Head	Jessica Marie	7/27/22	118	1703	1730	35.8738	-75.5392	27.7	Lk	55.8	FFL204	FFL205	989001040620461	Missing left rear flipper.
Nags Head	Jessica Marie	7/31/22	199	1331	1401	35.8656	-75.5234	27.2	Cc	89.2	FFL206	FFL207	989001040620448	
Nags Head	Jessica Marie	7/31/22	203	1743	1813	35.8733	-75.5371	27.2	Cc	101.9	FFL208	FFL209	989001040620485	Flipper tag scars on both front flippers. No PIT or flipper tags found.
Nags Head	Jessica Marie	8/19/22	305	1500	1530	35.8875	-75.5283	23	Cc	97.9	FFL284	FFL285	989001040620481	
Nags Head	Jessica Marie	8/20/22	329	758	828	35.8883	-75.5285	22.7	Cc	89.5	FFL286	FFL287	989001040620454	
Oak Island	Jessica Marie	5/2/21	17	0729	0759	33.8717	-78.0536	19.6	Cc	67.1	KKH947	KKH948	989001038168935	
Oak Island	Jessica Marie	5/2/21	24	1359	1429	33.8736	-78.0549	20.0	Cc	73.0	KKH949	KKH950	989001038168885	
Oak Island	Jessica Marie	5/2/21	31	1951	2021	33.8722	-78.0587	20.0	Lk	37.6	-	-	989001038168894	Too small for flipper tags
Oak Island	Jessica Marie	5/3/21	38	0241	0311	33.8720	-78.0590	20.0	Lk	36.8	-	-	989001038168929	Too small for flipper tags
Oak Island	Jessica Marie	5/3/21	39	0456	0526	33.8734	-78.0597	20.0	Lk	30.9	-	-	989001038168890	Too small for flipper tags
Oak Island	Jessica Marie	5/3/21	46	1122	1152	33.8733	-78.0529	20.0	Lk	51.8	KKH976	KKH977	989001038168921	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Oak Island	Jessica Marie	5/3/21	48	1432	1502	33.8726	-78.0595	20.0	Lk	30	-	-	989001038168907	Too small for flipper tags
Oak Island	Jessica Marie	5/3/21	48	1432	1502	33.8726	-78.0595	20.0	Lk	57.2	KKR740	KKR741	989001038168882	
Oak Island	Jessica Marie	5/3/21	49	1652	1722	33.8744	-78.0619	20.0	Cc	76.1	KKR742	KKR743	989001038168897	
Oak Island	Jessica Marie	5/4/21	62	0857	0927	33.8744	-78.0616	20.4	Lk	28.0	-	-	989001038168943	Too small for flipper tags
Oak Island	Jessica Marie	5/4/21	65	1239	1309	33.8743	-78.0596	20.4	Lk	25.3	-	-	989001038168964	Too small for flipper tags
Oak Island	Jessica Marie	5/4/21	68	1607	1637	33.8714	-78.0569	20.4	Cc	81.0	KKR744	KKR745	989001032046316	
Oak Island	Jessica Marie	5/4/21	71	1947	2017	33.8703	-78.0557	20.4	Lk	30.3	-	-	989001032046347	Too small for flipper tags
Oak Island	Jessica Marie	5/6/21	82	1533	1603	33.8716	-78.0516	19.8	Cc	71.3	KKR749	KKR750	989001038168954	
Oak Island	Jessica Marie	5/7/21	96	0704	0734	33.8715	-78.0539	20.3	Cc	76.2	FFA951	FFA952	989001038168918	Male
Oak Island	Jessica Marie	5/7/21	96	0704	0734	33.8715	-78.0539	20.3	Lk	25.5	-	-	989001038168960	Too small for flipper tags
Oak Island	Jessica Marie	5/7/21	100	1142	1211	33.8755	-78.0614	20.3	Cc	113.1	KKR700	KKR737	989001032046343	
Oak Island	Jessica Marie	5/7/21	102	1427	1457	33.8745	-78.0609	20.3	Ao SA DPS	152.4	-	-	989001038168946	
Oak Island	Jessica Marie	5/8/21	131	1146	1216	33.8718	-78.0514	19.7	Cc	103.8	FFA953	FFA954	989001038168931	Male
Oak Island	Jessica Marie	5/9/21	136	1033	1103	33.8736	-78.0578	20.0	Ao Carolina DPS	205.0	-	-	989001032046313	
Oak Island	Jessica Marie	5/9/21	138	1229	1259	33.8721	-78.0572	20.0	Lk	55.7	FFA955	FFA956	989001032046393	
Oak Island	Jessica Marie	5/9/21	142	1607	1637	33.8727	-78.0611	20.0	Lk	33.7	-	-	989001038168962	Too small for flipper tags
Oak Island	Jessica Marie	5/9/21	144	1844	1914	33.8758	-78.0637	20.0	Cc	63.4	FFA957	FFA958	989001038168969	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Oak Island	Jessica Marie	5/13/21	223	1945	2015	33.8724	-78.0519	20.3	Lk	31.0	-	-	989001032046461	Too small for flipper tags
Oak Island	Jessica Marie	5/13/21	225	2245	2315	33.8731	-78.0591	20.3	Lk	51.0	FFA959	FFA960	989001032046319	
Oak Island	Jessica Marie	5/14/21	238	1359	1429	33.8736	-78.0586	20.2	Lk	39.3	FFA961	FFA962	989001032046301	
Oak Island	Jessica Marie	5/15/21	252	0123	0153	33.8720	-78.0603	20.2	Lk	35.5	-	-	989001032046385	Too small for flipper tags
Oak Island	Jessica Marie	5/15/21	256	0530	0555	33.8704	-78.0503	20.0	Cc	75.9	FFA967	FFA968	989001033214101	
Oak Island	Jessica Marie	5/15/21	269	1612	1642	33.8738	-78.0543	20.0	Cc	101.6	FFA963	FFA964	989001038168385	
Oak Island	Jessica Marie	5/15/21	275	2149	2219	33.8700	-78.0512	20.0	Cc	74.3	FFA965	FFA966	989001031357981	Male
Oak Island	Jessica Marie	5/15/21	276	2231	2244	33.8712	-78.0583	20.0	Lk	29.4	-	-	989001033214129	Too small for flipper tags
Oak Island	Jessica Marie	5/16/21	294	1139	1209	33.8713	-78.0608	20.2	Cc	67.0	FFA969	FFA970	989001038168936	
Oak Island	Jessica Marie	5/17/21	319	0521	0551	33.8709	-78.0586	20.2	Lk	34.0	-	-	989001033214125	Too small for flipper tags
Oak Island	Jessica Marie	5/18/21	354	0559	0629	33.8708	-78.0609	20.4	Cc	49.6	FFA971	FFA972	989001032046470	Turtle is a possible Cc/Cm hybrid displaying biological characteristics of both species but dominated by Cc criterion.
Oak Island	Jessica Marie	5/18/21	359	1055	1125	33.8710	-78.0607	20.9	Cc	99.1	FFA973	FFA974	989001032046460	
Oak Island	Jessica Marie	5/20/21	416	0153	0223	33.8730	-78.0636	23.3	Lk	40.9	FFA975	FFA976	989001039097812	
Oak Island	Lady Paige	2/23/22	240	838	908	33.0511	-78.0563	12	Ao SA DPS	51.5	-	-	989001039097911	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Oak Island	Lady Paige	2/24/22	290	1709	1739	33.8762	-78.0624	12	Ao Carolina DPS	106.1	-	-	989001039097846	
Oak Island	Lady Paige	2/24/22	290	1709	1739	33.8762	-78.0624	12	Ao SA DPS	196.7	-	-	989001039097876	
Oak Island	Lady Paige	2/27/22	387	655	725	33.8670	-78.0486	12.2	Ao SA DPS	70	-	-	989001039097821	
Oak Island	Lady Paige	3/2/22	529	2329	2359	33.8866	-78.1694	13	Ao SA DPS	74.1	-	-	989001039097835	
Oak Island	Lady Paige	3/3/22	544	1122	1152	33.8750	-78.1684	13.2	Ao Carolina DPS	104.2	-	-	989001039097845	
Oak Island	Lady Paige	3/4/22	572	2233	2303	33.8661	-78.0582	14	Ao Chesapeake DPS	92.7	-	-	989001038168932	
Oak Island	Lady Paige	3/5/22	638	1838	1908	33.8791	-78.0486	14.3	Ao Carolina DPS	112.6	-	-	989001039097907	
Oak Island	Lady Paige	3/7/22	648	155	225	33.8677	-78.0516	14.3	Ao Carolina DPS	112.3	-	-	989001039097933	
Oak Island	Lady Paige	3/7/22	648	155	225	33.8677	-78.0516	14.3	Ao SA DPS	62	-	-	989001039097880	
Oak Island	Lady Paige	3/8/22	728	1641	1710	33.8803	-78.0550	15	Ao SA DPS	61.6	-	-	989001038168939	
Oak Island	Lady Paige	3/13/22	806	847	916	33.8752	-78.0607	13.6	Ao SA DPS	69.9	-	-	989001038168968	
Oak Island	Lady Paige	3/13/22	830	2331	2359	33.8698	-78.0498	13.6	Ao Chesapeake DPS	180	-	-	989001038168974	2 of 2 sturgeon captured on the same tow.
Oak Island	Lady Paige	3/13/22	830	2331	2359	33.8698	-78.0498	13.6	Ao SA DPS	60.9	-	-	989001038168938	1 of 2 sturgeon captured on the same tow.
Oak Island	Lady Paige	3/14/22	840	603	633	33.8800	-78.0594	13.4	Ao SA DPS	84.7	-	-	989001038168941	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Oak Island	Lady Paige	3/15/22	904	2159	2229	33.8769	-78.0608	14.4	Ao Carolina DPS	114.5	-	-	989001038168910	
Oak Island	Lady Paige	3/16/22	927	1103	1132	33.8793	-78.0572	14.4	Ao SA DPS	61.1	-	-	989001038168951	
Oak Island	Lady Paige	3/17/22	956	632	701	33.8788	-78.0575	15	Ao Carolina DPS	69.1	-	-	989001038168952	
Oak Island	Lady Paige	3/17/22	967	1323	1353	33.8743	-78.0611	15	Ao Carolina DPS	67.2	-	-	989001038168922	
Oak Island	Lady Paige	3/18/22	990	402	432	33.8687	-78.0557	16.2	Ao SA DPS	130.6	-	-	989001038168961	
Oak Island	Lady Paige	3/19/22	1027	828	857	33.8784	-78.0607	16.2	Lk	32.4	-	-	989001038168937	Too small for flipper tags.
Oak Island	Lady Paige	3/20/22	1053	526	556	33.8702	-78.0580	16.6	Lk	34.2	FFA721	FFA722	989001039097858	3 of 3 turtles captured
Oak Island	Lady Paige	3/20/22	1053	526	556	33.8702	-78.0580	16.6	Lk	37.9	FFA720	FFA719	989001038168947	2 of 3 turtles captured
Oak Island	Lady Paige	3/20/22	1053	526	556	33.8702	-78.0580	16.6	Lk	47.8	FFA718	FFA717	989001039097921	1 of 3 turtles captured
Oak Island	Lady Paige	3/20/22	1068	1540	1609	33.8740	-78.0599	16.6	Ao Carolina DPS	70.8	-	-	989001039097841	
Oak Island	Lady Paige	3/21/22	1084	130	200	33.8695	-78.0540	16	Ao SA DPS	67.7	-	-	989001039097932	
Oak Island	Lady Paige	3/22/22	1120	33	103	33.8678	-78.0574	16.4	Ao Carolina DPS	180.7	-	-	989001039097917	
Oak Island	Lady Paige	3/22/22	1140	1343	1412	33.8731	-78.0497	16.4	Cc	52.2	FFA723	FFA724	989001038168934	
Oak Island	Lady Paige	3/23/22	1179	1730	1800	33.8709	-78.0552	16.4	Cc	46.1	FFA901	FFA902	989001039097849	
Oak Island	Lady Paige	3/26/22	1196	844	913	33.8761	-78.0611	16.2	Cc	104.8	FFA903	FFA904	989001039097808	Male

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag- LFF	Flipper Tag- RFF	PIT Tag	Comments
Oak Island	Lady Paige	3/28/22	1252	1002	1031	33.8730	-78.0533	15	Cc	80.3	FFA905	FFA906	989001039097890	
Oak Island	Lady Paige	3/28/22	1269	2139	2209	33.8689	-78.0592	15	Ao Carolina DPS	84.3	-	-	989001039097872	
Oak Island	Lady Paige	3/29/22	1281	521	550	33.8698	-78.0545	14.5	Lk	28.6	-	-	989001039097936	Too small for flipper tags.
Oak Island	Lady Paige	4/10/22	1505	840	910	33.8672	-78.0573	17.4	Lk	47.4	-	-	989001040620495	Pit tag- right shoulder
Oak Island	Lady Paige	4/10/22	1515	1618	1648	33.8671	-78.0609	17.4	Lk	27	-	-	98900140620501	Pit tag- right shoulder
Oak Island	Lady Paige	4/10/22	1523	2244	2314	33.8671	-78.0535	17.4	Ao SA DPS	154.2			989001040620521	applied pit tag
Oak Island	Lady Paige	4/11/22	1529	257	327	33.8736	-78.0608	17	Ao SA DPS	94.7	-	-	989001040620478	
Oak Island	Lady Paige	4/12/22	1582	1159	1229	33.8682	-78.0553	17	Cc	84.3	FFG557	FFG558	989001039936347	Relocation from another project.
Oak Island	Lady Paige	4/12/22	1587	1718	1748	33.8664	-78.0531	17	Lk	45.8	FFA909	FFA910	989001040620476	
Oak Island	Lady Paige	4/12/22	1591	2113	2143	33.8687	-78.0536	17	Cc	115.2	FFA911	FFA912	989001040620509	
Oak Island	Lady Paige	4/13/22	1595	140	210	33.8675	-78.0588	17.6	Lk	59.3	FFA913	FFA914	989001040620524	
Oak Island	Lady Paige	4/14/22	1634	256	326	33.8799	-78.0607	17.7	Lk	45.8	FFA915	FFA916	989001040620512	
Oak Island	Lady Paige	4/14/22	1648	1326	1356	33.8681	-78.0581	17.7	Lk	61	FFA917	FFA918	989001040620489	
Oak Island	Lady Paige	4/15/22	1680	1013	1043	33.8672	-78.0588	17.9	Lk	65.1	FFA919	FFA920	989001040620525	
Oak Island	Lady Paige	4/15/22	1687	1550	1620	33.8690	-78.0543	17.9	Lk	25.9	-	-	989001040620534	Too small for flipper tags.
Oak Island	Lady Paige	4/15/22	1687	1550	1620	33.8690	-78.0543	17.9	Lk	50.4	FFA921	FFA922	989001040620467	
Oak Island	Lady Paige	4/16/22	1704	324	354	33.8670	-78.0550	17.9	Lk	42.9	FFA923	FFAA924	989001040620471	

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Oak Island	Lady Paige	4/16/22	1723	1607	1637	33.8711	-78.0594	17.9	Lk	32.8	-	-	989001040620515	
Oak Island	Lady Paige	4/17/22	1739	254	324	33.8756	-78.0610	18.2	Lk	42.1	FFA925	FFA725	989001040620503	
Oak Island	Lady Paige	4/17/22	1759	1640	1710	33.8702	-78.0575	18.2	Lk	24.7	-	-	989001040620486	Too small for flipper tags.
Oak Island	Lady Paige	4/19/22	1788	715	745	33.8676	-78.0573	18.4	Cc	75.4	FFA978	FFA977	989001040620490	
Oak Island	Lady Paige	4/19/22	1795	1251	1321	33.8685	-78.0525	18.4	Dc	158.9	FFA979	FFA980	989001040620491	
Oak Island	Lady Paige	4/19/22	1803	1939	2009	33.8781	-78.0555	18.4	Cc	51.2	FFA981	FFA982	989001040620510	
Oak Island	Lady Paige	4/20/22	1822	819	849	33.8760	-78.0565	17.9	Cc	77.4	FFA983	FFA984	989001040620447	
Oak Island	Lady Paige	4/20/22	1831	1431	1501	33.8718	-78.0542	17.9	Ao SA DPS	122.4	-	-	989001040620475	
Wilmington	Brenda K	4/5/22	4	1519	1549	33.8261	-78.0336	16.1	Lk	54.8	FFA827	FFA828	989001039097786	
Wilmington	Brenda K	4/8/22	11	817	847	33.8514	-78.0281	17.2	Cc	72.1	FFA829	FFA830	989001038168881	
Wilmington	My Girls	4/12/22	98	1247	1317	33.8296	-78.0311	17.4	Ao SA DPS	119	-	-	989001040620545	Pit Tag applied to the base of dorsal fin
Wilmington	My Girls	4/14/22	165	1455	1525	33.8458	-78.0313	18.5	Cc	97.5	FFL201	FFL202	989001040620496	
Wilmington	My Girls	4/16/22	220	1247	1317	33.8548	-78.0202	18.1	Cc	69.3	FFL226	FFL227	989001040620535	
Wilmington	My Girls	4/19/22	301	1703	1733	33.8477	-78.0301	18.1	Dc	144.6	-	-	989001040620458	Turtle safely disentangled from the net and released via harness.
Wilmington	Jessica Marie	5/10/22	396	2253	2330	33.8977	-78.0153	21.2	Cm	59	FFG435	FFG437	989001040620414	Coloration appears Cc, but all morphology indicates Cm

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Wilmington	Jessica Marie	5/15/22	488	1054	1124	33.8064	-78.0393	21.5	Cc	76.4	FFG438	FFG439	989001040620432	
Wilmington	Jessica Marie	5/15/22	489	1256	1326	33.8240	-78.0337	21.5	Cc	113.5	FFG441	FFG440	989001040620427	PIT tag in FL Shoulder
Wilmington	Jessica Marie	5/15/22	496	1945	2015	33.8143	-78.0363	21.5	Cc	90.7	FFG443	FFG444	989001060620409	
Wilmington	Jessica Marie	5/15/22	496	1945	2015	33.8143	-78.0363	21.5	Cc	93.1	FFG445	FFG446	989001040620405	
Wilmington	Jessica Marie	5/15/22	496	1945	2015	33.8143	-78.0363	21.5	Cc	96.1	FFG447	FFG448	989001040620359	PIT tag in FL Shoulder
Wilmington	Jessica Marie	5/16/22	509	833	903	33.8114	-78.0370	21.5	Cc	107.4	FFG449	FFG450	989001040620408	Male
Wilmington	Jessica Marie	5/16/22	513	1250	1328	33.8028	-78.0407	21.8	Cc	73.7	FFL101	FFL102	989001040620419	PIT tag in FL Shoulder
Wilmington	Jessica Marie	5/17/22	519	945	1015	33.8113	-78.0380	21.8	Lk	52	FLL103	FLL104	989001040620441	
Wilmington	Jessica Marie	5/17/22	533	2058	2128	33.8300	-78.0482	22	Cc	105	FLL105	FLL106	989001040620435	PIT tag in FL Shoulder, Male
Wilmington	Jessica Marie	5/18/22	542	711	741	33.8289	-78.0332	22	Ao DPS unknown - sample not received	174.5	-	-	989001040620407	Released after 20 Mins on board
Wilmington	Jessica Marie	5/18/22	560	2155	2225	33.8189	-78.0358	22.4	Cc	79	FFL107	FFL108	989001040620432	
Wilmington	Jessica Marie	5/18/22	560	2155	2225	33.8189	-78.0358	22.4	Cc	100.2	FLL110	FLL109	989001040620442	PIT Tag in FL Shoulder
Wilmington	Jessica Marie	5/21/22	581	1929	1959	33.8352	-78.0305	23.2	Cc	76.2	FFL111	FFL112	989001040620401	
Wilmington	Jessica Marie	5/22/22	599	1522	1552	33.8156	-78.0361	23.5	Cc	77.4	FFL113	FFL114	989001040620412	PIT Tag in FR shoulder
Wilmington	Jessica Marie	5/23/22	622	1919	1949	33.8113	-78.0378	24	Cc	90.9	FFL115	FFL116	989001040620420	PIT Tag in FR shoulder
Wilmington	Jessica Marie	5/24/22	633	700	730	33.8092	-78.0384	24	Cc	62	FFL117	FFL118	989001040620376	PIT Tag in FR shoulder

Project	Trawler	Date	Tow #	Start Time	End Time	Capture Latitude	Capture Longitude	H_2O Temp (°C)	Species	CCL/ TL (cm)	Flipper Tag-LFF	Flipper Tag-RFF	PIT Tag	Comments
Wilmington	Jessica Marie	5/24/22	645	1951	2021	33.8304	-78.0323	24.3	Cm	27.7	-	-	989001040620440	Too small for flipper tags. PIT Tag in FR shoulder.
Wilmington	Jessica Marie	5/25/22	663	1238	1308	33.8337	-78.0305	24.2	Cc	106	FFL119	FFL120	989001040620429	Male. PIT Tag in FR shoulder.
Wilmington	Jessica Marie	5/25/22	668	1719	1749	33.8158	-78.0366	24.2	Cc	97	-	FFL121	989001040620415	Male. PIT Tag in FR shoulder.
Wilmington	Jessica Marie	5/26/22	687	1113	1143	33.8333	-78.0324	24.2	Cc	72.4	FFL122	FFL123	989001040620436	PIT Tag in FR shoulder
Wilmington	Jessica Marie	5/28/22	710	1222	1252	33.8315	-78.0318	24.2	Cc	96.5	FFL124	FFL125	989001040620392	PIT Tag in FR shoulder
Wilmington	Jessica Marie	5/29/22	744	1500	1530	33.8348	-78.0318	24.4	Cc	95.7	FFL126	FFL127	989001040620428	PIT Tag in FR shoulder
Wilmington	Jessica Marie	5/30/22	758	238	308	33.8287	-78.0318	24.4	Cc	101.6	FFL128	FFL129	989001040620387	PIT Tag in FR shoulder

APPENDIX F. 2020 SARBO REPORTING CHANGES REQUESTED

Provided Electronically to NMFS and in an adobe PDF redline version.

APPENDIX F. 2020 SARBO REPORTING CHANGES REQUESTED

2020 SARBO Section 2.Programmatic Implementation, Tracking, and Reporting

2.9.3.3 Pre-Construction Notification:
NMFS will be notified at least 2 weeks prior to construction of any project covered under this Opinion by the USACE and/or BOEM, to the maximum extent practicable, so that NMFS is aware of current and upcoming projects in the region. Projects that are expected or anticipated to occur during the upcoming fiscal year will be reported prior to the start of that year. The notification will include the required project information provided in Section 0 of this Opinion that explains what the project is, where it will be happening, how it will be completed, and when work is expected to occur. All information will be reported according to the digital reporting requirements provided in Section **Error! Reference source not found.** of this Opinion. The pre-construction notification will be provided in a manner that creates a searchable compiled list of all projects planned to begin within the fiscal year, which could be transmitted by emailing a spreadsheet that is updated with each new project, a list maintained on a publicly available website such as ODESS, or other method approved by the SARBO Team. The pre-construction notification (sent to **SERO.Dredge@noaa.gov**) will include a statement that the applicable PDCs have been reviewed and will be requirements of the project.

2.9.3.4 During and Post-Construction Reporting
Important project details will be reported to NMFS digitally, according to the digital reporting requirements provided in Section **Error! Reference source not found.** of this Opinion. This includes:

- All lethal and nonlethal take associated with a project covered under this Opinion will be reported within 48 hours. Project details related to take that will be reported as detailed in Section 0 of this Opinion.
- All observations of North Atlantic right whales observed while completing a project (aerial survey reporting is outlined separately in **Error! Reference source not found.**) be reported according to the reporting requirements in the ~~within 24 hours of the observation. The process to report a North Atlantic right whale observation is outlined in the~~ North Atlantic Right Whale Plan (**Error! Reference source not found.**) and applies to all work covered under this Opinion.
- Any reporting requirements outlined in the PDCs including surveys conducted under the Coral PDCs (0~~), surveys conducted under the Johnson's seagrass PDCs (Appendix D),~~ and PSO responsibilities outlined in **Error! Reference source not found.**.

The SARBO Team must be able to access and track relevant project details to verify compliance with the PDCs of this Opinion including the ability to monitor the accumulating total take of ESA-listed species and any loss of designated critical habitat features for the year, though loss of critical habitat is not anticipated. Project details that will be reported for all projects (regardless of if take occurred) are detailed in Section 0 of this Opinion.

2.9.3.5 Required Project Information:
Project details listed below apply to all projects covered under this Opinion, even if the project did not include hopper dredging, resulted in no take of an ESA-listed species, or resulted in no

Commented [BNMCUC(1]: This requirement caused confusion as written. Staff was unclear if a report was required to the SERO.Dredge@noaa.gov reporting and/or to the Whale Alert as required in the NARW Conservation Plan. The Whale Alert info seems the appropriate source as USACE coordinates closely with NMFS on these efforts and reports are publicly available at Whale Map.

Commented [BNMCUC(2]: Johnson's is delisted so this requirement is no longer applicable.

adverse effects to critical habitat. All required information will be digitally accessible to NMFS prior to work commencing and reported according to the digital reporting requirements provided in Section **Error! Reference source not found.** of this Opinion. Information initially provided as estimated project details, such as the start date and the total volume of material dredged, will be updated with accurate final information and digitally available to NMFS within 30 days of project completion.

This information required is intended to provide the basic details that were needed to complete the analysis in this Opinion and are needed to confirm that the effects evaluated in this Opinion are still accurate. These details will be reviewed during the programmatic annual review (Section 0 of this Opinion), may be incorporated in the risk-based adaptive management process for future projects occurring in the general area of a completed project (Section **Error! Reference source not found.** of this Opinion), and may be used to inform future consultations on similar actions analyzed in this Opinion.

2.9.3.5.1 Required Project Information for All Projects

The required project details listed below are grouped by the questions they answer with an explanation of why the reported information is important to the implementation of the 2020 SARBO and future similar consultations.

Who is in Charge of the Project?

It is important to track which action agency (e.g., USACE or BOEM) and point of contact is overseeing the project and if another action agency involved. Knowing who is in charge of the project and how the project was authorized (e.g., request for SARBO Supersede review for a modification) is important for project tracking and consistency under this Opinion, and if there are questions later about the rationale behind decisions made. If the project includes a PSO, the PSO and PSO company name and contact information is important if there are questions about take. The following information will be provided to NMFS:

1. USACE and/or BOEM Project Manager (point of contact and contact information). The SARBO Team members representing these agencies serve as the point of contact.
2. Protected Species Observer/s: Observer company, if a PSO was used, and contact information
3. The~~Each~~ federal action agency associated with project covered under the 2020 SARBO (e.g., USACE SAD, SAW, SAC, SAS, SAJ, BOEM) and any other ~~, other~~ agency that required ESA Section 7 consultation on the same project (e.g., ~~such as the~~ U.S. Air Force and/or Federal Emergency Management Agency [FEMA]). Other agencies that USACE reports to on a project are not listed (e.g., reporting to EPA for sediment sampling)
4. All federal action agency project tracking numbers ~~associated with the project~~for those agencies requiring ESA Section 7 consultation associated with the project, if applicable (e.g., USACE Civil Works Contract Number or USACE Regulatory tracking number, e.g., SAW-2018-xxxxx)
5. Biological Opinion(s) used to authorize the work (i.e., SARBO and any other Opinion used to cover a proposed project, if combined)

When is the Project Occurring?

Commented [BNMCUC(3]: Changes requested for clarification. Staff were confused which agencies should be documented (e.g., those serving as co-action agencies vs those involved in other ways such as receive reporting or have an existing MOA with USACE.

The estimated start and end date will be provided in the pre-construction notification (Section 0 of this Opinion) and then updated to the actual start and end date. Knowing when a project occurs is important in understanding the risk of the activity to ESA-listed species since it may or may not be present in the area when work is proposed or may be using the area for a specific life function in that location during that time of year, such as the presence of the North Atlantic right whale during calving season. The following information will be provided to NMFS:

1. Project start date (Estimated dates must be updated with actual dates)
2. Project end date (Estimated dates must be updated with actual dates)

Where is the Project Occurring?
Knowing the project overall location and the specific area where within the project area where work occurred is important to be able to determine how the project spatially relates to other factors. This could include being able to overlay how many projects occurred in a critical habitat unit or an area that required additional PDCs (e.g., within the range of ESA-listed corals) to see if the effects analyzed in this Opinion are accurate. Tracking which projects are occurring in sensitive areas is important to ensuring the effects analyzed in this Opinion are accurate. Knowing where a project occurs could also be used to determine if reported strandings in an area could be linked to work occurring under this Opinion.

If the extent of the project footprint (e.g., the entire extent of ABC Borrow area) has already been provided to NMFS or is available for download from a specified public website, referring to the location in a manner that is quantifiable is sufficient (XYZ Beach from mile marker X-Y). If it is a new location, the geographic limits of the project footprint need to be provided as a shapefile. The following information will be provided to NMFS:

1. Project name (Typically projects are referred to by the name of the area. If the area has more than one common name, all common names should be provided).
2. Project location for both dredging AND placement. For regularly occurring projects with an easily referenced named location, a central location may be sufficient (e.g., latitude and longitude in decimal degree format [xx.xxxx, -xx.xxxx]). Project spatiolocation (i.e., shapefile/Keyhole Markup language Zipped (commonly referred to as KMZ)/ geographic information system (commonly referred to as GIS) layer to show the complete action area is needed if this information has not been previously provided to NMFS such as a USACE regulatory project that provided during the completion of this Opinion or the area of a channel realignment covered under this Opinion.
3. Is the project occurring in an area identified in this Opinion that requires additional protection, such as within the range of ESA-listed coral (0), ~~Johnson's seagrass (Appendix D)~~, sturgeon rivers (**Error! Reference source not found.**), or when and where North Atlantic right whales may be present (**Error! Reference source not found.**)?
4. Is the project occurring within the geographic limits of a designated critical habitat, even if features are not impacted? For example, ~~Johnson's seagrass critical habitat Unit J or~~ loggerhead critical habitat unit LOGG-N-19.
5. ~~Total area of the project that occurs within the geographic area of one or more critical habitat units, if applicable. For example, 1,000 ft² of dredging occurred within North Atlantic right whale critical habitat.~~

Commented [BNMCUC(4]: USACE believes this requirement is unnecessary and too onerous. Projects covered under the 2020 SARBO were determined by NMFS to have no effect to Acropora critical habitat, Green sea turtles, hawksbill sea turtles, leatherback sea turtles, and North Atlantic right whale critical habitat The only critical habitat features that NMFS determined may affect critical habitat were effects to Atlantic sturgeon critical habitat PBF 3 for the unobstructed water of appropriate depth and PBF 4 for water quality conditions that were both determined to be insignificant. In addition, the loggerhead sea turtle nearshore reproductive habitat type was determined to be insignificant. Therefore, this requirement is unnecessary to track effects to critical habitat.

Dredging and placement projects covered under SARBO are not reported in square feet and it is an unnecessary burden to have project managers focus on this reporting requirement.

What Type of Project and Equipment?
In order to track if the effects analyzed in this Opinion are accurate and to know if the number of each species estimated to be captured based on the amount of anticipated dredging estimated to occur annually under this Opinion (catch per unit effort [CPUE]) is accurate, tracking the types of projects covered under this Opinion and the types of equipment used is needed.

This information may start to show trends that can be used for future projects and/or future dredging consultations to reduce take of ESA-listed species. One example would be if take is reduced when bed-leveling is used during the clean-up phase of hopper dredging in most locations, but not in certain other locations or for specific bed-leveling designs, this information could be investigated further and used in future risk-based assessments regarding the type of equipment that could be used in a specific location to reduce take. The following information will be provided to NMFS:

1. Project type/s
   a) Maintenance Dredging
   b) Minor channel modification/realignment
   c) Borrow site
   d) Muck dredging
   e) Beach nourishment
   f) Nearshore placement
   g) ODMDS
   h) G&G survey
   i) New placement location
   j) Other
2. Pre-project proposed dredge and placement total volume in cubic yards.
3. Post-project actual dredge and placement total volume in cubic yards.
4. Confirmation (yes/no) that dredging does not exceed the previously federally-approved or federally-authorized dredge template including previously considered overdepth and/or advanced maintenance. If it does exceed (yes), an explanation will be provided (e.g., approved through supersede, unintentional/unusual event and lesson learned).
5. Vessels and specific equipment used on project. A single project may include more than 1 category of equipment listed below for a portion or all of a project. The equipment types expected to be used and listed with the pre-construction notification (Section 0 of this Opinion) will be updated at the end of the project if modifications were necessary.
   a) Hopper dredge
      (1) Used UXO/MEC screening. Note that projects that the use of UXO/MEC screening is only allowed if reviewed through the Alternative review/ Supersede process outlined in Section **Error! Reference source not found.** of this Opinion.
      (2) Screening size used for the project. If the project required an increase or removal of inflow screen size (according to PDC HOPPER.1, Appendix B), the sizes used and volume dredged with screens larger than 4 x 4-inch must be recorded and reported.
      (3) If inflow screening is removed, the USACE and/or BOEM will track the start and end date of dredging that occurred without inflow screening and the number of loads, which will be reported in the annual report.
      (4) Bycatch captured, to the extent practicable

Commented [BNMCUC(5]: USACE has increased bycatch reporting and is working with NMFS and other partners to determine how best to use this information. However, the safety and reporting of ESA-listed species will always take priority.

b) Modified hopper (as defined in Section **Error! Reference source not found.** of the Opinion such as the CURRITUCK, ~~and~~ MURDEN, and Merritt).
c) Non-hopper dredging equipment (e.g., bucket, clamshell, cutterhead, water-injection, bed-leveling to complete project)
d) Bed-leveling (used as the sole form of material movement or just during clean-up phase of hopper dredging).
e) Name and automatic identification system tracking number of any support vessels over 33-ft in length in areas and during times that required adherence to the North Atlantic Right Whale Conservation Plan (Appendix F).
f) Geophysical survey
   (1) Include the equipment type (e.g., multibeam, boomer), frequency at which the equipment was operated, maximum source/power level it was operated at (that will be used during the annual review to determine the dB limits in the PDCs were not exceeded), location used, and total time used.
g) Relocation trawling
   (1) Total number of tows for the project.
   (2) Total number of days.
   (3) Relocation trawling start date.
   (4) Relocation trawling end date.
   (5) Bycatch captured, to the extent practicable (i.e., other species captured during trawling by species and estimated number of captures). Protection of ESA-listed species captured and the safety of the crew is the priority over recording all bycatch capture details. USACE will continue to strive to improve bycatch reporting, to the extent practicable.
h) New Equipment or construction method approved through the SARBO Supersede 2 process outlined in Section **Error! Reference source not found.** of this Opinion.

Commented [BNMCUC(6]: USACE is working with NMFS on improving this process, as discussed in the annual report. Based on the new process, this PDC may need refined.

Commented [BNMCUC(7]: USACE requests revisiting this reporting requirement, as discussed in the annual report.

2.9.3.5.2 Required Project Information When Take Occurs

The following details will be reported when take occurs associated with a project covered under this Opinion. This required information applies to lethal and nonlethal take of mobile species (i.e., all species listed in **Error! Reference source not found.** of this Opinion, except ESA-listed corals ~~and Johnson's seagrass)~~. Information collected provides details on the type of species captured including the size and age of the animal based on the measurements taken. Environmental conditions recorded at the time of take (e.g., Beaufort state, water and air temperature, and notes provided in the comments section) may help to better understand where and when take may occur at future similar projects and may be incorporated into the risk-assessment process. For example, the number of sea turtle takes increases when the water temperature is above or below a certain threshold and after a major cold snap. Tracking this information aids in the risk assessments for future projects. Knowing the Beaufort state also helps to understand how visible animals may be in the area, especially if a vessel strike occurs. The following information will be provided to NMFS:

1. Location of take (latitude and longitude if possible or estimated based on the portion of project where work is occurring such as a specific portion of an entrance channel, pass, or borrow site)
2. Tow number when take occurred during relocation trawling or dredge load number if take occurred during hopper dredging.

3. Protected Species Observer/s that observed and handled the take: Observer name/company and contact information
4. Species take must be tracked by total number (e.g., 3 loggerhead sea turtles). Atlantic sturgeon must be reported by District Population Segment (DPS). Project take details can initially state Atlantic sturgeon DPS unknown, but must be updated to known DPS when the genetic sample is processed, which will occur within 1 year of take (**Error! Reference source not found.**). All samples must be processed in time to provide DPS information in the annual report. If the observed remains of a sea turtle cannot be identified by species, recording the take as unknown sea turtle is appropriate. Unknown sturgeon will require genetic testing to determine if it was an identifiable DPS of Atlantic sturgeon.
5. Previous animal identification/tracking tag information (internal and external tags), if any
6. New passive integrated transponder (PIT) Tag information, if inserted according to the PSO PDCs in Appendix H
7. Genetic sample collected, if applicable under PSO PDCs in Appendix H
8. Age class of species take based on size (e.g., juvenile, adult) if known.
9. Specimen Condition (e.g., alive, fresh dead, or decomposed as described in the PSO PDCs in ~~0~~ H Section 4). While decomposed animals are not counted as take associated with the project, they will still be recorded and reported with the project take.
10. Final disposition (e.g., released at site, relocated, rehabilitation and outcome once known, necropsy, disposal)
11. Species gender (if known)
12. Species size/length (measurement details are provided by species in the PSO PDCs, in Appendix H).
13. Beaufort state at the time of take.
14. Water temperature at the time of take-recorded at the water's surface. When possible, record ~~in marine environments and at~~ the bottom in estuarine and riverine environments.
15. Notes about species condition: Any additional relevant information regarding take of ESA-listed species including turtles with Fibropapillomatosis disease, previous wounds, or multiple ESA-listed species captured in same net.
16. Notes about site condition anomalies: Any observations by PSO or crew that may lead to increased captures or deposition of capture including presence of other species like cannonball jelly fish or regional conditions such as large storm or dramatic change in temperature like a recent cold snap.
17. If the take occurred during hopper dredging:

a) List the location where take was identified (e.g., draghead, inflow box, overflow box).
b) Provide the screening in place at the time of take. Were both inflow and overflow screening used? List the size of screening used for both.
c) State if UXO/MEC screening was installed at time of take

Commented [BNMCUC(8]: USACE requests NMFS provide the age class sizes to meet this requirement.

Commented [BNMCUC(9]: PSOs have stated this the species gender typically cannot be determined on the vessel.

2.9.4 Annual Programmatic Review

No changes request at this time.

2.9.4.1 Annual Programmatic Report

No changes request at this time.

2.9.4.2 Required for the Programmatic Annual Review Report

The following information will be reported in a digital compiled and sortable summary spreadsheet or narrative, as appropriate, according to the reporting guidelines provided in Section **Error! Reference source not found.** of this Opinion.

1) This report will include a master spreadsheet compiling all of the required information from Section 0 of this Opinion, for all projects covered by this Opinion during the year. The spreadsheet must provide a tally of at least the number of nonlethal and lethal take by species/DPS, any loss of critical habitat features by critical habitat unit and quantifying any loss of each feature by the area of loss (acres or square feet),[1] and total volume dredged during the year.
2) In addition to, or as part of, the master spreadsheet identified in item 1 above, identify and tally all projects:
   a) Located within a critical habitat unit or species-specific range that required additional protection, as appropriate:
      i) In sturgeon rivers (Sturgeon PDCs, **Error! Reference source not found.**)
      ii) ~~In the range of Johnson's seagrass (Johnson's seagrass PDCs, Appendix D)~~
      iii) In the range of ESA-listed corals (Coral PDCs, 0)
      iv) In the range and during the time when North Atlantic right whales may be present (**Error! Reference source not found.**)
   b) Using an equipment type that required additional reporting, such as:
      i) geophysical surveys
3) Hopper dredging with modified or removed inflow screening.
4) Project activities located within the range of ESA-listed corals that required a survey. Survey reports are submitted according to the Coral PDCs (0).
5) Requiring relocation of ESA-listed corals. The tally of these projects will include the total number and type of ESA-listed corals relocated by species and a summary of the survival rates for the year, according to the Coral PDCs (0).
~~6) Project activities located within the range of Johnson's seagrass that required a survey. The tally of these projects will include a summary of the results of the post-construction surveys.~~

2.9.4.3 Lessons Learned

No changes request at this time.

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[1] Note that adverse effects to designated critical habitat are not anticipated as a result of the proposed action; however, this reporting requirement ensures that NMFS will be notified in the event that adverse effects to critical habitat have occurred.

Appendix B. 2020 SARBO General PDCs

PLACE.3 Nearshore placement is covered under this Opinion that meet the conditions listed below and described in Section **Error! Reference source not found.** of the 2020 SARBO.

- Nearshore placement described in SARBA Appendix B, which is generally related to beach nourishment projects.
- Nearshore placement in areas that have undergone an individual Section 7 consultation and require repeat placement within the same area.
- New nearshore placement adjacent to beaches, through the use of side-casting material adjacent to a dredge location, or any other placement in water is allowed ~~outside the range of Johnson's seagrass (Johnson's Seagrass PCDs, Appendix D),~~ outside the range of ESA-listed corals (Coral PDCs, 0)~~,~~ and outside of sturgeon rivers (Sturgeon PDCs, **Error! Reference source not found.**).

PLACE.6 Upland Placement, which is defined as placement not occurring in a natural body of water and outside of NMFS purview, must meet the following criteria:

- Upland placement projects with return/discharge water to waters under NMFS purview will be designed to assure that turbidity generated by the discharge waters has returned to ambient levels before reaching any nearby ESA-listed coral ~~or Johnson's seagrass~~.
- Discharge flow will be maintained to prevent scour or erosion.

Section 1.4 (Appendix B) Geophysical and Geotechnical (G&G) Surveys

G&G surveys, as described in Section **Error! Reference source not found.** of 2020 SARBO, may be used to determine sediment composition and depth in areas where dredging or material placement can occur under 2020 SARBO. G&G surveys may also be used to identify sensitive resources in areas surrounding the areas proposed for dredging, or material placement such as hardbottom habitat within the range of ESA-listed corals (Coral PDCs, 0)~~, or areas of seagrass within the range of Johnson's seagrass (Johnson's seagrass PDCs, Appendix D)~~.

INWATER.3 Turbidity control: All work that may generate turbidity will be completed in a way that minimizes the risk of turbidity and sedimentation reaching non-mobile ESA-listed species (i.e., ESA listed corals ~~and Johnson's seagrasses~~) as well as other non-ESA-listed non-mobile species (e.g., non-ESA-listed corals, sponges, and other natural resources) to the maximum extent practicable. This may include selecting equipment types that minimize turbidity and positioning equipment away or downstream of non-mobile species.

INWATER.7 Dredging or material placement in areas not previously used for dredging or placement are allowed under this Opinion for borrow sites, side-cast dredging, beach nourishment, nearshore placement associated with beach nourishment, if they meet all of the PDCs in this Opinion, including those listed below:

- Within the range of ESA-listed corals (Coral PDCs in 0)~~, within the range of Johnson's seagrass (Johnson's Seagrass PDCs in Appendix D),~~ and in sturgeon rivers (Sturgeon PDCs in **Error! Reference source not found.**): Additional PDCs apply to these activities.

APPENDIX C. 2020 SARBO Coral PDCs

1 Description of the Areas Coral PDCs Apply

No changes request at this time.

2 Requirements for All Dredge and Material Placement Projects Within the Range of ESA-listed Corals

No changes request at this time.

3 Beach Nourishment Survey Protocol

3.1 Survey Objectives

The objectives of the beach nourishment survey protocol are to identify and map the location of all coral hardbottom and ESA-listed corals located (1) between the proposed beach fill template ETOF and 500 ft waterward of the ETOF and (2) within portions of beach fill templates permitted but previously unfilled for beach nourishment projects covered under the 2020 SARBO (these areas are referred to as the beach hardbottom survey area). This level of detail cannot be obtained using transect data or the NMFS *ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol*, Updated July 2019.

Commented [BNMCUC(10]: Suggest underlining this point to emphasize it.

If ESA-listed corals are identified in the beach hardbottom survey area, the USACE will coordinate with NMFS to conduct a project-specific review to determine if coral relocation is necessary to protect corals from potential turbidity and sedimentation resulting from the beach nourishment. Conditions that may be considered when evaluating if corals need to be relocated include the specific location and details about each ESA-listed coral within 500 ft of the ETOF. This includes the species, size, health status, and any other relevant details about each coral with a clearly understandable way to reference each coral to a location provided on a map using current aerial imagery as the base map showing the proposed placement area, ETOF, and hardbottom edge. USACE will continue to work with NMFS to understand the risk to corals identified based on the project details, ~~composition of sand that will be placed,~~ hydrology, proximity to coral, and past experience with similar projects in the area. While the current area required to be surveyed is within 500 ft of the ETOF, that does not imply that all corals within that area are intended to be relocated. Corals should not be unnecessarily moved if affects to them are not anticipated or the stress from relocation is deemed appropriate.

3.2 Surveys for Beach Nourishment Projects

For beach nourishment projects covered under this Opinion, the location of hardbottom may be identified using high-resolution geophysical surveys and will then be visually verified by divers. Divers will swim all areas of hardbottom and map the extent of all hardbottom areas within the beach hardbottom survey area described in Coral PDCs Section 2.3. Hardbottom in the survey area will be identified and also documented if the hardbottom meets the definition of coral hardbottom, defined in Coral PDC Section **Error! Reference source not found.**. For projects with hardbottom identified, all hardbottom areas will be provided on a map that uses a current aerial imagery as the base map and provides the proposed area of fill and ETOF.

~~Divers will also identify and record the presence of all ESA-listed corals within the beach hardbottom survey area, according to the *ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol*, Updated July 2019 (https://www.fisheries.noaa.gov/southeast/consultations/regulations-policies-and-guidance). The protocol provides information on staff qualifications, QA/QC procedures, delineating *Acropora* critical habitat features, coral survey protocols, and data collection requirements. If this guidance is updated, the new NMFS survey protocol will be followed.~~

3.3 Survey Reports for Beach Nourishment Projects

Surveys will report the information listed below to NMFS within 60 days of the completion of the survey. This information will be collected and reported as described in the 2020 SARBO Section **Error! Reference source not found.**. ~~The *ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol* does not provide a reporting form for surveys associated with beach nourishment projects, but the forms in the protocol can be adapted to this survey type. If this guidance is updated, the new NMFS survey protocol will be followed.~~ The information reported will include:

1. Georeferenced map (ArcGIS files) and GPS coordinates for all hardbottom and ESA-listed corals identified by species.
2. Map of the location of each colony of ESA-listed corals.
3. Map of the location of *Acropora* critical habitat essential feature (i.e. coral hardbottom). Mapping the location of coral hardbottom both within the geographic boundaries of *Acropora* critical habitat and within the range of ESA-listed corals is required, but indicate the area of coral hardbottom that is within Acropora critical habitat.
4. Dimensions of the colony (length, width, and height, or longest dimension length [units = cm]), percent live tissue, and recent partial mortality.
5. Water depth and general description of the vertical relief (high, medium, low) of the coral hardbottom feature where the colony is found.
6. Report summarizing field-data collection.

Commented [BNMCUC(11)]: The protocol does not provide the required information. References to it are confusing and result in insufficient data collection.

4 Pipeline Survey Protocol

No changes request at this time.

5 Coral Relocation Protocol for ESA-Listed Corals

All coral relocation completed for beach nourishment or pipeline placement projects covered under the 2020 SARBO will be completed as described below. This coral relocation process and/or qualifications required to relocate coral outlined in the Appendix may be adapted if deemed appropriate by both USACE and NMFS. Anyone handling ESA-listed corals must have all the appropriate training and state certifications.

Commented [BNMCUC(12)]: Additional detail provided in track changes would reduce confusion.

The USACE may contact NMFS prior to a coral relocation project (from either a beach nourishment or pipeline placement project) to determine, through a project specific review, if it may be appropriate to give relocated ESA-listed corals to a coral nursery instead of relocated to a

nearby location. If corals are provided to a coral nursery, no monitoring of transplant success (Coral PDC Section 5.4) is required.

For beach nourishment projects, the USACE will contact NMFS prior to relocating corals located between the proposed beach fill template ETOF and 500 ft waterward of the ETOF and in areas of the permitted beach fill template that have not been previously filled, to determine if relocation is necessary based on the likelihood of turbidity or sedimentation reaching corals within this area. This assessment will consider the material to be placed, site conditions, hydrology, and likelihood of potential burial of corals in the area during or after sand placement.

5.1 Qualified person

All relocation and reporting activities will be conducted by staff that meet the necessary requirements:

Staff Qualifications All field work and Quality Assurance/Quality Control (QA/QC) of the surveys and data collected will be completed by qualified biologists who meet at least the following minimum requirements

- Bachelor of Science in Marine Biology, Biology with a concentration in marine sciences, Environmental Science with a minor in Biology, or similar degree;
- At least 3 years documented experience monitoring coral hardbottom / coral reef communities in South Florida;
- Knowledge of marine benthic ecosystems and organisms, including but not limited to identification of Caribbean coral species.

QA/QC Prior to initiating fieldwork, the entire dive survey team (boat operators, divers, data transcribers, and QA/QC reviewers) will hold a training session to discuss the proper completion of survey protocols, field data sheets, and proper species identification. An appropriate QA/QC protocol should include the following:

- Test dive of a complete transect. If more than 1 dive team is employed then the test dive should be replicated by each diver pair. If a single dive team is employed then the test dive should be repeated with the divers swapping duties.
- Results of repeated test transects should not vary by more than 10%.
- Training should be documented and all divers should sign the training record.
- All field data sheets should be signed by the divers and a separate QA/QC reviewer.

The QA/QC reviewer should be a separate qualified biologist who is responsible for verifying survey results and ensuring proper implementation of the survey protocols.
~~outlined in the *ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol*, Updated July 2019 (https://www.fisheries.noaa.gov/southeast/consultations/regulations-policies-and-guidance). If this guidance is updated, the new NMFS survey protocol will be followed.~~

Commented [BNMCUC(13]: Deleted reference to the protocol since it does not give the survey information needed and confuses forks by referencing it. The text here is copied directly from that protocol.

5.2 Relocation site selection (No changes request at this time)

5.3 Relocation techniques (No changes request at this time)

5.4 Monitoring of Transplanted Corals (No changes request at this time)

Appendix D. 2020 SARBO Johnson's Seagrass PDCs

All PDCs and analysis relative to Johnson's seagrass in the 2020 SARBO is no longer relevant and will not be considered. All PDC requirements referencing Johnson's seagrass are also no longer relevant. Projects will be considered compliant with the 2020 SARBO by ignoring the Johnson's seagrass species requirements including those listed below from the SARBO PDCs

APPENDIX G. CORAL REVIEW

Projects Coordinated with NMFS Within the Range of ESA-listed Corals.

District	Project	NMFS Approval	Summary of action and NMFS Response
SAJ Civil Works	Arecibo	Supersede and Coral Review Approved July 2020	Proposed action: Maintenance dredging of harbor via mechanical dredging, and no overflow will be conducted. Dredging would occur late fall to early winter 2019, which is outside of coral spawning season for ESA-listed corals. Dredging will last approximately 12 days. Colonized bedrock, which may be functioning as coral critical habitat is located within 1,100 ft of the dredge area based on existing habitat maps. Material to be dredged consists of fine to medium sand size quartz, silty sand, and clayey sand with up to 22% fines. All other proposed 2020 SARBO conditions will be followed. Puerto Rico has a water quality standard of 10 NTU over background measured 150 m from the dredge. Approval rational from NMFS: "Although the Arecibo project will include dredging of material with up to 22% fines, the project is expected to be much shorter in duration and smaller in scope than the Port of Miami project, lasting only 12 days. Additionally, the water quality standard in Puerto Rico is 10 NTU over background measured at 150 m from the dredge. This means that the water quality at the location of the hardbottom will be maintained at the same levels as background. Hardbottom is located within 1,100 ft to the east of the dredge area but predominant currents in the area tend to run from the northeast to southwest direction. Based on the distance from coral hardbottom, hydrodynamics of the area, as well as the shorter duration and smaller scope of the dredging combined with the Puerto Rico water quality standard, we believe that this project may be completed under the SARBO supersede procedures." Records: due to staff changes, the request and approval dates could not be verified. However, NMFS confirmed that it was approved and provided the rationale. Used dates from Mayaguez for request and estimate approval was in July based on email exchanged.
SAJ Civil Works	Broward Segment II	NMFS Coral Review Approved 8/21/2020	Proposed action: Broward Segment 2 includes 4 reaches- Reach 1 includes new beach placement, Reach 2 and 4 are maintenance, and reach 3 is above MHW. NMFS (Kelly Logan) responded on 8/21- "Thank you for the additional information. We agree that Reach 2 and Reach 4 are covered under SARBO with the acknowledgement that they still need to complete the hardbottom and ESA-coral surveys for those sections. We agree that Reach 3 would also be covered, again with surveys, and with agreed upon monitoring to ensure that the fill remains above MHW. NMFS would like the chance to review the monitoring protocol for that please. And we agree that Reach 1 will need to undergo individual Section 7 Consultation."

District	Project	NMFS Approval	Summary of action and NMFS Response
SAJ Civil Works	Broward Segment II, Reach 1	NMFS Supersede/ Coral Review Approved 9/30/2020	Submitted Broward Segment II, Reach 1 as a Supersede review since the beach fill area to the ETOF is a sandy area and the closest hardbottom edge is 80 ft from ETOF only near R25-R26 and more than 500 ft for the remaining fill area. NMFS Response: "Thank you for the information regarding the hardbottom and ESA coral surveys within Reach 1. NMFS has received the attached map which shows the 100 x 100 m survey boxes where NOVA Southeastern University is currently conducting ESA coral surveys at Reach 1 along with a brief preliminary summary stating that 3 staghorn and 1 O. faveolata were found at site 15 and 1 additional O. faveolata was found at site 18. The exact locations were not provided and it is not clear how far these colonies are from the proposed ETOF. Thank you for agreeing to conduct pre- and post-construction surveys of the hardbottom areas within 500 ft of the proposed ETOF. NMFS would be happy to assist with the survey designs to ensure that they capture any unanticipated impacts to coral critical habitat. Thank you for addressing the potential cumulative impacts from the sand bypassing. Additionally, NMFS would like a copy of the Broward County Biological Monitoring Plan and copies of any monitoring reports that are submitted as part of the proposed project. Since we cannot verify the distance between the ETOF and the known ESA-listed corals we cannot make a determination on whether those corals should be relocated or not. Our preliminary recommendation is to require relocation of Orbicella corals within 500 ft of the proposed ETOF and monitoring of the known ESA-listed corals that are nearby but outside of the 500 ft as part of the Biological Monitoring transects if possible. This will give us reasonable assurance that there are no unexpected impacts to ESA-listed corals from the proposed action. NMFS agrees that the effects of the proposed nourishment at Reach 1 are likely to be substantially similar in size and scope to those evaluated under the SARBO with the agreed upon additional monitoring, post-construction surveys, and potential coral relocation. "

District	Project	NMFS Approval	Summary of action and NMFS Response
SAJ Civil Works	Broward Segment II, Reach 2 and 4 + Broward Segment III, Reach 3	NMFS Coral Review Approved 10/29/2021	Proposed action: Portions Broward Segments II and III were originally coordinated with NMFS in FY20 as a Regulatory project and NMFS determined that additional surveys were required and that all Acropora corals within 200 ft and all Oricella corals within 500 ft of the ETOF should be relocated. In FY21 discussion began again for work in the same area as a Civil Works project now scheduled to occur first. New surveys were conducted in Broward Segment II, Reaches 2 and 4 identifying ESA-listed corals that USACE worked closely with NMFS to determine which ones should be relocated. USACE provided training on how the ETOF was calculated along with other necessary information. Ultimately, NMFS PRD determined that all Acropora and Orbicella within 200 ft of the ETOF should be relocated. USACE partnered with coral nurseries with the help of NMFS and FWC to ensure the corals relocated could be used in restoration projects throughout the area expanding the genetic diversity. On November 4, 2021, the coral relocation in Segment II, Reach 2 was complete and a total of 28 colonies were safely relocated (27 ACER, 1 OFAV). Surveys and relocation for Segment II, Reach 3 are ongoing. While this coordination was complex and challenging, it represents the first project USACE and NMFS coordinated coral relocation. However, it resulted in a win for corals by partnering with coral researchers and nurseries to providing corals that will ultimately benefit the overall reef while still allowing beach nourishment to occur that is needed for coastal resiliency and used by sea turtles, shorebirds, and more and tourists important to the local economy.
SAJ Regulatory	Broward Segment III	NMFS Coral Review Approved 8/13/2020	Proposed action: Discussed on call with NMFS and USACE NMFS Response: "The project, as described in the information you provided, meets the PDCs of the 2020 SARBO. We do feel that this project warrants relocation of ESA listed corals, particularly Orbicella corals which have been decimated by recent disease outbreaks. NMFS requires all staghorn corals within 200 feet of the ETOF be relocated in accordance with the Coral Relocation Protocol for ESA-Listed Corals in Appendix C, Section 5.0. Additionally, NMFS requires the relocation of all the Orbicella corals within 500 feet of the ETOF either to the Coral Rescue or an established coral nursery. We are coordinating with the Coral Rescue group to potentially arrange collection of the Orbicella colonies so please stand by for further information."

District	Project	NMFS Approval	Summary of action and NMFS Response
SAJ Civil Works	Dade County Contract D Sunny Isles	NMFS Supersede/ Coral Review Approved 5/26/2021. ECO#3234 under SARBO/SERO-2019-03111	Proposed action: The proposed project is the replenishment of a sandy beach above and below mean high water in Sunny Isles Beach, FL. The renourishment will include the placement of approximately 280,000 cy of material between R-7 and R-19.3. Sand will be trucked from an approved upland site and will be unloaded via dump trucks above MHW. The project will use sand from upland mines, no dredging is proposed. The proposed action is expected to take up to 8 months. The project is located within designated critical habitat for elkhorn and staghorn corals. Nearshore ephemeral hardbottom, which does not contain the essential features, is present in the project area approximately 412-486 ft from the ETOF. No ESA-listed corals or seagrasses are reported within the action area. NMFS response: The project does not adhere to PDC C-BEACH 2, which requires surveys to determine the presence of coral hardbottom and ESA-listed corals. If ESA-listed corals are identified within 500 ft of the ETOF, coordination with NMFS is required to determine if corals should be relocated to avoid potential harm during beach nourishment construction. USACE is confident that ESA corals do not occur within 500 ft of the ETOF and therefore would not require NMFS coordination or relocation of corals. However, the information used to make this determination does not exactly meet the conditions of the 2020 SARBO survey protocol and USACE is requesting Supersede review. Key details: • A 2020 survey identified that there are 3 areas of hardbottom within 500 ft of the ETOF with the closest being at least 412 feet from the ETOF. • The hardbottom within the project area is very ephemeral, which would not support ESA-listed species, and no ESA-listed species have been documented around the project. Therefore, the Corps believes, and DERM supports, that there is not a risk to hardbottom or ESA-listed species from this project. • The USACE believes that based on the available historical data and the preliminary results of the Miami-Dade County Department of Environmental Resources Management (DERM) 2020 survey, this information meets the intent of the SARBO PDC C-BEACH.2, and no additional surveys are needed to support the upcoming beach nourishment event at the Dade County Beach Erosion Control and Hurricane Protection Project Sunny Isles Segment (referred to as “Dade Contract D”).

District	Project	NMFS Approval	Summary of action and NMFS Response
SAJ Regulatory	Higgs Beach, Key West. SAJ-2010-00920, INQ-2020-00101	NMFS Supersede/ Coral Review Approved 5/28/2020. NMFS SERO-2019-03111 Implementation 1924.	Proposed action: Originally submitted to NMFS as an individual consultation. NMFS Response: "The project does not adhere to PDC C-BEACH 1, bullet #3, which states that: "New beach nourishment projects (those not described in the SARBA Appendix B or those without an individual Section 7 consultation that analyzed the effects to ESA-listed corals and Acropora critical habitat features) within the defined range of ESA-listed corals are not covered under this Opinion." However, the applicant plans to place sand within the historic fill template and the USACE indicates that the fill will be placed within the 2006 ETOF which leads us to believe that the project area may have been nourished previously even though we are unable to locate a prior consultation. Additionally, the fill material exceeds the SARBO requirements for beach compatible material. Finally, the project meets all the other SARBO PDCs including use of turbidity barriers and monitoring of hardbottom, seagrass, and coral outside the fill template but within 500 yds of the ETOF. Based on the small project footprint, discreet timeline, distance from coral and hardbottom, and the adherence to PDCs we believe the project and its effects are substantially similar to those analyzed under the 2020 SARBO and therefore qualifies for supersede."
SAJ Civil Works	Mayaguez	NMFS Supersede/ Coral Review Approved 4/27/2020. Ref ID: 1769	Proposed action: Dredging- All material contains greater than 10% fines. 2. Mechanical or cutterhead to scow, No Hopper dredging 3. We estimate 12 and 15 days of dredging for Arecibo and Mayaguez, respectively. NMFS Response: Approved due to distance between dredging and nearest coral.
SAJ Civil Works	Palm Beach Harbor O&M	NMFS Supersede/ Coral Review Approved 9/16/2022	Proposed action: Request placement in the same nearshore location south of the jetty that was approved October 2020 as a supersede. Also requesting the approval include using the site in perpetuity. No hardbottom or corals in this area routinely used to bypass sand from north of the channel to south of the channel. NMFS Response: "NMFS has determined that the proposed action qualifies for approval through the SARBO supersede process for the work scheduled for December 2022-May 2023 because there are no effects to coral or critical habitat from the nearshore placement. The nearshore placement area must be used between May and Oct 31 (as opposed to beach placement) to avoid interactions with nesting sea turtles and consistent with the U.S. Fish and Wildlife Service's 2015 Revised Statewide Programmatic Biological Opinion. NMFS determines that the nearshore placement area may be used within other times of the year as an alternative to beach placement. NMFS does not approve the blanket supersede in perpetuity request from USACE.- Kelly Logan"

District	Project	NMFS Approval	Summary of action and NMFS Response
SAJ Civil Works	Palm Beach Inlet and Nearshore Placement R-76 to R-79	NMFS Supersede/ Coral Review Approved 10/29/2020	Proposed action: After a few months of trying to find the necessary information to submit this Supersede request for nearshore placement within the range of corals, SAD was informed that the dredge had mobilized on 27 OCT. SAD discussed options with SAJ and was told that they were not covered under the ESA to work until the Supersede request was approved by NMFS. On 27 OCT, the dredge began work. Incident Summary: On Wednesday, On October 28, 2020, a stop work order was issued to Cashman Dredging & Marine Contracting Co., LLC (Cashman) because of the lack of environmental clearance related to an Endangered Species Act (ESA) species (i.e., coral/Acropora). Current work includes dredging the harbor's entrance channel and placing the material in a near shore disposal area south of the inlet's south jetty. An oversight occurred prior to award related to a note from PD-E on their BCOES certification that stated, "do not open bids until ESA consultation complete." Ongoing coordination with NMFS was underway at the time under the new SARBO supersede process. PD-E believes the risk is low we would encounter the ESA species; however, there is not 100% assurance." USACE and NMFS discussed on 29 OCT. While surveys were not conducted prior to work beginning, USACE provided multiple historic survey records and pointed out where this area had been considered in past consultations with NMFS. Based on this information, USACE believes that there is at least 500 feet (probably 750 feet) between the furthest extent of the nearshore placement site to the closest documented hardbottom. NMFS Response: "NMFS agrees that this project as described to us in the emails and attachments dated October 26, 27, and 28th can proceed under SARBO supersede." This gave ESA Section 7 coverage under SARBO for dredging to resume.

APPENDIX H. BROWARD COUNTY SEGMENT II AND SEGMENT III CORAL RELOCATION REPORTS

Broward County Segment II Shore Protection
Endangered Species Act
Listed Corals Collection Summary Report

Final Report

February 2022

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1.0 INTRODUCTION

1.1 Study Context and Objective

In 2006, *Acropora cervicornis* (staghorn coral) and *Acropora palmata* (elkhorn coral) were listed as threatened species under the Endangered Species Act of 1973 (ESA; Federal Register/Vol. 71, No. 129/Thursday, July 6, 2006 / Rules and Regulations, http://www.gpo.gov/fdsys/pkg/FR-2006-07-06/pdf/06-6017.pdf). Five additional Caribbean stony coral species were listed as threatened in 2014 under the Endangered Species Act: *Orbicella annularis* (lobed star coral), *Orbicella faveolata* (mountainous star coral), *Orbicella franksi* (boulder star coral), *Dendrogyra cylindrus* (pillar coral), and *Mycetophyllia ferox* (rough cactus coral) (https://www.fisheries.noaa.gov/action/listing-20-reef-building-coral-species-under-esa).

As part of the Broward County Shore Protection Segment II Beach Renourishment Project, the United States Army Corps of Engineers (USACE) required hardbottom and endangered species act (ESA)-listed coral surveys, as well as ESA-listed coral collection/relocation efforts, in accordance with the 2020 South Atlantic Regional Biological Opinion (SARBO). The USACE contracted GLE Associates, Inc. (GLE), who sub-contracted Dial Cordy and Associates (DCA) to conduct the surveys and coral collection/relocation efforts in select nearshore hardbottom (Walker et al. 2008) habitats between Hillsboro Inlet and Port Everglades Inlet (approximately State R Monuments R-36 to R-72), in Broward County, FL. One of the primary objectives of the initial surveys was to identify all ESA-listed corals located between the proposed beach fill template equilibrium toe-of-fill (ETOF) and 500-ft seaward of the ETOF as described in the 2020 SARBO. Colonies occurring within the potential impact areas of the project were required for collection/relocation. The preferred method of relocation was to local coral nurseries, however if any corals were not accepted by local nurseries they would be relocated to an offshore recipient site. The initial performance work statement (Attachment A) provided by the USACE indicated that all ESA-listed corals within 200-ft would need to be relocated, and all non-Acroporid species (*A. cervicornis* and *A.* palmata) within 500-ft of the ETOF would need to be relocated.

Two proposed ESA-coral relocation lists (Reach 2 and Reach 4) were provided to the USACE prior to all collection/relocation efforts. The Reach 2 list contained 28 colonies, 27 *A. cervicornis* and 1 *O. faveolata*, all within 200-ft of the ETOF. The initial Reach 4 list contained a total of 136 colonies, 52 *A. cervicornis*, 24 *O. annularis*, and 60 *O. faveolata*, with all *Orbicella* sp. Colonies beyond 200-ft of the ETOF. On 22 November through email communication, the GLE project manager was notified by a representative from the USACE that “coral colonies within the 200-ft from ETOF should be collected. According to the attached, there are no Orbicellas within that range therefore no Orbicellas would be collected.” Therefore, ESA-listed colonies were only collected in areas up to 200-ft from the ETOF.

All ESA-listed corals were collected under the authorization of Florida Fish and Wildlife Commission (FWC) special activity licenses (SAL): SAL-21-2375-R (Reach 2) and SAL-21-2383-R (Reach 4) (Appendix B). ESA-listed coral collections began on 04 November and concluded on

11 December. All collected colonies were transferred to Dr. Abigail Renegar's holding tanks at NOVA Southeastern University (NSU), Dania, FL, and are awaiting final transfer to the NSU offshore coral nursery operated by Dr. Dave Gilliam.

1.2 Study Area

The ESA-coral collection sites were located within two separate identified areas. These areas were identified as Reach 2 (R-36 to R-41.3) and Reach 4 (R-51 to R-72) (Figure 1). Water depths within the collection sites ranged from 4 to 7m. ESA-listed corals were collected from 7 of the ETOF adjacent sites within both Reach 2 (n=33 sites) and Reach 4 (n=126 sites) (Table 1). Collected ESA-listed colonies were both found as attached intact colonies and as unattached colonies and individual fragments in a variety of habitats/microhabitats including; continuous hardbottom, rubble, and sand filled solution holes.

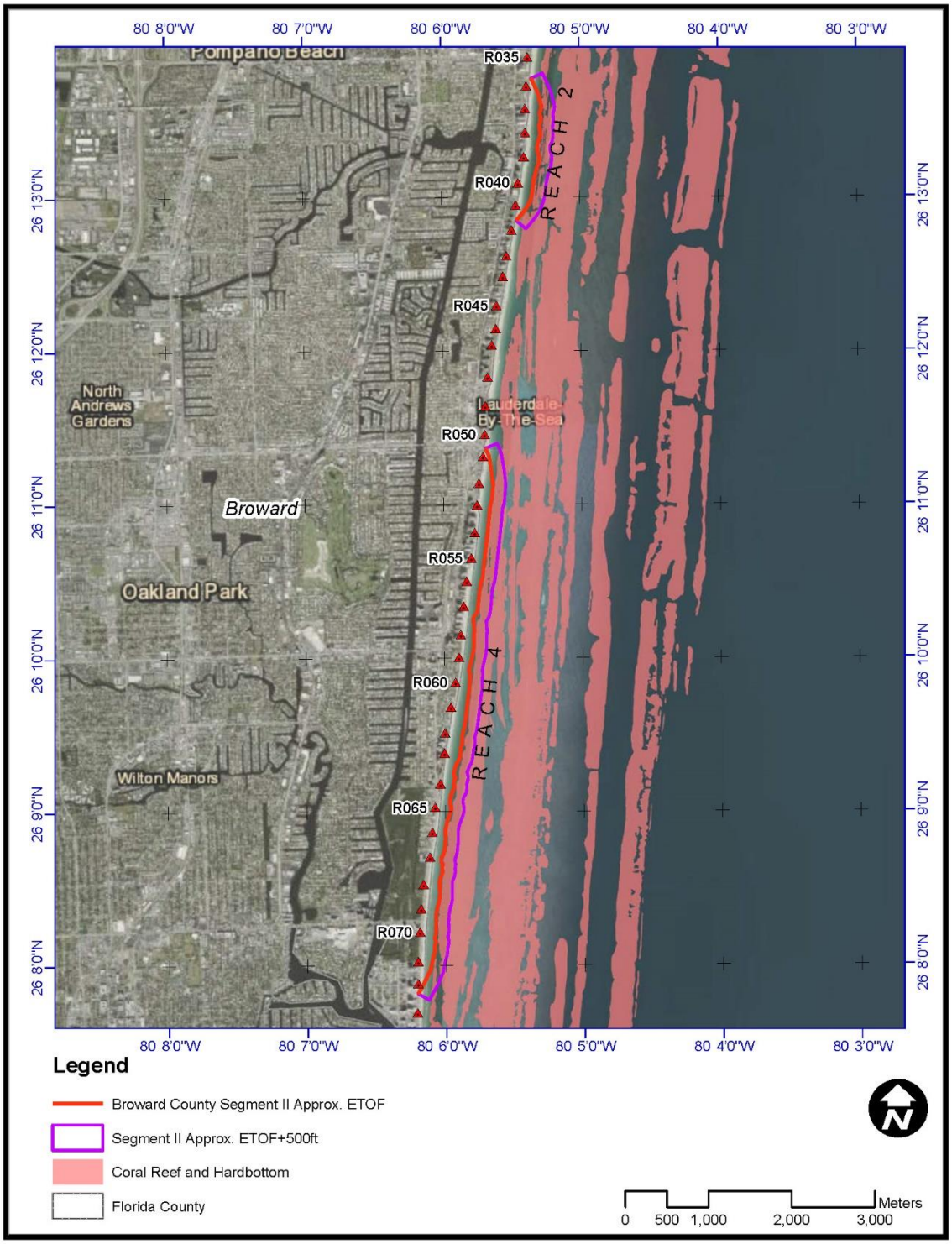


Figure 1. Map depicting the general location of the Reach 2 (North, R-36-R41.3) and Reach 4 (South, R51-R72) project areas in Broward County, FL. The red line indicates the approximate ETOF and the purple line represents the approximate 500-ft boundary.

2.0 METHODS

Data collected from the initial hardbottom/ESA-listed surveys were used to create the proposed coral collection/relocation lists. Both colony specific locations and general quadrant (NW, NE, SW, and SE) locations were input into ArcGIS 10.7.1 in order to determine the locations of all ESA colonies that occurred within the 200-ft ETOF boundary, and all non-Acroporid ESA colonies within the 500-ft ETOF boundary. An output table of ESA-listed colonies that met the requirement for transfer was generated for each project Reach. When available, colony specific metrics (maximum dimension, percent live tissue, and stress) were included to help identify the colonies during the collection efforts. Colonies identified as diseased during the initial surveys were highlighted in the submitted lists as not to be relocated. The proposed collection/relocation lists have been provided in Appendix C (Reach 2) and Appendix D (Reach 4). Within Reach 2, seven sites were identified as having a total of 28 ESA-listed colonies (27 *A. cervicornis* and 1 *O. faveolata*) within 200-ft of the ETOF. The proposed list for Reach 4 included 85 *A. cervicornis* colonies at seven sites, with location specific data for 28 colonies and an additional 57 colonies likely falling within the 200-ft of the ETOF based on the quadrant they were observed in (Table 1).

ESA-listed coral collection/relocation was conducted by qualified personnel as outlined in the NOAA/NMFS "ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol" (included in Appendix A), and adhered to the standards outlined in the FWC special activities licenses that the collection activities were permitted under (Appendix B). To ensure that all colonies within the 200-ft ETOF boundary were observed/collected a weighted line (leadline) was deployed from the dive vessel, utilizing Hypack navigational software and a sub-meter differential GPS (dGPS) unit, along the path of 200-ft boundary line. In addition to the leadline, weighted lines with buoys were dropped near individual; colonies, or groups of colonies, with specific location data. The buoys allowed the divers to confirm they were collecting the previously identified colonies.

For the collection process, the dive team typically entered the collection sites at the southern boundary and start point of the leadline (dependent on the prevailing current). The dive team surveyed all of the habitat extending west of the leadline to the hardbottom edge to collect any additional corals that may have either been missed during the initial surveys, or had moved in to the site due to dominant wave energy (D'Antonio et al. 2016). Once colonies were found they were collected using hammer and chisels, for large *A. cervicornis* colonies and the single *O. faveolata,* and gardening clippers on smaller *A. cervicornis colonies*. Per the stipulation of the FWC SAL all *A. cervicornis* colonies needed to have all dead branch ends removed, and all colonies greater than 25-cm longest dimension needed to be cut into fragments less than 25-cm in longest dimension. Prior to the collection of each colony specific data were recorded: maximum overall dimension (cm), percent live tissue, signs of stress, colony state (loose or attached), and any other relevant observations. Additionally, at least one photograph was taken of each colony prior to removal. Pursuant to the FWC SAL a visual health assessment was conducted for each coral prior to collection (Appendix B).

Collected colonies were placed in buckets while collection activities occurred underwater. Upon returning to the dive vessel the colonies/fragments were transferred to 25 gallon tote bins filled with fresh seawater and then covered with a sheet. After the completion of each site and in order to minimize the time the collected corals were kept on the boat, the harvested colonies were taken to the NOVA for delivery to Dr. Renegar's team.

Due to prolonged periods of increased wind and wave activity after the collection of Reach 2 colonies, three additional sites were surveyed during the Reach 4 collection efforts. Due to the known motility of *A. cervicornis* colonies/fragments, the 200-ft ETOF area of Sites 119, 123, and 127 were surveyed due to the high abundances of colonies reported in the eastern portions of the sites. Additionally, Site 113 which was not included in the proposed Reach 4 collection list was added to the collection efforts due to the presence of *A. cervicornis* in the northwest quadrant. Since no specific colony coordinates were recorded for the corals in the northwest quadrant of the site, the general centroid coordinate of the quadrant was used in the GIS analysis which fell to the east of the 200-ft ETOF line.

Table 1. The number of colonies proposed for collection/relocation identified at each site within Reach 2 and Reach 4 based on the GIS analysis.

Site	*A. cervicornis*	*O. faveolata*
Reach 2		
12	3	
16	10	
18	4	
20	8	
21	1	
22		1
26	1	
Reach 2 Total	27	1
Reach 4		
87	2	
101	2	
105	32	
107	6	
111	27	
117	15	
119	1	
Reach 4 Total	85	
Segment 2 Total	112	1

3.0 Summary of Collection Efforts and Observations

Collection efforts occurred at a total of 18 sites and a total of 132 out of 134 observed colonies were collected from 14 of the sites. The 28 proposed colonies within Reach 2 were found and collected (Figure 2). No additional colonies were observed at any of the Reach 2 sites. An additional 21 colonies were observed within Reach 4, with 19 of the 21 colonies collected for a total of 104 colonies (Figure 3). In total, 888 ESA-listed coral fragments (883 *A. cervicornis* and 5 *O. faveolata*) were successfully delivered to the holding tanks at NOVA.

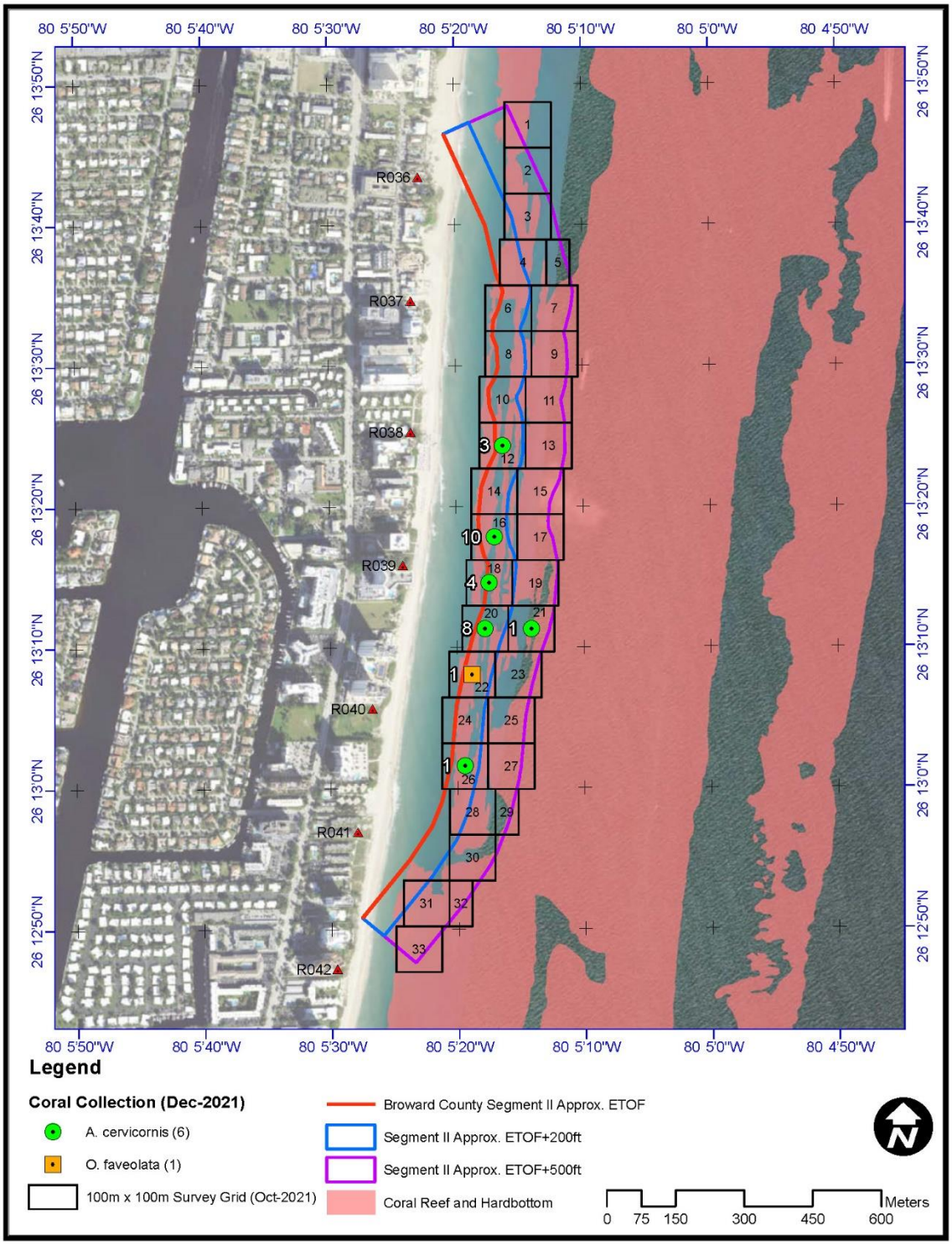


Figure 2. Map depicting the location of the collection sites and the number and species of corals collected from each location for Reach 2.

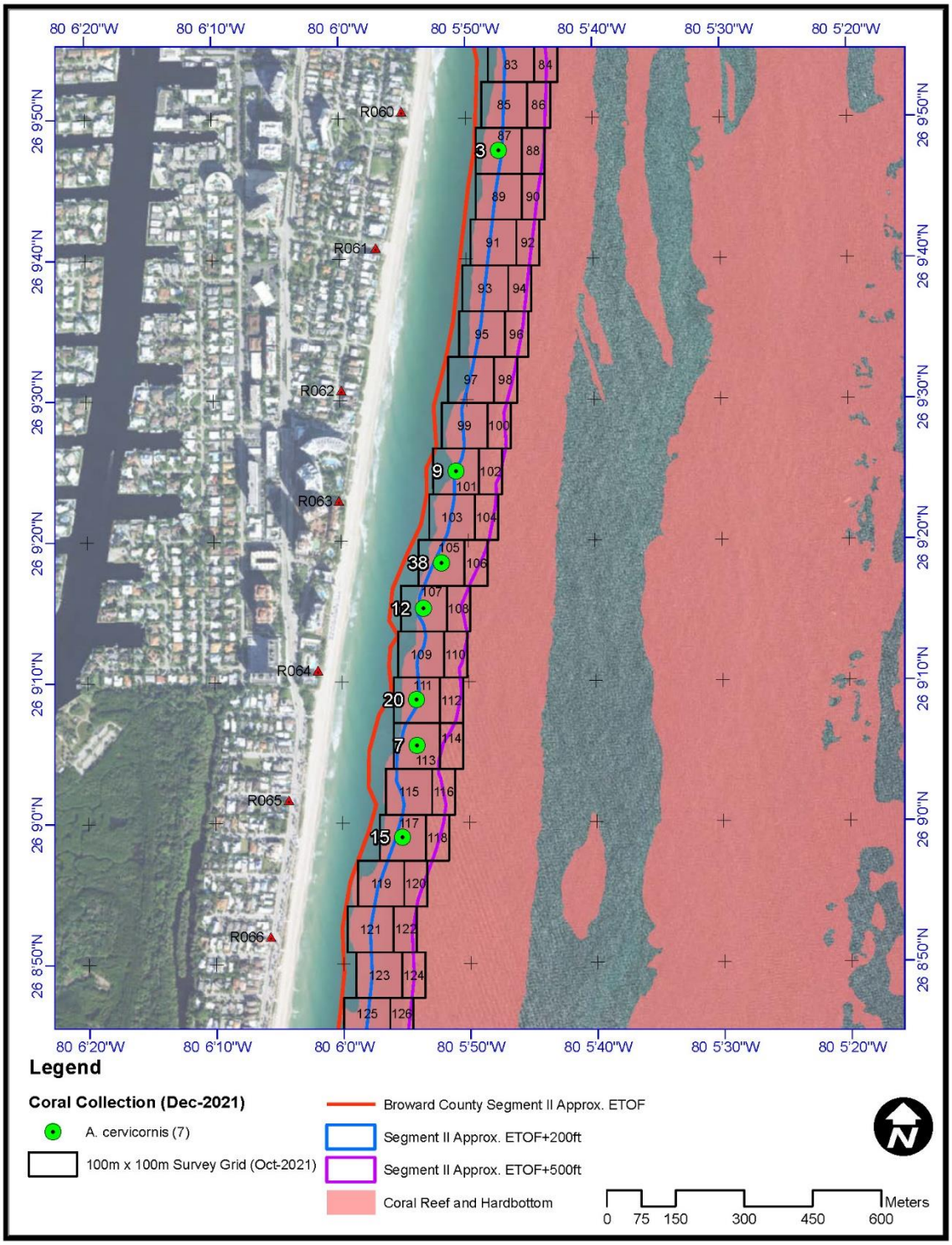


Figure 3. Map depicting the location of the collection sites and the number and species of corals collected from each location for Reach 4.

The two colonies that were not collected were *A. cervicornis* colonies observed at Site 87 and Site 105. Both colonies were suffering from significant recent mortality. The colony at Site 87 was recorded as having 5% live tissue, as well as being dislodged and covered by a dislodged octocoral. The colony at Site 105 was observed with more than 50% recent mortality due to disease.

Figure 4. Images of dislodged *A. cervicornis* colony covered by a dislodged octocoral (left) and experiencing significant recent mortality (right).

Figure 5. Image of diseased *A. cervicornis* at Site 105 suffering from more than 50% recent mortality.

Mean (±Std. Dev.) colony size (based on maximum dimension) of all the collected *A. cervicornis* colonies was 34-cm (±20.6cm). The largest colony collected had a maximum dimension of 150-cm and 80% live tissue. The single *O. faveolata* collected had a maximum dimension of 75-cm, and 20% live tissue at the time of collection. Mean (± SD) percent live tissue for all collected *A. cervicornis* was 60% (±31%). Within Reach 4 52% (54 of 104) of the observed colonies were recorded as being loose/unattached, with 12 of the loose colonies experiencing partial burial and recent mortality due to the burial.

Out of the 14 proposed relocation sites ESA-listed corals were found at 13 of the sites. GIS data from the Coastal Eco-Group surveys conducted in January 2020 indicated that a single *A. cervicornis* was observed along the hardbottom edge. The colony was not found at the provided coordinate, a more extensive search of the area within the 200-ft ETOF line revealed no additional colonies. A buoy was dropped at the provided coordinate and the current state of the benthos was no visible hardbottom edge in the area that was mapped in 2020, and that the majority of the surveyed area was hardbottom buried by 10-15-cm of coarse sand with emergent macroalgae (Figure 6). Of the four additional sites that were surveyed in Reach 4, seven additional colonies were found at Site 113. While none of the colonies were included in the relocation list due to the lack of location specific data for the colonies observed in the northwest quadrant, 33.3% (7 of 21) of the counted colonies did fall within 200-ft of the ETOF.

Figure 6. Location of *A. cervicornis* recorded in 2020 within the boundary of Site 119.

Per the specifications of the PWS the following information has been provided digitally to the USACE: field photographs (all collected corals), raw data and Excel summary spreadsheets, and scanned datasheets.

4.0 References

D'Antonio, N.L., Gilliam, D.S., and Walker, B.K. 2016. Investigating the spatial distribution and effects of nearshore topography on *Acropora cervicornis* abundance in Southeast Florida. Peer J 4:e2473

Florida Fish and Wildlife Conservation Commission (FWC). 2017. Unified Florida Reef Tract Map. Available at: https://geodata.myfwc.com/documents/myfwc::unified-florida-reef-tract-map/about

Walker, B. K., Riegl, B., and Dodge, R. E. 2008. Mapping coral reef habitats in southeast Florida using a combined technique approach. Journal of Coastal Research 24**:** 1138-1150.

APPENDIX A

USACE Performance Work Statement and Attachments

Attachment 1 Map of Survey Areas
Attachment 2 SARBO NMFS Coral Survey Protocol

PERFORMANCE WORK STATEMENT

BROWARD COUNTY SHORE PROTECTION PROJECT SEGMENT II BEACH RENOURISHMENT

DIVER-BASED BEACH HARDBOTTOM SURVEY PROTOCOL AND ENDANGERED SPECIES ACT (ESA)-LISTED CORAL RELOCATION/COLLECTION PROTOCOL

July 2021

1. GENERAL INFORMATION

1.1 Description of Services:

This is a non-personal services contract to provide tasks as described below for the completion of a diver-based beach renourishment diver-based hardbottom survey for the Broward County Shore Protection Project (located in Broward County, FL), at designated locations, to allow placement of material in areas between Hillsboro Inlet and Port Everglades Inlet (approximately State R Monuments R-25 to R-72). The Contractor shall provide all personnel, equipment, supplies, facilities, transportation, tools, materials, supervision, and other items to perform all services as defined in this Performance Work Statement (PWS) except for those items specified as government furnished.

1.2 Background:

The 2020 South Atlantic Regional Biological Opinion (SARBO) requires that beach nourishment projects covered under this Opinion complete a beach hardbottom survey to identify and map the location of any hardbottom located 500 ft seaward of the beach fill template equilibrium toe-of-fill (ETOF). Divers will also have to identify and record the presence of all Endangered Species Act (ESA)-listed corals within the beach hardbottom survey area. These hardbottom surveys must be completed prior to beach sand placement for beach nourishment projects within the range of ESA-listed corals in areas depicted by the two scenarios shown in Figure 52 of the 2020 SARBO (Appendix C "Coral" Section 2.3 "Beach Nourishment"). Select ESA-listed corals that are found within the 500' survey area will be relocated/collected per guidance and approval provided by U.S. Army Corps of Engineers, Jacksonville District (the Government). The survey and relocation/collection work (if necessary) are expected to be complete by November 1st, 2021, prior to the start of the upcoming renourishment event.

1.3 Objective:

The objectives of this beach nourishment survey are to identify and map the location of all coral hardbottom and ESA-listed corals located between the proposed beach fill template ETOF and 500 ft seaward of the ETOF as described in the 2020 SARBO (these areas are referred to as the beach hardbottom survey area). If ESA-listed corals are identified in the beach hardbottom survey area, coral relocation/collection will be conducted based on the project-specific review between the Government and National Marine Fisheries Service (NMFS) to protect ESA-listed corals from potential turbidity and sedimentation resulting from the beach nourishment.

1.4 Restrictions:

1. Personal Services: The Government shall neither supervise contractor employees nor control the method by which the contractor performs the required tasks. Under no circumstances shall the Government assign tasks to, or prepare work schedules for, individual contractor employees. It shall be the responsibility of the contractor to manage its employees and to guard against any actions that are of the nature of personal services or give the perception of personal services. If the contractor believes that any actions constitute, or are perceived to constitute personal services, it shall be the contractor's responsibility to notify the Procuring Contracting Officer (PCO) immediately.

2. Inherently Governmental: Avoidance of Performance Closely Associated with Inherently Governmental Functions. Task orders issued under this indefinite delivery/indefinite quantity (IDIQ) Contract will receive special consideration to avoid inclusion of services which are considered closely associated with inherently governmental functions. Under no circumstances will this IDIQ Contract be utilized in a manner which would require the Contractor to manage another contractor, nor in manner such as where the Contractor might influence official evaluations of other contractors; neither directly nor indirectly.

3. Brooks-Act Prohibition: Under this contract, the Contractor is prohibited from performing architect-engineer type services which require a registration by state law. The Contractor is prohibited from performing architect-engineer type services associated with the design or construction of real property (land and structures). The Contractor is prohibited from performing ancillary architect-engineer type services, which require supervision by a registered professional. The Contractor is prohibited from performing survey or mapping services associated with architect-engineer type planning, development construction, design, or alteration of real property.

1.5 Scope:

The contractor shall furnish all materials, equipment, supplies, personnel, and all other services required to perform the environmental services and Sustainment, Restoration and Modernization support outlined in this statement of work and as specifically identified in the individual task orders.

1.6 Period of Performance:

The period of performance shall be for 1 calendar year.

1.7 Place of Performance:
The work to be performed under this contract will be performed at designated locations between Hillsboro Inlet and Port Everglades Inlet, located in Broward County, Florida.

1.8 Recognized Holidays:

New Year's Day
Martin Luther King Jr.'s Birthday
President's Day
Memorial Day
Independence Day
Juneteenth
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day

2. CONTRACTOR ADMINISTRATION AND MANAGEMENT

2.1 Business Relations:

The contractor shall successfully integrate and coordinate all activity needed to execute the requirement. The contractor shall manage the timeliness, completeness, and quality of problem identification. The contractor shall provide corrective action plans, proposal submittals, timely identification of issues, and effective management of subcontractors. The contractor shall seek to ensure customer satisfaction and professional and ethical behavior of all contractor personnel.

2.2 Contractor Personnel, Disciplines, and Specialties:

Not applicable

2.3 Key Personnel:

All in-water work (*in-situ* data collection methods) and Quality Assurance/Quality Control (QA/QC) of the surveys and data collected will be completed by qualified biologists who meet at least the following minimum requirements:

1) Bachelor of Science in Marine Biology, Biology with a concentration in marine sciences, Environmental Science with a minor in Biology, or similar degree;
2) At least 3 years documented experience monitoring coral hardbottom / coral reef communities in South Florida;
3) Knowledge of marine benthic ecosystems and organisms, including but not limited to identification of Caribbean coral species.

The contractor shall provide a contract manager who shall be responsible for the performance of the work. The name of this person and an alternate who shall act for the contractor when the manager is absent shall be designated in writing to the contracting officer. The contract manager or alternate shall have full authority to act for the contractor on all contract matters relating to daily operation of this contract. The contract manager or alternate shall be available between *8:00 a.m. to 4:30p.m.*, Monday thru Friday except Federal holidays or when the Government facility is closed for administrative reasons.

2.4 Identification of Contractor Employees:

All contract personnel attending meetings, answering Government telephones, and working in other situations where their contractor status is not obvious to third parties are required to identify themselves as such to avoid creating an impression in the minds of members of the public that they are Government officials. They must also ensure that all documents or reports produced by contractors are suitably marked as contractor products or that contractor participation is appropriately disclosed. [

2.5 Subcontract Management:

The contractor shall be responsible for any subcontract management necessary to integrate work performed on this requirement and shall be responsible and accountable for subcontractor performance on this requirement. The prime contractor will manage work distribution to ensure there are no Organizational Conflict of Interest (OCI) considerations. Contractors may add subcontractors to their team after notification to the Contracting Officer (KO) or Contracting Officer Representative (COR).

2.6 Contractor Travel:

Contractor will be authorized travel expenses consistent with the substantive provisions of the Joint Travel Regulation (JTR) and the limitation of funds specified in this contract. All travel requires Government approval/authorization and notification to the COR.

3. SECURITY

3.1 Security Requirements:

A security clearance is not required for the Contractor employees.

3.2 Antiterrorism/Operation Security (AT/OPSEC) Requirements:

1. AT Level I Training - All contractor employees, to include subcontractor employees, requiring access to Army installations, facilities and controlled access areas shall complete AT Level I awareness training within 30 calendar days after contract start date or effective date of incorporation of this requirement into the contract, whichever is applicable. The contractor shall submit certificates of completion for each affected contractor employee and subcontractor employee, to the COR or to the Contracting Officer, if a COR is not assigned, within 5 calendar days after completion of training by all employees and subcontractor personnel. AT Level I awareness training is available at the following website: http://jko.jten.mil/courses/atl1/launch.html

2. Access and General Protection/Security Policy and Procedures - All contractor and all associated sub-contractors' employees shall comply with applicable installation, facility and area commander installation/facility access and local security policies and procedures (provided by government representative). The contractor shall also

provide all information required for background checks to meet installation/facility access requirements to be accomplished by installation Provost Marshal Office, Director of Emergency Services or Security Office. Contractor workforce must comply with all personal identity verification requirements (FAR clause 52.204-9, Personal Identity Verification of Contractor Personnel) as directed by DOD, HQDA and/or local policy. In addition to the changes otherwise authorized by the changes clause of this contract, should the Force Protection Condition (FPCON) at any installation or facility change, the Government may require changes in contractor security matters or processes.

3. For contractors requiring Common Access Card (CAC) - Before CAC issuance, the contractor employee requires, at a minimum, a favorably adjudicated National Agency Check with Inquiries (NACI) or an equivalent or higher investigation in accordance with Army Directive 2014-05 and Homeland Security Presidential Directive-12 (HSPD-12). Proposed language: "The contractor and all sub-contractors employees will be issued a CAC only if duties involve one of the following: (1) Both physical access to a DoD facility and access, via logon, to DoD networks on-site or remotely; (2) Remote access, via logon, to a DoD network using DoD-approved remote access procedures; or (3) Physical access to multiple DoD facilities or multiple non-DoD federally controlled facilities on behalf of the DoD on a recurring basis for a period of 6 months or more. At the discretion of the sponsoring activity, an interim CAC may be issued based on a favorable review of the FBI fingerprint check and a successfully scheduled NACI at the Office of Personnel Management."

4. Suspicious Activity Reporting Training (e.g. iWATCH, CorpsWatch, or See Something, Say Something) - The contractor and all associated sub-contractors shall receive a brief/training (provided by the RA) on the local suspicious activity reporting program. This locally developed training will be used to inform employees of the types of behavior to watch for and instruct employees to report suspicious activity to the project manager, security representative or law enforcement entity. This training shall be completed within 30 calendar days of contract award and within 30 calendar days of new employees commencing performance with the results reported to the COR NLT 5 calendar days after the completion of the training.

5. Contractor Employees Who Require Access to Government Information Systems - All contractor employees with access to a government info system must be registered in the ATCTS (Army Training Certification Tracking System) at commencement of services, and must successfully complete the DOD Information Assurance Awareness prior to access to the information systems and then annually thereafter IAW AR 380- 67 (Personnel Security Program) and Homeland Security Presidential Directive 12 (Policy for a Common Identification Standard for Federal Employees and Contractors).

6. OPSEC Standing Operating Procedure/Plan - The Contractor shall develop an OPSEC SOP/Plan within 90 days of contract award. The OPSEC SOP/Plan must be reviewed and approved by the RA OPSEC Officer. The SOP/Plan will include the government's critical information, why it needs to be protected, where it is located, who is responsible for it and how to protect it. In addition, the contractor shall identify an individual who will be an OPSEC Coordinator.

7. OPSEC Training - All new contractor employees will complete Level I OPSEC Training within 30 calendar days of their reporting for duty. Additionally, all contractor employees must complete annual OPSEC awareness training. The contractor shall submit certificates of completion for each affected contractor and subcontractor employee, to the COR or to the contracting officer (if a COR is not assigned), within 5 calendar days after completion of training. OPSEC awareness training is available at the following websites: https://www.iad.gov/ioss/ or http://www.cdse.edu/catalog/operations-security.html

8. For Information Assurance (IA)/Information Technology (IT) Training - All contractor employees and associated sub- contractor employees must complete the DoD IA awareness training before issuance of network access and annually thereafter. All contractor employees working IA/IT functions must comply with DoD and Army training requirements in DoD 8570 01-M and AR 25- 2 within six months of employment.

9. Escort Requirements - All contract employees, including subcontractor employees who are not in possession of the appropriate security clearance or access privileges, will be escorted in areas where they may be exposed to classified and/or sensitive materials and/or sensitive or restricted areas.

10. Pre- screen candidates using E- Verify Program - The Contractor must pre- screen Candidates using the E- verify Program (http://www.dhs.gov/E- Verify) website to meet the established employment eligibility requirements. The Vendor must ensure that the Candidate has two valid forms of Government issued identification prior to ensure the correct information is entered into the E- verify system. An initial list of verified/eligible Candidates must be provided to the COR no later than 3 business days after the initial contract award. When contracts are with individuals, the individuals will be required to complete a Form I- 9, Employment Eligibility Verification, with the designated Government representative. This Form will be provided to the Contracting Officer and shall become part of the official contract file.

11. Threat Awareness Reporting Program - All new contractor employees will complete annual Threat Awareness and Reporting Program (TARP) Training provided by a Counterintelligence Agent, IAW AR 381-12. The contractor shall submit certificates of completion for each affected contractor and subcontractor employee(s) or a memorandum for the record, to the COR or to the contracting officer (if a COR is not assigned), within 5 calendar days after completion of training. Authorized web based TARP training for CAC card holders is available at the following website: https://www.us.army.mil/suite/page/655474

3.3 Physical Security:

The contractor shall be responsible for safeguarding all Government information. Government-furnished equipment, property, and facilities are not applicable to this task order.

3.4 Key Control:

Reserved.

3.4.1 Lost Keys:

Reserved.

3.4.2 Keys issued to Contractor:

Reserved.

3.4.3 Lock Combinations

Reserved.

4. QUALITY

4.1 Quality Control:

The contractor shall develop and maintain an effective quality control program to ensure services are performed in accordance with this PWS. The contractor shall develop and implement procedures to identify, prevent, and ensure non-recurrence of defective services. The contractor's quality control program is the means by which he assures himself that his work complies with the requirement(s) of the contract. After acceptance of the quality control plan the contractor shall receive the contracting officer's acceptance in writing of any proposed change to his QC system.

4.2 Quality Assurance:

The Government shall evaluate the contractor's performance under this contract in accordance with the Performance Requirements Summary (PRS). Additionally, the Government will use a Quality Assurance Surveillance Plan (QASP) in the inspection of the services. This plan is primarily focused on what the Government must do to ensure that the contractor has performed in accordance with the performance standards. It defines how the performance standards will be applied, the frequency of surveillance, and the minimum acceptable defect rate(s).

4.3 Quality Assurance Surveillance Plan (QASP):

The Government shall monitor the Contractor's performance under this Task/Delivery Order in accordance with the Government's QASP.

4.4 Performance Requirements Summary:

The contractor service requirements are summarized into performance objectives that relate directly to mission essential items. The performance threshold briefly describes the minimum acceptable levels of service required for each requirement. These thresholds are critical to mission success.

5. GOVERNMENT CONTRACT ADMINISTRATION

5.1 Post Award Conference/Periodic Progress Meetings:

The Contractor agrees to attend any post award conference convened by the contracting activity or contract administration office in accordance with Federal Acquisition Regulation Subpart 42.5. The contracting officer, Contracting Officer Representative (COR), and other Government personnel, as appropriate, may meet periodically with the contractor to review the contractor's performance. At these meetings the contracting officer will apprise the contractor of how the government views the contractor's performance and the contractor will apprise the Government of problems, if any, being experienced. Appropriate action shall be taken to resolve outstanding issues. These meetings shall be at no additional cost to the government.

5.2 Contracting Officer Representative (COR):

The COR will be identified by separate letter. The COR monitors all technical aspects of the contract and assists in contract administration. The COR is authorized to perform the following functions: assure that the Contractor performs the technical requirements of the contract; perform inspections necessary in connection with contract performance; maintain written and oral communications with the Contractor concerning technical aspects of the contract; issue written interpretations of technical requirements, including Government drawings, designs, specifications; monitor Contractor's performance and notifies both the Contracting Officer and Contractor of any deficiencies; coordinate availability of Government-furnished property; and provide site entry of Contractor personnel. A letter of designation issued to the COR, a copy of which is sent to the Contractor, states the responsibilities and limitations of the COR, especially with regard to changes in cost or price, estimates or changes in delivery dates. The COR is not authorized to change any of the terms and conditions of the resulting order.

5.3 Contractor Performance Assessment Reporting System (CPARS):

This contract requires reporting in the Contractor Performance Assessment Reporting System (CPARS). Any task order awarded under this contract that is valued at greater than $1,000,000.00 will also be subject to reporting in CPARS. The contractor is responsible for providing and maintaining a representative in CPARS who has the authority to review and accept performance reports on behalf of the contractor.

6. OTHER REQUIREMENTS AND INFORMATION

6.1 Hours of Operation:

The contractor is responsible for conducting business, between the hours of 8:00 am to 4:30 pm thru Friday, except Federal holidays or when the Government facility is closed due to local or national emergencies, administrative closings, or similar Government directed facility closings. For other than firm fixed price contracts, the contractor will not be reimbursed when the government facility is closed for the above reasons. The Contractor must maintain at all times an adequate workforce for the uninterrupted performance of all tasks defined within this PWS when the Government facility is not closed for the above reasons. When hiring personnel, the Contractor shall keep in mind that the stability and continuity of the workforce are essential.

6.2 Other Direct Costs:

Reserved.

6.3 Data Rights:

The Government has unlimited rights to all documents/material produced under this contract. All documents and materials, to include the source codes of any software, produced under this contract shall be Government owned and are the property of the Government with all rights and privileges of ownership/copyright belonging exclusively to the Government. These documents and materials may not be used or sold by the contractor without written permission from the Contracting Officer. All materials supplied to the Government shall be the sole property of the Government and may not be used for any other purpose. This right does not abrogate any other Government rights.

6.4 Organizational Conflict of Interest:

Contractor and subcontractor personnel performing work under this contract may receive, have access to, or participate in the development of proprietary or source selection information (e.g., cost or pricing information, budget information or analyses, specifications or work statements, etc.), or perform evaluation services which may create a current or subsequent Organizational Conflict of Interest (OCI) as defined in FAR Subpart 9.5. The Contractor shall notify the Contracting Officer immediately whenever it becomes aware that such access or participation may result in any actual or potential OCI and shall promptly submit a plan to the Contracting Officer to avoid or mitigate any such OCI. The Contractor's mitigation plan will be determined to be acceptable solely at the discretion of the Contracting Officer and in the event the Contracting Officer unilaterally determines that any such OCI cannot be satisfactorily avoided or mitigated, the Contracting Officer may effect other remedies as he or she deems necessary, including prohibiting the Contractor from participation in subsequent contracted requirements which may be affected by the OCI.

6.5 Phase In/Phase Out:

Reserved.

7. DEFINITIONS AND ACRONYMS

7.1 Definitions:

CONTRACTOR. A supplier or vendor having a contract to provide specific supplies or service to the Government. The term used in this contract refers to the prime.

CONTRACTING OFFICER. A person with authority to enter into, administer, and or terminate contracts, and make related determinations and findings on behalf of the government. Note: The only individual who can legally bind the Government.

CONTRACTING OFFICER REPRESENTATIVE (COR). An employee of the U.S. Government appointed by the contracting officer to administer the contract. Such appointment shall be in writing and shall state the scope of authority and limitations. This individual has authority to provide technical direction to the Contractor as long as that direction is within the scope of the contract, does not constitute a change, and has no funding implications. This individual does NOT have authority to change the terms and conditions of the contract.

DEFECTIVE SERVICE. A service output that does not meet the standard of performance associated with the Performance Work Statement.

DELIVERABLE. All goods, out-puts, end products, services, work, work product, items, materials and property to be created, developed, produced, delivered, performed or provided by or on behalf of, or made available through, Contractor (or any agent, contractor or subcontractor of the contractor) in connection with this contract. Most

deliverables take the form of a tangible product (hardware, software, data, written report, completed installation, etc.), but some can also be less tangible (meeting facilitator or custodial services).

KEY PERSONNEL. Contractor personnel that are evaluated in a source selection process and that may be required to be used in the performance of a contract by the Key Personnel listed in the PWS. When key personnel are used as an evaluation factor in best value procurement, an offer can be rejected if it does not have a firm commitment from the persons that are listed in the proposal.

PHYSICAL SECURITY. Actions that prevent the loss or damage of Government property.

QUALITY ASSURANCE. The government procedures to verify that services being performed by the Contractor are performed according to acceptable standards.

QUALITY ASSURANCE SURVEILLANCE PLAN (QASP). An organized written document specifying the surveillance methodology to be used for surveillance of contractor performance.

QUALITY CONTROL. All necessary measures taken by the Contractor to assure that the quality of an end product or service shall meet contract requirements.

SUBCONTRACTOR. One that enters into a contract with a prime contractor. The Government does not have privity of contract with the subcontractor.

WORKDAY. The number of hours per day the Contractor provides services in accordance with the contract.

WORK WEEK. Is defined as Monday through Friday, unless specified otherwise.

7.2 Acronyms:

ACOR	Alternate Contracting Officer's Representative
AFARS	Army Federal Acquisition Regulation Supplement
AR	Army Regulation
CCE	Contracting Center of Excellence
CFR	Code of Federal Regulations
CONUS	Continental United States (excludes Alaska and Hawaii)
COR	Contracting Officer Representative
COTR	Contracting Officer's Technical Representative
COTS	Commercial Off the Shelf
DA	Department of the Army
DD250	Department of Defense Form 250 (Receiving Report)
DD254	Department of Defense Contract Security Requirement List
DFARS	Defense Federal Acquisition Regulation Supplement
DMDC	Defense Manpower Data Center
DOD	Department of Defense
FAR	Federal Acquisition Regulation
HIPAA	Health Insurance Portability and Accountability Act of 1996
KO	Contracting Officer
OCI	Organizational Conflict of Interest
OCONUS	Outside Continental United States (includes Alaska and Hawaii)
ODC	Other Direct Costs
PIPO	Phase In/Phase Out
POC	Point of Contact
PRS	Performance Requirements Summary
PWS	Performance Work Statement
QA	Quality Assurance
QAP	Quality Assurance Program
QASP	Quality Assurance Surveillance Plan

QC	Quality Control
QCP	Quality Control Program

8. GOVERNMENT-FURNISHED PROPERY, EQUIPMENT, SERVICES AND MATERIALS

8.1 Property:

Reserved.

8.2 Equipment:

Reserved.

8.3 Services:

Reserved.

8.4 Materials:

Reserved.

9. CONTRACTOR REQUIREMENTS

9.1 Contractor Furnished Items. *(i.e., any item that the contractor is required to have to perform the contract).*

9.2 Submittals. *(i.e., Safety Plan in accordance with EM384-1-1).*

9.3 Contract Requirements. *(i.e., Quality Control Plan, Certificate of Liability Insurance and any other certifications or any documentation that are required before work can be started).*

10. PERFORMANCE REQUIREMENTS

10.1 Basic Services:

The Contractor shall provide services for all tasks as described below for the completion of a diver-based beach nourishment survey for the Broward County Shore Protection Project Segment II Beach Renourishment Project, at designated locations, to allow placement of material in areas between Hillsboro Inlet and Port Everglades Inlet (approximately R-25 to R-72). See Attachment 1 for a graphic depiction of the survey area. Survey methods shall be conducted by qualified biologists meeting the minimum requirements as described in section 2.3. Documentation demonstrating appropriate expertise and experience is required to be provided to the Government with your proposal.

10.2 Task Heading and Standards:

Task 1: Kick-off Call:
Immediately following award of this contract, a kick-off conference call will be scheduled between the Government and the Contractor to consider a variety of issues, outline responsibilities, review schedule and deliverables, establish points-of-contact (POC), etc. The Contractor shall arrange the conference call and shall be responsible for the agenda and preparing minutes of the call/meeting and submitting to the Government.

Task 2: Identification of Coral Hardbottom and ESA-Listed Corals Field Activities
Presence of Coral Hardbottom and ESA-listed Corals:

Divers will identify and record the presence of all coral hardbottom and ESA-listed corals within the beach hardbottom survey area associated with placement of material in Reach 2 (from R-36 to R-41.3) and Reach 4 (from R-51 to R-72) (see Attachment 1 for a depiction of the survey area) according to the NMFS's ESA-Listed Coral Colony and *Acropora* Critical Habitat Survey Protocol updated in July 2019 (see Attachment 2). This protocol provides specific information on survey methods, QA/QC procedures, delineating *Acropora* critical habitat features, and data collection requirements. If this guidance is updated, the new NMFS survey protocol will be followed.

Dive Safety Plan:
The Contractor shall prepare a Dive Safety Plan and submit for Government approval **no later than 7 calendar days** post award of the contract, and prior to commencement of the first dive.

(1) The Contractor's diving operations shall comply with all the requirements of Section 30 of the U.S. Army Corps of Engineers' "Safety and Health Requirements Manual," EM 385-1-1 (30 November 2014) and paragraphs 3 and 11 of Appendix P, "Contract Diving Operations" of Jacksonville District Regulation CESAJR 385-1-1, dated 1 September 1998. A diving operations plan and the other submittal items specified below must be reviewed and accepted by the District Diving Coordinator and the Safety Office prior to the commencement of any diving operations.

(2) The appropriate number of personnel shall be furnished for each dive, as required by paragraph 7, Dive Teams, of Appendix P to CESAJR 385-1-1.

(3) All diving shall be performed and conducted in accordance with the requirements of the following documents:

(a) U.S. Army Corps of Engineers, Safety and Health Requirements Manual, EM 385-1-1, Section 30.

(b) U.S. Army Corps of Engineers, Jacksonville District Regulation CESAJR 385-1-1, Appendix P "Contract Diving Operations."

(c) U.S. Navy Diving Manual, Volumes I and II (NAVSEA 0994-LP-001-9010 and NAVSEA 0994-LP-001-9020).

(d) 29 CFR, Part 1910, Subpart T, OSHA Regulations.

(4) The Contractor shall submit the following items after award of the contract, with sufficient time allowed for review by the District Diving Coordinator, prior to performing the first dive:

(a) A safe diving practices manual as specified in paragraph 30.A.11 of EM 385-1-1.

(b) Dive Operations Plan to include all the items specified in paragraph 30.A.13 of EM 385-1-1. This plan shall contain information specific to the diving operations to be performed on each dive. A Dive Log shall be maintained for each dive undertaken to include name of diver, name of dive team members, diving mode, surface and underwater conditions, water depth and bottom time, and nature and description of work performed. A generalized, philosophical discussion of diving, or an enumeration of diving-related theory shall NOT be accepted for the Dive Operations Plan.

(c) Activity Hazard Analysis, pursuant to Appendix P, paragraph 3.c. shall be submitted. This must address specific hazards anticipated for each diving operation to be performed and must specifically address other work of any kind being performed concurrently that interface with or affect the diving operations. Applicable lock out, tag out, and safe clearance procedures must also be included in the Analysis.

(d) Up-to-date resume denoting diving-related training and experience for each diver.

(e) Medical certification from a physician as to each diver's fitness/suitability for diving, as required by paragraph 30.A.12 of EM 385-1-1. This certification must be from a licensed physician within the 12

months immediately preceding any dive performed under the contract and must be renewed at 12-month intervals.

(f) Proof of current CPR and First-Aid training for each member of the dive team, as required by paragraph 30.A.08 of EM 385-1-1.

(g) Copies of certifications and/or documentation to demonstrate that any pressurized air tanks (SCUBA, Surface supplied air systems, "bail-out bottles", etc.) to be used by the divers have been visually inspected at 12-month intervals and hydrostatically tested at 5-year (60-month) intervals, as required by paragraph 30.B.03.f. (3) of EM 385-1-1. Breathing air supply hoses, helmets, and masks shall be visually inspected and meet specifications contained in paragraphs 30.E.06 and 30.E.07.

(h) Copies of certifications and/or documentation to demonstrate that the compressor(s) used to provide breathing air for the divers have been tested at six-month intervals and meet the air purity requirements specified in paragraph 30.E.05 of EM 385-1-1.

(i) Identification of emergency and first aid equipment (first aid kit, oxygen resuscitation system, backboard) to be available at the dive location during any diving operations, pursuant to paragraph 30.E.11 of EM 385-1-1.

(j) Emergency Management Plan, pursuant to paragraph 30.A.13.a. (8). This must address emergency procedures, to include a means of notification, telephone numbers (for law enforcement, ambulance, hospital, doctors, and recompression chamber), nearest U.S. Coast Guard (USCG) emergency assistance and rescue center, and location of evacuation routes.

Diver training and QA/QC procedures:
Prior to initiating fieldwork, the entire dive survey team (boat operators, divers, data transcribers, and QA/QC reviewers) will hold a training session to discuss the proper completion of survey protocols, field data sheets, and proper species identification. An appropriate QA/QC protocol should include the following:

1. Test dive of a complete transect. If more than one dive team is employed, then the test dive should be replicated by each diver pair. If a single dive team is employed, then the test dive should be repeated with the divers swapping duties.
2. Results of repeated test transects should not vary by more than 10%.
3. Training should be documented, and all divers should sign the training record.
4. All field data sheets should be signed by the divers and a separate QA/QC reviewer.

The QA/QC reviewer should be a separate qualified biologist who is responsible for verifying survey results and ensuring proper implementation of the survey protocols.

Task 3: Coral Hardbottom and ESA-Listed Corals Data Analysis and Reporting
Coral Hardbottom and ESA-Listed Corals Survey
Deliverables are described in the NMFS' 2019 ESA-Listed Coral Colony and *Acropora* Critical Habitat Survey Protocol (Attachment 2) and will include:

- Georeferenced map (ArcGIS files) and latitude and longitude using decimal degrees (i.e., xx.xxxx^{o}N, –xx.xxxx^{o}W) for all coral hardbottom and ESA-listed corals identified by species.
- Map of the location of each colony of ESA-listed corals.
- Map of the location of *Acropora* critical habitat essential feature (i.e. coral hardbottom). Mapping the location of coral hardbottom both within the geographic boundaries of *Acropora* critical habitat and within the range of ESA-listed corals is required but indicate the area of coral hardbottom that is within *Acropora* critical habitat.
- Dimensions of the colony (length, width, and height, or longest dimension length [units = cm]), percent live tissue, and recent partial mortality.
- Water depth and general description of the vertical relief (high, medium, low) of the coral hardbottom feature where the colony is found.

- A thorough description of methods and techniques used in field investigations and data acquisition, as well as processing and data analysis, and findings of the survey.

Report Submittal. All data (*in-situ* transect coordinates, photo and video files, scanned data sheets, and Excel spreadsheets with raw data) will be available no later than 7 calendar days after all field data collection is complete. Information shall be presented in text, tabular, and graphic forms, whichever is most appropriate, effective, and advantageous to concisely communicate relevant information. All figures and tables shall have a number, title, appropriate explanatory notes, and a source note. In addition, all figures shall include appropriate reference points to help identify the location. All photographic still images and/or field notes collected during field activities shall be included in the report as an Appendix. The raw data submittal should also include a narrative summarizing the findings (e.g. dates and weather conditions during survey, absence/presence of coral hardbottom, absence/presence of ESA-listed corals, and any other significant/noteworthy observations). The draft survey report and map showing coral hardbottom and ESA-listed corals (if present) shall be provided to the Government no later than 15 days after all field data collection is complete. The final report shall be submitted within 10 calendar days of receipt of all Government comments. The Government shall review both draft and final versions of the document for accuracy of information and shall provide comments to the Contractor within 5 business days of receipt of the document. The Contractor shall address comments provided by the Government within 5 business days of receipt.

The Contractor shall provide to the Government one (1) electronic copy and 3 bound hard copies of both the draft and final reports. Each hard copy of the report shall also include a CD with all data and text of the report in electronic format, including, but not limited to, the following: photographs, sub-surface graphic representation, and/or GIS mapping. All documents provided from the Contractor shall be in MS Word, MS Excel, and Adobe Acrobat format. All final Adobe Acrobat documents shall be Section 508 Compliant. All graphics shall be saved as .jpeg or comparable files. All GIS files shall be in ArcView (shapefile) or comparable format.

All documents provided from the contactor shall be submitted to:

Broward County Segment II Survey Protocol
POC: Nolan Lacy
USACE-PD-EQ
701 San Marco Blvd
Jacksonville, FL 32207
nolan.m.lacy@usace.army.mil

Task 4: ESA-Listed Coral Relocation/Collection Proposal

ESA-Listed Coral Relocation/Collection Proposal

The Contractor shall compile a spreadsheet list ("Proposed Coral Relocation/Collection List") and a georeferenced map (ArcGIS files) of ESA-listed corals proposed for relocation/collection using the survey data collected in Task 2 for Reaches 2 and 4 and the coral hardbottom and ESA-listed corals survey information provided by the Government for Reaches 1 and 3. The list will include ESA-listed corals which are located in the following ranges:

- All *Acropora cervicornis* located within 200 ft of the ETOF
- All other ESA-listed corals (i.e. *Orbicella franksi*, *Orbicella faveolata*, *Orbicella annularis*, *Acropora palmata*, *Dendrogyra cylindrus*, *Mycetophyllia ferox*) located within 500 ft of the ETOF

The Proposed Coral Relocation/Collection List will include the following information for each coral:

- Species
- Dimensions of the colony (length, width, and height, or longest dimension length [units = cm]), percent live tissue, and recent partial mortality
- Location of the coral in latitude and longitude using decimal degrees (i.e., xx.xxxx^{o}N, –xx.xxxx^{o}W)
- Notes describing any signs of active disease, bleaching, or other signs of stress
- Any other significant/noteworthy observations
- Proposed relocation site (including approximate location in latitude and longitude using decimal degrees (i.e., xx.xxxx^{o}N, –xx.xxxx^{o}W)), name of the coral rescue nursery, or acknowledgement that the coral should not be relocated due to active signs of disease or stress

Collection/Relocation Sites: The Contractor shall first coordinate proposed collection of ESA-listed corals with coral rescue nursery(s). If the coral rescue nursery(s) refuse collection of any of the proposed ESA-listed corals, the Contractor shall propose an appropriate relocation site for the remaining ESA-listed corals. The Contractor will provide the Government with a list of the coral rescue nursery(s) (e.g. nursery name, address, website, and phone number) that were coordinated with. The Contractor will propose a relocation site that is suitable habitat as described by 2020 SARBO Appendix C Section 5.2 "Relocation site selection" (see Attachment 3).

Colony Condition Precluding Collection/Relocation: No colony shall be collected or relocated if there are signs of active disease. No collection or relocation shall occur if there are signs of bleaching or other signs of stress.

Determination of Corals to be Relocated/Collected:
The Contractor shall provide the Proposed Coral Relocation/Collection List, georeferenced map of ESA-listed corals proposed for relocation/collection, and the list of coral rescue nursery(s) that the Contractor coordinated with to the Government for review. The Government will provide the Contractor with final approval of the ESA-listed corals to be collected/relocated within 10 calendar days of the Contractor's submittal.

Task 5: ESA-Listed Coral Relocation/Collection Field Activities
Divers will conduct ESA-listed coral collections/relocations within Broward County Segment 2 (approximately R-25 to R-72) based on approval from the Government and according to the 2020 SARBO Appendix C Section 5 "Coral Relocation Protocol for ESA-Listed Corals" (see Attachment 3). This protocol provides specific information on qualified persons (section 5.1), relocation site selection (section 5.2), relocation techniques (section 5.3), and monitoring of transplanted corals (5.4). If this guidance is updated, the new NMFS survey protocol will be followed.

Task 6: Monitoring of Transplanted ESA-Listed Corals
Monitoring shall not be conducted for ESA-listed corals that are collected for coral rescue nursery(s).

Monitoring shall be conducted for ESA-listed corals that are relocated. Monitoring shall be conducted at 1 week, 1 month, 3 months, 6 months, and 12 months post-relocation.

Monitoring of relocated corals shall be conducted according to the 2020 SARBO Appendix C Section 5 "Coral Relocation Protocol for ESA-Listed Corals" (see Attachment 3). This protocol provides specific information on qualified persons (section 5.1) and monitoring of transplanted corals (5.4). If this guidance is updated, the new NMFS survey protocol will be followed.

Task 7: ESA-Listed Coral Relocation/Collection and Monitoring Data Analysis and Reporting
Initial Relocation/Collection Summary Report. A draft and final report describing the relocation/collection field work will be submitted. All raw data (e.g. GPS-coordinates, photo and video files, scanned data sheets, and Excel spreadsheets with raw data, etc.) shall be available no later than 7 calendar days after all field data collection is complete. The report will include:

- A thorough description of the methods and techniques used in the field.
- A description of the number of corals successfully collected for coral rescue nursery(s), number of corals successfully transplanted to the relocation site, and any unsuccessful collections/relocations with an explanation of contributing factors.
- Any other significant/noteworthy observations.

Baseline Observations at the Transplant Location Report.
If relocation of ESA-listed corals is conducted, a draft and final report for the baseline observations at the transplant location shall be submitted. All raw data (e.g. GPS-coordinates, photo and video files, scanned data sheets, and Excel spreadsheets with raw data, etc.) shall be available no later than 7 calendar days after all field data collection is complete. This report is described in the 2020 SARBO Appendix C Section 5.4 "Monitoring of Transplanted Corals". The report will include:

- Record the species and the number on the plastic identification tag adjacent to each transplanted colony.
- Record the widest length, width, and height of the coral, percent live tissue, and site depth at mean high water of each colony at both the original location and the transplant location.
- Record the GPS location (in decimal degrees) or the compass bearing and distance (in feet) from a known fixed point, and photograph each transplanted coral with a scale in the photo.

- A thorough description of methods and techniques used in field investigations and data acquisition, as well as processing and data analysis.

Post-Transplant Success and Survival Reports.
If relocation of ESA-listed corals is conducted, a draft and final report shall be submitted for each monitoring event required by the post-transplant success and survival monitoring. All raw data (e.g. GPS-coordinates, photo and video files, scanned data sheets, and Excel spreadsheets with raw data, etc.) shall be available no later than 7 calendar days after all field data collection is complete. These reports are described in the 2020 SARBO Appendix C Section 5.4 "Monitoring of Transplanted Corals" and will include:

- 1 week monitoring checks for attachment success; immediately reattach any corals that are not firmly attached to the hardbottom; percent mortality (report in 10% increments) for each of the monitored transplanted corals.
- 1 and 3-month monitoring records sediment cover on the colonies (sediment dusting, sediment accumulation, partial burial, burial of the base, burial, or sediment halo if present) and colony condition (bleaching, % live tissue, and presence of disease, fouling, or predation).
- 6 and 12-month monitoring records colony size, percent live tissue, sediment cover on the colonies, and colony condition.
- All reports will include a table with the percent mortality (reported in 10% increments) for each of the monitored transplanted corals.
- All reports will include a thorough description of methods and techniques used in field investigations and data acquisition, as well as processing and data analysis.
- All reports will address success of transplanting corals. The success of transplanting corals is met if 85% of all of the ESA-listed corals/coral colonies that are transplanted survive the transplant procedure. Survival of each coral transplanted is measured by determining if the individual has less than 25% partial mortality of the live tissue. The 1-year survival rate may consider the health of existing corals in the surrounding area, meaning that the survival rate may be adjusted if all corals in the area are affected by an external factor such as coral bleaching or disease.

Report Submittals. All data (e.g. GPS-coordinates, photo and video files, scanned data sheets, and Excel spreadsheets with raw data, etc.) shall be available no later than 7-calendar days after all field data collection is complete. Information shall be presented in text, tabular, and graphic forms, whichever is most appropriate, effective, and advantageous to concisely communicate relevant information. All figures and tables shall have a number, title, appropriate explanatory notes, and a source note. In addition, all figures shall include appropriate reference points to help identify the location. All photographic still images and/or field notes collected during field activities shall be included in the report as an Appendix.

If applicable, the draft report and map showing the location of the transplanted ESA-listed corals shall be provided to the Government no later than 15 days after all field data collection is complete. The final report shall be submitted within 10 calendar days of receipt of all Government comments. The Government shall review both draft and final versions of the document for accuracy of information and shall provide comments to the Contractor within 5 business days of receipt of the document. The Contractor shall address comments provided by the Government within 5 business days of receipt.

The Contractor shall provide to the Government one (1) electronic copy and 3 bound hard copies of both the draft and final reports. Each hard copy of the report shall also include a CD with all data and text of the report in electronic format, including, but not limited to, the following: photographs, sub-surface graphic representation, and/or GIS mapping. All documents provided from the Contractor shall be in MS Word, MS Excel, and Adobe Acrobat format. All final Adobe Acrobat documents shall be Section 508 Compliant. All graphics shall be saved as .jpeg or comparable files. All GIS files shall be in ArcView (shapefile) or comparable format.

All documents provided from the contactor shall be submitted to:

Broward County Segment II Survey Protocol
POC: Nolan Lacy
USACE-PD-EQ

701 San Marco Blvd
Jacksonville, FL 32207
nolan.m.lacy@usace.army.mil

11. REGULATIONS AND PUBLICATIONS

The Contractor must abide by all applicable regulations, publications, manuals, and local policies and procedures. *(For example, insert AR 25-2, AR 530-1.)*

Technical Publications: All work performed under this contract shall be in accordance with the following publications, and contractor's personnel shall be familiar with and comply with same. Publications may be found at http://140.194.76.129/publications/.

- Corps of Engineers Manual EM 385-1-1 - Safety and Health Requirements Manual.
- Corps of Engineers, Labor Relations Manual ER 1180-1-8.
- Quality Assurance Representatives Guide EP 415-1-261, Volumes 1 through 4.
- Department of the Army, Engineering Regulation ER 1180-1-6, 30 September 1995 - Construction Quality Management.
- SAD QA Manual

12. CONTRACTOR MANPOWER AND REPORTING

Accounting for Contract Services (FEB2007)

The Office of the Assistant Secretary of the Army (Manpower & Reserve Affairs) operates and maintains a secure Army data collection site where the contractor will report ALL contractor manpower (including subcontractor manpower) required for performance of this contract. The contractor is required to completely fill in all the information in the format using the following web address: https://contractormanpower.army.pentagon.mil. The required information includes: (1) Contracting Office, Contracting Officer, Contracting Officer's Technical Representative; (2) Contract number, including task and delivery order number; (3) Beginning and ending dates covered by reporting period; (4) Contractor name, address, phone number, e-mail address, identity of contractor employee entering data; (5) Estimated direct labor hours (including subcontractors); (6) Estimated direct labor dollars paid this reporting period (including subcontractors); (7) Total payments (including subcontractors); (8) Predominant Federal Service Code (FSC) reflecting services provided by contractor (and separate predominant FSC for each subcontractor if different); (9) Estimated data collection cost; (10) Organizational title associated with the Unit Identification Code (UIC) for the Army Requiring Activity (the Army Requiring Activity is responsible for providing the contractor with its UIC for the purposes of reporting this information; (11) Locations where contractor and subcontractors perform the work (specified by zip code in the United States and nearest city, country, when in an overseas location, using standardized nomenclature provided on website); (12) Presence of deployment or contingency contract language; and (13) Number of contractor and subcontractor employees deployed in theater this reporting period (by country). As part of its submission, the contractor will also provide the estimated total cost (if any) incurred to comply with this reporting requirement. Reporting period will be the period of performance not to exceed 12 months ending September 30 of each government fiscal year and must be reported by 31 October of each calendar year. Contractors may use a direct XML data transfer to the database server or fill in the fields on the website. The XML direct transfer is a format for transferring files from a contractor's systems to the secure website without the need for separate data entries for each required data element at the website. The specific formats for the XML direct transfer may be downloaded from the website.

13. EXHIBITS AND ATTACHMENTS

13.1 Exhibit A – Performance Requirements Summary

13.2 Exhibit B – Deliverables

EXHIBIT A

Performance Requirements Summary

Performance Objective (The Service required—usually a shall statement)	**Standard**	**Performance Threshold** (This is the maximum error rate. It could possibly be "Zero deviation from standard")	**Method of Surveillance**
PRS # 1. The contractor shall provide environmental investigations.	The contractor shall follow approved work plans associated with individual calls.	Any deviation shall be preapproved by the contracting officer in writing. No more than one customer complaint per quarter.	100 % reporting
PRS # 2. The contractor shall provide environmental compliance services.	The contractor shall follow approved work plans associated with individual calls.	Any deviation shall be preapproved by the contracting officer in writing. No more than one customer complaint per quarter.	100 % reporting

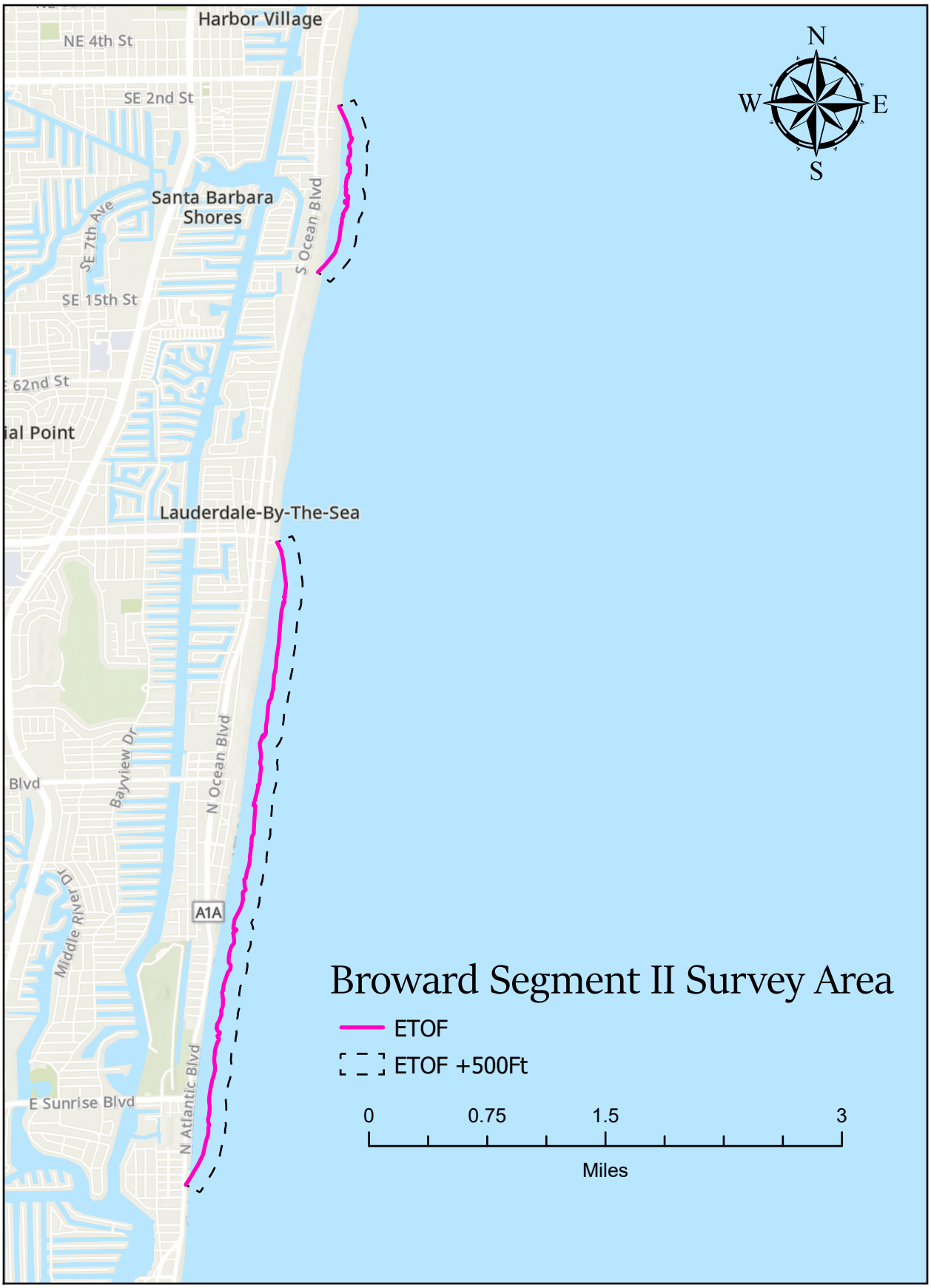
EXHIBIT B

Deliverable Schedule

Deliverable	Frequency	# of Copies	Medium/Format	Submit To
Kick Off Meeting Minutes	Once (1) No later than 3 calendar days following the kick-off meeting. The kick-off call shall be held within 5 calendar days following award of the contract.	One (1) digital copy	All documents provided from the contractor shall be in MS Word or MS Excel and Adobe Acrobat format. All graphics shall be saved as jpeg or comparable files. All GIS files shall be in ArcView (shapefile) or comparable format.	COR Nolan Lacy, PD-EQ Jacksonville District, U.S. Army Corps of Engineers 701 San Marco Blvd Jacksonville, FL 32207 Nolan.M.Lacy@usace.army.mil
Dive Safety Plan	Once (1) No later than 7 calendar days after contract award	One (1) digital copy and one (1) hard copy	[Same as above]	[Same as above]
All raw data (*in-situ* transect coordinates, photo and video files, scanned field data sheets, and Excel spreadsheets with raw data)	Once (1) No later than 7 calendar days after field data collection is complete	One (1) digital copy and one (1) hard copy on CD(s)	Raw data shall be provided in Geo-referenced Microsoft Excel or delineated text file. All documents shall be in MS Word and Adobe Acrobat format and Section 508 Compliant. All graphics shall be saved as jpeg or comparable files. All GIS files shall be in ArcView (shapefile) or comparable format.	[Same as above]
Draft report for the Coral Hardbottom and ESA-Listed Coral Survey	Once (1) No later than 15 calendar days after field data collection is complete	One (1) digital copy, plus three (3) hard copies with three (3) CDs (one with each hard copy)	[Same as above]	[Same as above]
Final report for the Coral Hardbottom and ESA-Listed Coral Survey	Once (1) No later than 10 calendar days after receipt of all draft report comments.	[Same as above]	[Same as above]	[Same as above]
Proposed Coral Relocation/Collection List and Map	Once (1) No later than 45 days after completion of coral hardbottom survey	One (1) digital copy	[Same as above]	[Same as above]

Deliverable	Frequency	# of Copies	Medium/Format	Submit To
Draft Initial Relocation/Collection Summary Report	Once (1) No later than 15 calendar days after field data collection is complete	[Same as above]	[Same as above]	[Same as above]
Final Initial Relocation/Collection Summary Report	Once (1) No later than 10 calendar days after receipt of all draft report comments.	[Same as above]	[Same as above]	[Same as above]
Draft report for the Baseline Observation at the Transplant Site Report (if coral relocation is conducted)	[Same as above]	[Same as above]	[Same as above]	[Same as above]
Draft reports for the Post-Transplant Success and Survival Reports (for each of the 5 monitoring events, if coral relocation is conducted)	[Same as above]	[Same as above]	[Same as above]	[Same as above]
Final report for the Baseline Observation at the Transplant Site Report (if coral relocation is conducted)	Once (1) No later than 10 calendar days after receipt of all draft report comments.	[Same as above]	[Same as above]	[Same as above]
Final reports for the Post-Transplant Success and Survival Reports (for each of the 5 monitoring events, if coral relocation is conducted)	Once (1) No later than 10 calendar days after receipt of all draft report comments.	[Same as above]	[Same as above]	[Same as above]

Created By: Kathryn Lebow
Map Creation Date:7/14/2021



Spatial Reference
Name: GCS WGS 1984
GCS: GCS WGS 1984
Datum: WGS 1984

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol

Updated July 2019

Objective

To outline recommended survey methods for determining the distribution and abundance of coral species listed under the Endangered Species Act (ESA) and the amount of Acropora critical habitat at sites under ESA Section 7 consultation. The methods should be applicable to a broad range of project scales. ESA-listed coral species include *Acropora cervicornis* (staghorn coral), *Acropora palmata* (elkhorn coral), *Orbicella annularis* (lobed star coral), *Orbicella faveolata* (mountainous star coral), *Orbicella franksi* (boulder star coral), *Dendrogyra cylindrus* (pillar coral), and *Mycetophyllia ferox* (rough cactus coral).

Problem

Two aspects make quantitative sampling for coral species difficult:
Patchy and clumped distribution, with colonies as small as 0.01 m2, which may be clumped together within a sub-area of the project area; and

1. Stratified distribution, with occurrence perhaps limited to a particular depth gradient or substrate type within a project area.
2. Additionally, hard bottom habitat can be interspersed with sand patches, making it difficult to accurately determine the amount of Acropora critical habitat present in a project area.

Recommended Methods for Critical Habitat Delineation

Surveying to identify the presence of coral hard bottom is important both for delineating the Acropora critical habitat essential feature and as a simplified way to identify areas where ESA-listed coral species may occur. The staghorn and elkhorn coral critical habitat essential feature is substrate of suitable quality and availability (i.e., consolidated hard bottom or dead coral skeletons free from fleshy macroalgae or turf algae and sediment cover); such substrate supports successful larval settlement, recruitment, and reattachment and recruitment of asexual fragments. If available, recent benthic habitat maps (as approved by NMFS) can be used to identify hard bottom areas and to estimate the amount of critical habitat present in the project area. If recent habitat maps are not available, high-resolution geophysical surveys will likely be necessary. Diver conducted surveys can be used to help ground-truth the presence and distribution of hard bottom habitat. Diver surveys can be conducted in conjunction with the surveys for species distribution as described below.

Recommended Methods for Species Distribution:

The most appropriate approach depends on scale, and the amount of expected error depends on the approach. Unless a complete survey of the entire area is done, the estimated distribution and

abundance of these species may be significantly in error. With the exception of very small project areas, efficient field sampling may require sampling in two stages. A preliminary visual reconnaissance of the site should be conducted to locate any visible occurrences of ESA-listed coral species regardless of size. Following the preliminary reconnaissance, a more comprehensive sampling should be initiated. All surveys should be completed by divers (or snorkelers if water depths are shallow and visibility is adequate) working in teams of two. Divers should swim at a speed slow enough to detect small corals and maintain a depth of approximately 1m from the bottom.

When using the following survey methods, survey personnel should record the following:

1. Species name;
2. Single largest linear dimension of the colony or length, height, and width (units = mm);
3. Rank of percentage live tissue and recent partial mortality (i.e., 1-25%, 26-50%, 51-75%, 76-100%);
4. GPS coordinates of each colony (if possible) or GPS location of each survey site (unit = decimal degrees and state datum) along with a description of where each colony occurs (measurement along a transect or location within a quadrant); and
5. Site map with locations of each colony.

Small Project Area (< ~0.1 hectare or 0.25 acre)

Conduct a visual reconnaissance of the entire project area. Reconnaissance can be limited to areas of hard bottom. Record the required information (items 1-5 above) for all ESA-listed coral colonies encountered. The total amount of hard bottom surveyed must also be provided so that a density of corals can be calculated.

Intermediate to Large Project Area (> ~0.1 hectare or ~0.25 acre)

Data should be collected at 1 sampling site per every 10,000 m^2 within the project area. Sampling can be limited to the portion of the project site that contains hard bottom (i.e., where the species may occur). The portion that contains unconsolidated sediment can be omitted from the sampling area. At each sampling site, a 2-tiered survey will be conducted.

1. Divide the area to be surveyed into plots of 10,000 m^2 (100 m X 100 m). Swim the whole plot using a grid pattern, noting any ESA-listed coral colonies. Placing two intersecting 100 m long transects to divide the plot into 4 quadrants may be helpful for orientation within the plot. If 5 or fewer colonies of any ESA-listed species are encountered, collect the required data (items 1-5 above) on those colonies. Density will be calculated by number of colonies (by species) divided by the amount of hard bottom per 10,000 m^2 (estimated using recent habitat maps or geophysical survey as defined above). No further surveying is required at the sampling plot, so proceed to the next sampling plot. If more than 5 colonies of any ESA-listed coral species are encountered, proceed to 2nd tier (item #2 below).
2. Conduct 3 non-overlapping belt transects at 3 locations within each 100 m by 100 m plot. Each belt transect should measure 4 m X 50 m and be placed over as much hard bottom as possible. Record the required data (items 1-5 above) for all colonies encountered along the transects. Also record the habitat transitions from hard bottom to sand along the transects and calculate

the proportion of the surveyed transect that is hard bottom. This calculation is necessary to determine the density of corals. Density of corals reported as number of colonies by species per site (calculated as number of coral colonies per area of actual hard bottom surveyed in water).

Staff Qualifications

All field work and Quality Assurance/Quality Control (QA/QC) of the surveys and data collected will be completed by qualified biologists who meet at least the following minimum requirements (1) Bachelor of Science in Marine Biology, Biology with a concentration in marine sciences, Environmental Science with a minor in Biology, or similar degree; (2) At least 3 years documented experience monitoring coral hardbottom / coral reef communities in South Florida; (3) Knowledge of marine benthic ecosystems and organisms, including but not limited to identification of Caribbean coral species.

QA/QC

Prior to initiating fieldwork, the entire dive survey team (boat operators, divers, data transcribers, and QA/QC reviewers) will hold a training session to discuss the proper completion of survey protocols, field data sheets, and proper species identification. An appropriate QA/QC protocol should include the following:

1. Test dive of a complete transect. If more than 1 dive team is employed then the test dive should be replicated by each diver pair. If a single dive team is employed then the test dive should be repeated with the divers swapping duties.
2. Results of repeated test transects should not vary by more than 10%.
3. Training should be documented and all divers should sign the training record.
4. All field data sheets should be signed by the divers and a separate QA/QC reviewer.

The QA/QC reviewer should be a separate qualified biologist who is responsible for verifying survey results and ensuring proper implementation of the survey protocols.

Surveyor's name_____ Date_____ Site ID _____
Site Latitude_____ Site Longitude_____

Transect ID_____ Surveyor signature_____ QA/QC review signature_____
Start Latitude_____ Start Longitude _____
End Latitude_____ End Longitude_____

Species name	Length	Width	Height	% Live Tissue	% Recent Mortality	Latitude	Longitude	Location along Transect

Habitat Transition Line - Note habitat type and changes

0m 50m

APPENDIX B

Florida Fish and Wildlife Conservation Commission
Special Activity Licenses:
SAL-21-2375-R
SAL-21-2383-R
FWC Coral and Octocoral Visual Health Assessment Protocol

Special Activity License

Florida Fish and Wildlife Conservation Commission
Division of Marine Fisheries Management
620 S. Meridian St., Mail Station 4B3, Tallahassee, Florida 32399-1600
Phone: 850-487-0554 • email: SAL@MyFWC.com
https://myfwc.com/license/saltwater/special-activity-licenses/

Issued to: William Precht
Dial Cordy and Associates, Inc.
1011 Ives Dairy Road, Suite 210
Miami, FL 33179

License #: SAL-21-2375-R
Effective Date*: 11/03/2021
Expiration Date: 11/30/2021

Purpose: Harvest and release of marine organisms for mitigation purposes pursuant to FWC rule 68B-8, F.A.C.

Licensee Signature _____ Date _____

Not valid unless signed. By signature, confirms that all information provided to issue the license is accurate and complete, and indicates acceptance and understanding of the provisions and conditions listed below. **Any false statements or misrepresentations when applying for this license may result in felony charges and will result in revocation of this license.**

Authorized by: Lisa Gregg, Program and Policy Coordinator for: Eric Sutton, Executive Director

Authorizing Signature Lisa Gregg Date November 3, 2021

Project: Broward County Segment 2, Reach 2 Beach Nourishment

Authorized Activities: All other required project-related federal, state or local authorizations must be obtained first before engaging in any activity authorized by this license.

Authorized to harvest, transport, cache and transfer any amount of any species of coral, including ESA-listed species. Holding and transport time between completion of harvest and completion of transfer is limited to one hour.

Health Certification
A visual health assessment must be conducted for each coral prior to harvest and pursuant to the attached "FWC Special Activity License, Coral Visual Health Assessment Protocols for In-Water Harvest and Release Activities" (Protocols). Corals that do not meet the criterion established in these Protocols may not be harvested.

Release Authorization
A Release Authorization is not required for the harvest, transport, cache and transfer of coral, provided that each coral meets the criterion established in the attached Protocols. Corals that do not meet the criterion established in these Protocols may not be harvested.

Authorized Locations: State waters of Broward County, with the following specifications and exceptions:

1) Corals may be harvested from, held in cache, and transferred to, the following entities and locations:
   - Harvest locations are limited to the general project location as identified by project-associated FDEP, USACE and Broward County permits.
   - Cache and transfer entities and location are as follows:
     Dr. Abigail Renegar (cache) and Dr. Dave Gilliam (transfer)
     Nova Southeastern University - Guy Harvey Oceanographic Center
     8000 North Ocean Drive
     Dania, FL 33004

2) This license does not authorize any activity in federal waters, unless species-specific FWC regulations are extended into federal waters by FWC rule.
3) This license does not authorize any activity within any state park, unless a state park permit has also been obtained from the Florida Department of Environmental Protection, Division of Recreation and Parks.
4) This license does not authorize any activity within any federal park, unless a federal park permit has also been obtained from the National Park Service.
5) This license does not authorize any activity within any Manatee Limited Entry Area (No Entry or Motorboat Prohibited Zones – list attached to this license).

Authorized Personnel: Ryan Fura. Alex Modys, William Precht

Authorized Gear:
1) Quadrats and transect lines.
2) Hand collection.
3) Hammer, chisel.
4) Wire brushes
5) Marine epoxy and/or cement.
6) Putty knives.
7) Tags, nails.

Reporting Requirements: Future SALs and SAL renewals are contingent upon successful fulfillment of reporting requirements. In order to complete the licensing process and fulfill reporting requirements, the following documentation must be submitted to SAL@MyFWC.com upon license renewal or within 30 days after expiration of the SAL, whichever occurs first:
1) An activity report detailing all SAL-related harvest, cache and transfer activities. The activity report is a report other than any publications or technical, monitoring, or final reports. The activity report must include the scientific name, numbers and sizes of the marine organisms harvested, cached, and transferred.
2) All reporting documentation required by other project-associated permits must be submitted to SAL@MyFWC.com and identified as reporting requirements for license number SAL-21-2375-R.
3) Any publications and/or reports resulting from activities conducted under the authority of this license must include the notation that the activity was conducted under FWC license number SAL-21-2375-R.

License Conditions and Provisions

Law Enforcement Notification: Notification must be made to the nearest FWC Law Enforcement Dispatch Center 24 hours prior to conducting any SAL related activities. An advanced float plan detailing locations, dates, and times of activities shall constitute sufficient notice, provided that authorized personnel do not deviate from the float plan and the float plan is filed with the nearest FWC Law Enforcement Dispatch Center at least 24 hours prior to conducting SAL related activities.

Prohibited Activities:
1) The following are considered prohibited species and may not be harvested or possessed unless specifically authorized by this license:
    a. Invertebrates: anemone, giant Caribbean (Genus Condylactis), conch, queen (*Strombus gigas*); coral, black (Order Antipatharia); coral, fire (Genus *Millepora*); coral, hard and stony (Order Scleractinia); live rock (non-aquacultured; includes any formations created by tube worms of the family Sabellariidae); sea fan, common (*Gorgonia ventalina*); sea fan, Venus (*Gorgonia flabellum*); starfish, Bahama (*Oreaster reticulatis*); urchin, longspine (*Diadema antillarum*).
    b. Bony Fishes: bonefish (Family Albulidae); grouper, Goliath (*Epinephelus itajara*); grouper, Nassau (*Epinephelus striatus*); silverside, key (*Menidia conchorum*); spearfish, longbill

(*Tetrapturus pfluegeri*); spearfish, Mediterranean (*Tetrapturus belone*); sturgeon (Family Acipenseridae); topminnow, saltmarsh (*Fundulus jenkinsi*).

c. Cartilaginous Fishes: dogfish, spiny (*Squalus acanthias*); sawfish, largetooth (*Pristis pristis*); sawfish smalltooth (*Pristis pectinata*); shark, Atlantic angel (*Squatina dumeril*); shark, basking (*Cetorhinus maximus*); shark, bigeye sand tiger (*Odontaspis noronhai*); shark, bigeye sixgill (*Hexanchus nakamurai*); shark, bigeye thresher (*Alopias superciliosus*); shark, bignose (*Carcharhinus altimus*); shark, Caribbean reef (*Carcharhinus perezii*); shark, Caribbean sharpnose (*Rhizoprionodon porosus*); shark, dusky (*Carcharhinus obscurus*); shark, Galapagos (*Carcharhinus galapagensis*); shark, great hammerhead (*Sphyrna mokarran*); shark, lemon (*Negaprion brevirostris*); shark, longfin mako (*Isurus paucus*); shark, narrowtooth (*Carcharhinus brachyurus*); shark, night (*Carcharhinus signatus*); shark, sandbar (*Carcharhinus plumbeus*); shark, sand tiger (*Carcharias taurus*); shark, scalloped hammerhead (*Sphryna lewini*); shark, sevengill (*Heptranchias perlo*); shark, silky (*Carcharhinus falciformis*); shark, sixgill (*Hexanchus griseus*); shark, smalltail (*Carcharhinus porosus*); shark, smooth hammerhead (*Sphyrna zygaena*); shark, tiger (*Galeocerdo cuvier*); shark, whale (*Rhincodon typus*); shark, white (*Carcharodon carcharias*); ray, manta (species of the genus Manta and Mobula); ray, spotted eagle; (*Aetobatus narinari*).

2) Special Activity Licenses do not authorize any harvest of marine mammals or marine turtles, but may authorize the harvest of any other marine organism identified as a Florida Endangered or Threatened Species, or a Species of Special Concern, pursuant to Chapters 68A-27 and 68B-8, F.A.C. (list available here: https://myfwc.com/media/1945/threatened-endangered-species.pdf)
3) Marine organisms harvested pursuant to a SAL may not be sold or consumed unless specifically authorized by this license.

General License Conditions:

1) Any authorized personnel conducting activities pursuant to a Special Activity License (SAL) must have a copy of the license signed by both the Commission and the license holder, complete with all attachments as specified on the license, in his/her possession while conducting any activities requiring the SAL.
2) Special Activity Licenses may be suspended or revoked if authorized personnel listed on the license have violated FWC rules or statutes or other laws or rules relating to the subject matter of the license, terms or conditions of the license, or have submitted false or inaccurate information on their application.
3) Special Activity Licenses are non-transferable.

Attachments to Follow:

- "FWC Special Activity License, Coral Visual Health Assessment Protocols for In-Water Harvest and Release Activities"
- Manatee Limited Entry Areas
- FWC Division of Law Enforcement, Special Activity License Notification Locations & Numbers

A person whose substantial interests are affected by FWC's action may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. A person seeking a hearing on FWC's action shall file a petition for hearing with the agency within 21 days of receipt of written notice of the decision. The petition must contain the information and otherwise comply with section 120.569, Florida Statutes, and the uniform rules of the Florida Division of Administration, chapter 28-106, Florida Administrative Code. If the FWC receives a petition, FWC will notify the Permittee.

Special Activity License

Florida Fish and Wildlife Conservation Commission
Division of Marine Fisheries Management
620 S. Meridian St., Mail Station 4B3, Tallahassee, Florida 32399-1600
Phone: 850-487-0554 • email: SAL@MyFWC.com
https://myfwc.com/license/saltwater/special-activity-licenses/

Issued to: William Precht
Dial Cordy and Associates, Inc.
1011 Ives Dairy Road, Suite 210
Miami, FL 33179

License #: SAL-21-2383-R
Effective Date*: 11/29/2021
Expiration Date: 12/31/2021

Purpose: Harvest and release of marine organisms for mitigation purposes pursuant to FWC rule 68B-8, F.A.C.

Licensee Signature _____ Date _____

Not valid unless signed. By signature, confirms that all information provided to issue the license is accurate and complete, and indicates acceptance and understanding of the provisions and conditions listed below. **Any false statements or misrepresentations when applying for this license may result in felony charges and will result in revocation of this license.**

Authorized by: Lisa Gregg, Program and Policy Coordinator for: Eric Sutton, Executive Director

Authorizing Signature Lisa Gregg Date November 29, 2021

Project: Broward County Segment 2, Reach 4 Beach Nourishment

Authorized Activities: All other required project-related federal, state or local authorizations must be obtained first before engaging in any activity authorized by this license.

Authorized to harvest, transport, cache and transfer any amount of any species of coral, including ESA-listed species. Holding and transport time between completion of harvest and completion of transfer should be limited to as little time as possible.

The following manipulations must be conducted to *Acropora cervicornis* coral species after harvest and prior to transfer to Nova Southeastern University:

1) For colonies >25cm in longest dimension:
    a. fragment into ≤25cm fragments in longest dimension
    b. remove dead branch ends
2) For colonies <25cm in longest dimension:
    a. remove dead branch ends

Health Certification
A visual health assessment must be conducted for each coral prior to harvest and pursuant to the attached "FWC Coral and Octocoral Visual Health Assessment Protocols for Mitigation Relocation Activities" (Protocols). Corals that do not meet the criterion established in these Protocols may not be harvested and must be noted as such in reporting requirements.

Release Authorization
A Release Authorization is not required for the harvest, transport, cache and transfer of coral, provided that each coral meets the criterion established in the attached Protocols. Corals that do not meet the criterion established in these Protocols may not be harvested.

Authorized Locations: State waters of Broward County, with the following specifications and exceptions:

1) Corals may be harvested from, held in cache, and transferred to, the following entities and locations:
    - Harvest locations are limited to the general project location as identified by project-associated FDEP, USACE and Broward County permits.
    - Cache and transfer entities and location are as follows:
      Dr. Abigail Renegar (cache) and Dr. Dave Gilliam (transfer)
      Nova Southeastern University - Guy Harvey Oceanographic Center
      8000 North Ocean Drive
      Dania, FL 33004
2) This license does not authorize any activity in federal waters, unless species-specific FWC regulations are extended into federal waters by FWC rule.
3) This license does not authorize any activity within any state park, unless a state park permit has also been obtained from the Florida Department of Environmental Protection, Division of Recreation and Parks.
4) This license does not authorize any activity within any federal park, unless a federal park permit has also been obtained from the National Park Service.
5) This license does not authorize any activity within any Manatee Limited Entry Area (No Entry or Motorboat Prohibited Zones – list attached to this license).

Authorized Personnel: Corinne Allen, Victoria Basham, Paul Fitzgerald, Ryan Fura, Zachary Graff, Cristie Ledon, Michael McDonough, Alex Modys, Tatiana Mrazik, Natalia Padillo-Anthemides, William Precht, Jason Schmidt, Randi Shiplett, Nick Strait, Kennedy Wall, Monica Winn.

Authorized Gear:

1) Quadrats and transect lines.
2) Hand collection.
3) Hammer, chisel.
4) Wire brushes
5) Marine epoxy and/or cement.
6) Putty knives.
7) Tags, nails.
8) Baskets, mesh bags.
9) Pliers, bone cutters.

Reporting Requirements: Future SALs and SAL renewals are contingent upon successful fulfillment of reporting requirements. In order to complete the licensing process and fulfill reporting requirements, the following documentation must be submitted to SAL@MyFWC.com upon license renewal or within 30 days after expiration of the SAL, whichever occurs first:

1) An activity report detailing all SAL-related harvest, cache and transfer activities. The activity report is a report other than any publications or technical, monitoring, or final reports. The activity report must include the scientific name, numbers and sizes of the marine organisms harvested, cached, and transferred, and must identify any corals that could not be harvested because they did not meet the criteria in the Visual Health Assessment Protocols.
2) All reporting documentation required by other project-associated permits must be submitted to SAL@MyFWC.com and identified as reporting requirements for license number SAL-21-2383-R.
3) Any publications and/or reports resulting from activities conducted under the authority of this license must include the notation that the activity was conducted under FWC license number SAL-21-2383-R.

License Conditions and Provisions

Law Enforcement Notification: Notification must be made to the nearest FWC Law Enforcement Dispatch Center 24 hours prior to conducting any SAL related activities. An advanced float plan detailing locations, dates, and times of activities shall constitute sufficient notice, provided that authorized personnel do not deviate from the float plan and the float plan is filed with the nearest FWC Law Enforcement Dispatch Center at least 24 hours prior to conducting SAL related activities.

Prohibited Activities:

1) The following are considered prohibited species and may not be harvested or possessed unless specifically authorized by this license:
    a. Invertebrates: anemone, giant Caribbean (Genus Condylactis), conch, queen (*Strombus gigas*); coral, black (Order Antipatharia); coral, fire (Genus *Millepora*); coral, hard and stony (Order Scleractinia); live rock (non-aquacultured; includes any formations created by tube worms of the family Sabellariidae); sea fan, common (*Gorgonia ventalina*); sea fan, Venus (*Gorgonia flabellum*); starfish, Bahama (*Oreaster reticulatis*); urchin, longspine (*Diadema antillarum*).
    b. Bony Fishes: bonefish (Family Albulidae); grouper, Goliath (*Epinephelus itajara*); grouper, Nassau (*Epinephelus striatus*); silverside, key (*Menidia conchorum*); spearfish, longbill (*Tetrapturus pfluegeri*); spearfish, Mediterranean (*Tetrapturus belone*); sturgeon (Family Acipenseridae); topminnow, saltmarsh (*Fundulus jenkinsi*).
    c. Cartilaginous Fishes: dogfish, spiny (*Squalus acanthias*); sawfish, largetooth (*Pristis pristis*); sawfish smalltooth (*Pristis pectinata*); shark, Atlantic angel (*Squatina dumeril*); shark, basking (*Cetorhinus maximus*); shark, bigeye sand tiger (*Odontaspis noronhai*); shark, bigeye sixgill (*Hexanchus nakamurai*); shark, bigeye thresher (*Alopias superciliosus*); shark, bignose (*Carcharhinus altimus*); shark, Caribbean reef (*Carcharhinus perezii*); shark, Caribbean sharpnose (*Rhizoprionodon porosus*); shark, dusky (*Carcharhinus obscurus*); shark, Galapagos (*Carcharhinus galapagensis*); shark, great hammerhead (*Sphyrna mokarran*); shark, lemon (*Negaprion brevirostris*); shark, longfin mako (*Isurus paucus*); shark, narrowtooth (*Carcharhinus brachyurus*); shark, night (*Carcharhinus signatus*); shark, sandbar (*Carcharhinus plumbeus*); shark, sand tiger (*Carcharias taurus*); shark, scalloped hammerhead (*Sphryna lewini*); shark, sevengill (*Heptranchias perlo*); shark, silky (*Carcharhinus falciformis*); shark, sixgill (*Hexanchus griseus*); shark, smalltail (*Carcharhinus porosus*); shark, smooth hammerhead (*Sphyrna zygaena*); shark, tiger (*Galeocerdo cuvier*); shark, whale (*Rhincodon typus*); shark, white (*Carcharodon carcharias*); ray, manta (species of the genus Manta and Mobula); ray, spotted eagle; (*Aetobatus narinari*).
2) Special Activity Licenses do not authorize any harvest of marine mammals or marine turtles, but may authorize the harvest of any other marine organism identified as a Florida Endangered or Threatened Species, or a Species of Special Concern, pursuant to Chapters 68A-27 and 68B-8, F.A.C. (list available here: https://myfwc.com/media/1945/threatened-endangered-species.pdf)
3) Marine organisms harvested pursuant to a SAL may not be sold or consumed unless specifically authorized by this license.

General License Conditions:

1) Any authorized personnel conducting activities pursuant to a Special Activity License (SAL) must have a copy of the license signed by both the Commission and the license holder, complete with all attachments as specified on the license, in his/her possession while conducting any activities requiring the SAL.
2) Special Activity Licenses may be suspended or revoked if authorized personnel listed on the license have violated FWC rules or statutes or other laws or rules relating to the subject matter of the license, terms or conditions of the license, or have submitted false or inaccurate information on their application.
3) Special Activity Licenses are non-transferable.

Attachments to Follow:

- "FWC Coral and Octocoral Visual Health Assessment Protocols for Mitigation Relocation Activities"
- "Definitions of Coral and Octocoral Terminology"
- Manatee Limited Entry Areas
- FWC Division of Law Enforcement, Special Activity License Notification Locations & Numbers

A person whose substantial interests are affected by FWC's action may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. A person seeking a hearing on FWC's action shall file a petition for hearing with the agency within 21 days of receipt of written notice of the decision. The petition must contain the information and otherwise comply with section 120.569, Florida Statutes, and the uniform rules of the Florida Division of Administration, chapter 28-106, Florida Administrative Code. If the FWC receives a petition, FWC will notify the Permittee.

Florida Fish and Wildlife Conservation Commission (FWC)
Coral and Octocoral Visual Health Assessment Protocols for Mitigation Relocation Activities

For purposes of these Florida Fish and Wildlife Conservation Commission (FWC), Coral and Octocoral Visual Health Assessment Protocols for Mitigation Relocation Activities (Protocols), a complete list of coral and octocoral terminology definitions is provided in the attached "Definitions of Coral and Octocoral Terminology".

Mitigation relocation activities require certification of health as a condition of authorization. The Health Certification process is conducted by authorized personnel and consists of a visual health assessment pursuant to the criteria outlined in these Protocols.

The visual health assessment must be conducted for each coral and octocoral pursuant to the criteria in these Protocols to ensure that all corals and octocorals appear to be in good health, are free from suspected disease and conditions that may impact their health, and that the presence of predators/competitors/overgrowth has been minimized. The visual health assessment must be conducted immediately prior to removal from any in-water location, and may need to be conducted again before the release activity is completed (i.e., immediately prior to removal and again immediately prior to removal from any and all temporary holding locations established to facilitate the release activity).

Corals and octocorals that do not meet the visual health assessment criteria cannot be harvested and released to other in-water locations. If any part of a coral or an octocoral does not meet all of the criteria for the visual health assessment process, no part of the coral or octocoral may be harvested or released even if the affected areas of the coral or octocoral are removed so that the remaining part of the coral does meet the visual health assessment criteria.

Corals and octocorals that are located in any temporary holding location and do not pass the visual health assessment criteria must be removed and appropriately disposed of on land.

Field personnel conducting coral and octocoral visual health assessments should be proficient with species identification, and trained in survey techniques, coral condition assessment, coral disease, and predator/competitor/overgrowth identification and removal, to assure accuracy of the assessment.

Coral Visual Health Assessment Criteria

Each coral must be evaluated and meet the following visual health assessment criteria prior to harvest or release:

1) Each coral harvested or released may not show any visible signs of active or suspect disease based on the presence of:

    a. Stress indicators such as: bleaching, partial bleaching, paling, tissue sloughing (caused by sedimentation), swelling or thinning, and excessive mucous production.

        - **Exception**: Exception to these "stress indicators" criterion is automatically provided for corals that are being harvested or released from interior waterways as identified in the FWC Mitigation Relocation Recommendations, "X. Visual Health Assessment" section, unless observed abnormalities or conditions may be attributed to active or suspect disease.

          ***Note 1**: Harvest and release of corals from interior waterways with tissue appearing pale to partially bleached (< 100% of coral tissue) is acceptable as color loss is recognized as a part of coral species' normal state when growing in interior waterways.

***Note 2**: Harvest and release of *Siderastrea* spp. from interior waterways with tissue appearing pink or purple is acceptable as such pigmentation is associated with non-pathogenic bacterial/microbial communities

b. Recent mortality greater than 5% tissue loss exposing underlying skeleton not due to predation/competition/overgrowth, and recent mortality greater than 10% tissue loss exposing underlying skeleton due to predation/competition/overgrowth.

- **Exception**: Old mortality is acceptable for corals that will be harvested or released.

c. Active disease such as: rapid tissue loss, tissue sloughing (not caused by sedimentation), stony coral tissue loss disease (SCTLD), white/black/yellow/red band diseases, white pox or plague diseases, white Beggiatoa mats, dark (purple) spot/blotch diseases, and growth anomalies.

d. Suspect disease indicators such as bands, spots, lesions, microbial mats, and cyanobacteria colonization.

2) Predators such as fireworms (*Hermodice carunculata*) or snails (e.g., *Coralliophila* spp.) must be removed (e.g., peeled off) prior to relocation.

3) Competitors and overgrowth (e.g., sponges, tunicates, ascidians, octocorals, zoanthids, corallimorphs, macroalgae, cyanobacteria) on old mortality must be removed (e.g., peeled, scrubbed using wire or plastic brushes, tweezed) as much as possible prior to harvest or release. Corals that have non-native, encrusting and/or overgrowing species on them (e.g., Genus *Symplegma*, Genus *Botryllus*) that cannot be removed may not be harvested or released.

- **Exception**: Corals containing boring sponges of the Genus Cliona (e.g., Cliona deletrix) are generally discouraged for harvest and release, but release will be expected if the presence of boring Cliona spp. is small (e.g., occupies <10% of the surface of the colony), and/or the benefits of relocation outweigh the risks of introducing or increasing prevalence of boring Cliona spp. on corals and substrate at a relocation site. The need for the release of corals containing boring Cliona spp. is project-specific and should be discussed in advance of permitting release activities or any relocation activities occurring.

- **Exception**: Corals with established algal lawns and associated skeletal lesions and pale spots created by farming damselfishes may be harvested and released.

- **Exception**: Corals containing stramenopile protists that are often confused with competition and overgrowth and appear as white aggregate coatings on the coral surface or embedded in the mucus layer, may be harvested and released.

Florida Fish and Wildlife Conservation Commission (FWC)
Coral and Octocoral Visual Health Assessment Protocols
for Mitigation Relocation Activities

Octocoral Visual Health Assessment Criteria

Each octocoral must be evaluated and meet the following visual health assessment criteria prior to harvest or release:

1) Rod, plume, and sea fan colonies must have at least 10 cm (approx. 4") of linear growth (height).

2) Each octocoral colony targeted for relocation may not show any visible signs of disease based on the presence of:

    a. Stress indicators such as: bleaching, partial bleaching, tissue sloughing or swelling, excessive mucous production.

        - **Exception**: Exception to this criterion is automatically provided for octocorals that are being removed and relocated from interior waterways as identified in the FWC Recommendations, "X. Visual Health Assessment" section.

          ***Note**: Octocorals rarely bleach and generally tend to exhibit partial bleaching at their branch tips closest to the water's surface.

    b. Recent mortality greater than 10% of tissue loss exposing axis.

       ***Note**: "Old mortality" is not readily determinable from "recent mortality" in octocorals.

    c. Active disease such as: purple spot, aspergillosis, red band disease, black wasting disease, growth anomalies (severely altered morphology of tissues and skeleton).

    d. Suspect disease indicators such as: bands, spots or rings (identified by severe dark purpling (25% or greater) or blackening of tissues), microbial mats, and cyanobacteria colonization.

3) Predators such as *Cyphoma gibbosum* or *Hermodice carunculata* in feeding position along tissue loss margin must be removed (e.g., peeled off) prior to relocation.

        - **Exception**: Colonies of *Gorgonia ventalina* with active predation of the nudibranch *Tritonia hamnerorum* cannot be relocated.

FWC Definitions for Coral and Octocoral Terminology

"Axis" is the central supporting skeletal structure of an octocoral made of proteinaceous gorgonin or calcium carbonate that is commonly dark brown to black in color.

"Bleaching" is the loss of color within coral or octocoral tissue due to the loss or reduction in number of endosymbiotic algae (i.e., zooxanthellae; Genus *Symbiodinium*). During bleaching, tissue is present but is pale to clear in color for corals and pale to white in octocorals, and for corals the white skeleton is visible underneath. A coral or octocoral may be "bleached" where 100% of tissue is affected by loss of zooxanthellae, "partially bleached" where < 100% of tissue is affected by loss of zooxanthellae and a portion of the tissue remains a healthy color, or "pale" where tissues have not completely lost all zooxanthellae and appear lighter in color especially compared to other corals and octocorals of the same species.

"Cache" is a temporary holding location to facilitate coral relocation and transfer activities.

"Coral" is an organism of any life stage or any part thereof (including gametes), that meets a regulatory definition of "coral" for the Florida Fish and Wildlife Conservation Commission, the Florida Department of Environmental Protection, National Marine Fisheries Service (NOAA Fisheries) as it pertains to the Southeast Region, the Florida Keys National Marine Sanctuary, or the National Park Service as it pertains to National Park areas within Florida.

"ESA-listed species" are species that are listed pursuant to the federal Endangered Species Act.

"Holdfast" is the base of an octocoral that attaches the colony to the substrate.

"Interior waterway" is an aquatic area that has experienced physical restructuring of the shoreline (e.g., inner port harbors, marinas, seawalls), or a naturally occurring area of low flushing (e.g., shallow bays).

"Introduction" is the intentional or unintentional release of a coral or an octocoral into an area and/or habitat in which it is not known to have naturally existed.

"Mitigation" is an action that is taken to avoid, minimize or offset potential negative effects from an activity.

"Nursery" is any in-water, over-water or land-based location where authorized coral and octocoral holding, propagation, rearing, acclimation or staging activities occur.

"Octocoral" are anthozoan cnidarians (any part of the species of the Subclass Octocorallia), with polyps bearing eight pinnate tentacles and eight complete septa, excluding encrusting octocorals (e.g., *Erythropodium caribaeorum*, *Briareum asbestinum*).

"Old mortality" is the non-living portion of exposed coral skeleton that has been overgrown by algae and other biofouling organisms, and/or where the corallite structure has eroded over time and may not be identifiable to the species level. "Old mortality" is not readily determinable from "Recent mortality" in octocorals.

"Outplanting" is the removal of a coral from any land or water-based nursery and placing such coral into any in-water location outside of a nursery.

"Plume" is the thin pinnate (feather-like) branches and thin tissue branchlets that extend from all sides of the main branches of an octocoral.

"Recent mortality" as it pertains to coral is the non-living portion of recently exposed coral skeleton (i.e., skeleton is white and corallite structures are intact and identifiable), including the development of fine "fuzz" or limited turf algae on exposed skeleton (i.e., skeleton is yellowish in appearance and corallite structure may be slightly eroded but still identifiable to species level), indicating that the mortality occurred within a couple of days to weeks prior to observation.

"Recent mortality" as it pertains to octocoral is the non-living portion of recently exposed octocoral axis skeleton (i.e., axis is dark brown to black), which can include the development of fine "fuzz" or turf algae on exposed axis, indicating that the mortality occurred within a few days prior to observation. Some dark live tissue around recent mortality can indicate healthy tissue regrowth over the exposed axis.

"Release" is the introduction, reintroduction, outplanting, relocation, transfer, translocation, transplantation of any coral or octocoral into or within any in-water location.

"Relocation" is any movement of a coral or octocoral at any life stage from any in-water location to another in-water location. Relocation includes translocation and transplantation, but excludes outplanting and transfer. Relocation occurs between a "removal site" (the in-water site where a coral or octocoral was harvested from), and a "relocation site" (the in-water location to which the coral or octocoral is physically moved to), and may potentially include a "temporary holding site" (a location where corals or octocorals are temporarily held in cache to facilitate relocation-associated activities).

"Rod" is a thickly branched upright form of octocoral, typically with secondary branches and thick tissues.

"Seafan" is an octocoral that is flat and fan-shaped with interconnected net-like branching with thin tissues.

"Transfer" is the physical conveyance of coral or octocoral between eligible entities.

"Translocation" is the in-water movement of a coral or octocoral from an area of suitable habitat to another area of suitable habitat, with or without consideration of historic distribution.

"Transplantation" is the in-water movement of corals or octocorals from one place to another.

APPENDIX C

Reach 2 – Submitted Coral Collection/Relocation List

Segment & Reach	Site	Colony ID	Site Coordinates		Colony Coordinates/Tier 1 Quadrant		Colony Size (cm)	% Live Tissue	Stress
			Latitude	Longitude	Latitude	Longitude			
Seg. 2, Reach 2	12	12_ACER01	26.2234221	-80.08788068	26.22371141	-80.0876055	31	100	paling, sponge
Seg. 2, Reach 2	12	12_ACER02	26.2234221	-80.08788068	26.2236765	-80.08762653	19	100	polyp extension, oh
Seg. 2, Reach 2	12	12_ACER03	26.2234221	-80.08788068	26.22367624	-80.08758502	15	100	polyp extension, oh
Seg. 2, Reach 2	16	16_ACER01	26.2216167	-80.08807798	26.22147157	-80.0884371	23	90	CM sponge
Seg. 2, Reach 2	16	16_ACER02	26.2216167	-80.08807798	26.22142009	-80.08800664	42	70	none
Seg. 2, Reach 2	16	16_ACER03	26.2216167	-80.08807798	26.22140978	-80.08802792	54	40	Algae
Seg. 2, Reach 2	16	16_ACER04	26.2216167	-80.08807798	26.22140063	-80.08799768	30	100	none
Seg. 2, Reach 2	16	16_ACER05	26.2216167	-80.08807798	26.22143062	-80.08799198	30	100	none
Seg. 2, Reach 2	16	16_ACER06	26.2216167	-80.08807798	26.22144191	-80.0880063	46	80	CM octocoral
Seg. 2, Reach 2	16	16_ACER07	26.2216167	-80.08807798	SE Quadrant		5	unknown	unknown
Seg. 2, Reach 2	16	16_ACER08	26.2216167	-80.08807798	SE Quadrant		18	unknown	unknown
Seg. 2, Reach 2	16	16_ACER09	26.2216167	-80.08807798	SE Quadrant		30	unknown	unknown
Seg. 2, Reach 2	16	16_ACER10	26.2216167	-80.08807798	NE Quadrant		10	unknown	unknown
Seg. 2, Reach 2	18	18_ACER01	26.22071942	-80.08819249	26.22109729	-80.08769098	75	30	none
Seg. 2, Reach 2	18	18_ACER02	26.22071942	-80.08819249	26.22028708	-80.08776706	35	25	Palythoa
Seg. 2, Reach 2	18	18_ACER03	26.22071942	-80.08819249	26.22027717	-80.08775306	22.5	30	sponge
Seg. 2, Reach 2	18	18_ACER04	26.22071942	-80.08819249	26.2203011	-80.087786	19	80	algae
Seg. 2, Reach 2	20	20_ACER01	26.21981616	-80.08828799	26.21983676	-80.0880795	90	35	algae/paling
Seg. 2, Reach 2	20	20_ACER02	26.21981616	-80.08828799	26.21983774	-80.08808755	22	60	algae
Seg. 2, Reach 2	20	20_ACER03	26.21981616	-80.08828799	26.22024211	-80.08784506	23	95	fish bites
Seg. 2, Reach 2	20	20_ACER04	26.21981616	-80.08828799	26.2202421	-80.08784406	44	25	algae
Seg. 2, Reach 2	20	20_ACER05	26.21981616	-80.08828799	26.22023381	-80.08783623	20	50	none
Seg. 2, Reach 2	20	20_ACER06	26.21981616	-80.08828799	26.22023143	-80.08783426	16	20	none
Seg. 2, Reach 2	20	20_ACER07	26.21981616	-80.08828799	26.22024633	-80.08784399	27	90	algae
Seg. 2, Reach 2	20	20_ACER08	26.21981616	-80.08828799	26.22024953	-80.08784023	16	25	burial/sediment
Seg. 2, Reach 2	21	21_ACER07	26.21980976	-80.08727868	26.22025815	-80.08776423	28	100	none
Seg. 2, Reach 2	22	22_OFAV01	26.21891379	-80.08858041	26.21892678	-80.08872863	75	20	algae/paling
Seg. 2, Reach 2	26	26_ACER01	26.21710915	-80.08874594	26.21675995	-80.0885454	23	75	none

APPENDIX D

Reach 4 - Submitted Coral Collection/Relocation List
A. Cervicornis only

Site	Species	Colony ID	Site Latitude	Site Longitude	Colony Latitude	Colony Longitude	Colony Size (cm)	% Live Tissue
87	A. cervicornis	87_T2_ACER02	26.16324558	-80.0965115	26.16301982	-80.0964834	52	90
101	A. cervicornis	101_ACER01	26.15692807	-80.0974934	26.15652563	-80.09760124	47	80
101	A. cervicornis	101_ACER02	26.15692807	-80.0974934	26.15670012	-80.09774948	28	90
105	A. cervicornis	105_ACER02	26.15512334	-80.0978252	26.15535447	-80.09807775	29	
105	A. cervicornis	105_ACER03	26.15512334	-80.0978252	26.15523337	-80.0979419	36	80
105	A. cervicornis	105_ACER04	26.15512334	-80.0978252	26.15535447	-80.09807775	na	na
105	A. cervicornis	105_ACER105	26.15512334	-80.0978252	26.15510659	-80.09803488	61	50
105	A. cervicornis	105_ACER106	26.15512334	-80.0978252	26.1551167	-80.09800241	32	50
105	A. cervicornis	105_ACER107	26.15512334	-80.0978252	26.15511838	-80.09799573	62	70
105	A. cervicornis	105_ACER108	26.15512334	-80.0978252	26.15512179	-80.0979919	50	30
105	A. cervicornis	105_ACER113	26.15512334	-80.0978252	26.15488671	-80.09814506	50	na
105	A. cervicornis	105_ACER114	26.15512334	-80.0978252	26.15488671	-80.09814506	60	na
107	A. cervicornis	107_ACER38	26.15422378	-80.0982162	26.15445492	-80.09846882	na	na
107	A. cervicornis	107_ACER39	26.15422378	-80.0982162	26.15445492	-80.09846882	na	na
107	A. cervicornis	107_ACER40	26.15422378	-80.0982162	26.15445492	-80.09846882	na	na
107	A. cervicornis	107_ACER41	26.15422378	-80.0982162	26.15445492	-80.09846882	na	na
107	A. cervicornis	107_ACER42	26.15422378	-80.0982162	26.15445492	-80.09846882	na	na
107	A. cervicornis	107_ACER43	26.15422378	-80.0982162	26.15445492	-80.09846882	na	na
111	A. cervicornis	111_ACER07	26.15242481	-80.0983828	26.15219686	-80.09863892	na	na
111	A. cervicornis	111_ACER08	26.15242481	-80.0983828	26.15219686	-80.09863892	na	na
111	A. cervicornis	111_ACER09	26.15242481	-80.0983828	26.15219686	-80.09863892	na	na
111	A. cervicornis	111_ACER10	26.15242481	-80.0983828	26.15219686	-80.09863892	na	na
111	A. cervicornis	111_ACER11	26.15242481	-80.0983828	26.15219686	-80.09863892	na	na
111	A. cervicornis	111_ACER12	26.15242481	-80.0983828	26.15219686	-80.09863892	na	na
111	A. cervicornis	111_ACER13	26.15242481	-80.0983828	26.15219686	-80.09863892	na	na
111	A. cervicornis	111_ACER14	26.15242481	-80.0983828	26.15219686	-80.09863892	na	na
111	A. cervicornis	111_ACER41	26.15242481	-80.0983828	26.15265591	-80.0986354	46	80
111	A. cervicornis	111_ACER42	26.15242481	-80.0983828	26.15250018	-80.09846049	44	70
111	A. cervicornis	111_T2_ACER01	26.15242481	-80.0983828	26.15220048	-80.09858452	62	90
111	A. cervicornis	111_T2_ACER02	26.15242481	-80.0983828	26.15220048	-80.09858452	30	100
111	A. cervicornis	111_T2_ACER03	26.15242481	-80.0983828	26.15220048	-80.09858452	12	100

Site	Species	Colony ID	Site Latitude	Site Longitude	Colony Latitude	Colony Longitude	Colony Size (cm)	% Live Tissue
111	A. cervicornis	111_T2_ACER04	26.15242481	-80.0983828	26.15220048	-80.09858452	68	90
111	A. cervicornis	111_T2_ACER05	26.15242481	-80.0983828	26.15220048	-80.09858452	26	90
111	A. cervicornis	111_T2_ACER06	26.15242481	-80.0983828	26.15220048	-80.09858452	6	100
111	A. cervicornis	111_T2_ACER07	26.15242481	-80.0983828	26.15220048	-80.09858452	24	100
111	A. cervicornis	111_T2_ACER08	26.15242481	-80.0983828	26.15220048	-80.09858452	28	60
111	A. cervicornis	111_T2_ACER09	26.15242481	-80.0983828	26.15220048	-80.09858452	18	90
111	A. cervicornis	111_T2_ACER10	26.15242481	-80.0983828	26.15220048	-80.09858452	18	95
111	A. cervicornis	111_T2_ACER11	26.15242481	-80.0983828	26.15220048	-80.09858452	35	100
117	A. cervicornis	117_ACER05	26.14971537	-80.0987099	26.14948742	-80.09896597	28	90
117	A. cervicornis	117_ACER07	26.14971537	-80.0987099	26.1499465	-80.09896244	na	na
117	A. cervicornis	117_ACER08	26.14971537	-80.0987099	26.1499465	-80.09896244	na	na
117	A. cervicornis	117_ACER09	26.14971537	-80.0987099	26.1499465	-80.09896244	na	na
117	A. cervicornis	117_ACER10	26.14971537	-80.0987099	26.1499465	-80.09896244	na	na
117	A. cervicornis	117_ACER105	26.14971537	-80.0987099	26.14948742	-80.09896597	na	na
117	A. cervicornis	117_ACER106	26.14971537	-80.0987099	26.14948742	-80.09896597	na	na
117	A. cervicornis	117_ACER107	26.14971537	-80.0987099	26.14948742	-80.09896597	na	na
117	A. cervicornis	117_ACER108	26.14971537	-80.0987099	26.14948742	-80.09896597	na	na
117	A. cervicornis	117_ACER109	26.14971537	-80.0987099	26.14948742	-80.09896597	na	na
117	A. cervicornis	117_ACER110	26.14971537	-80.0987099	26.14948742	-80.09896597	na	na
119	A. cervicornis	EG_ACER_P065a_0	26.14881425	-80.0991944	26.14905299	-80.09931793	15	na

Broward County Segment III Shore Protection
Endangered Species Act
Listed Corals Collection Summary Report

Draft Report

June 2022

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1.0 INTRODUCTION

1.1 Study Context and Objective

In 2006, Acropora cervicornis (staghorn coral) and Acropora palmata (elkhorn coral) were listed as threatened species under the Endangered Species Act of 1973 (ESA; Federal Register/Vol. 71, No. 129/Thursday, July 6, 2006 / Rules and Regulations, http://www.gpo.gov/fdsys/pkg/FR-2006-07-06/pdf/06-6017.pdf). Five additional Caribbean stony coral species were listed as threatened in 2014 under the Endangered Species Act: Orbicella annularis (lobed star coral), Orbicella faveolata (mountainous star coral), Orbicella franksi (boulder star coral), Dendrogyra cylindrus (pillar coral), and Mycetophyllia ferox (rough cactus coral) (https://www.fisheries.noaa.gov/action/listing-20-reef-building-coral-species-under-esa).

As part of the Broward County Shore Protection Segment III Beach Renourishment Project, the United States Army Corps of Engineers (USACE) was required to perform ESA-listed coral collection/relocation efforts, in accordance with the 2020 South Atlantic Regional Biological Opinion (SARBO). The USACE contracted GLE Associates, Inc. (GLE), who sub-contracted Dial Cordy and Associates (DCA) to conduct a desktop assessment utilizing previously collected data to determine the extent of the coral collection/relocation efforts in select nearshore hardbottom habitats (Walker et al. 2008) between Port Everglades Inlet and south to the Miami-Dade/Broward counties boundary (approximately State R Monuments R-86 to R-128), in Broward County, FL.

Initial survey data collected as part of ESA-coral and hardbottom surveys, were provided in the contents of a March 2020 draft report provided by Olsen Associates (Gilliam et al. 2020) utilizing survey data collected in 2019, as well as GIS data, under the guidance of the NOAA Fisheries Service's recommended protocol. Surveys were conducted at a total of 356 sites (178 of these being hardbottom adjacent). The survey protocol instituted a 2-tiered survey approach to document the distribution and abundance of the seven threatened species. The first tier was a rapid assessment of all sites to locate any occurrences of listed threatened species. The second tier was a more comprehensive effort designed to provide greater detail on colony density, size, and location. The provided report and data were used to create a coral relocation/collection list that was provided to the USACE on October 8, 2021.

Due to the lack of colony specific coordinates, or even general locations (i.e. quadrants), for individual colonies or clusters of corals, the provided list was an estimate of the total number of colonies that could possibly be collected. The initial relocation list included 158 ESA-corals recorded at 26 sites, with 145 A. cervicornis possibly occurring within 200-ft of the project equilibrium tow of fill (ETOF) and 13 O. faveolata colonies occurring within 500-ft of the ETOF. After a December 17, 2021 conference call between representatives from the USACE, GLE, and DCA it was determined that the SARBO survey methods were not ideal for accomplishing the ESA-relocation efforts for these nourishment projects, and at the request of the USACE, DCA prepared a revised survey/collection methods proposal and an updated collection/relocation list for the survey/collection efforts for Segment III. The methods were modified based on the DCA

field team's experience surveying and collection corals from the Segment II nourishment project in northern Broward County during the fall of 2021. The updated list included 21 of the originally proposed ETOF-adjacent sites, and three additional sites based on the assumption that the adjacent sites had higher densities of A. cervicornis colonies and there was high potential that since the original 2019 surveys that fragments had migrated (D'Antonio et al. 2016) or reefs potentially expanded into these sites (Walker et al. 2012).

DCA was provided with an updated performance work statement (PWS) in April 2022. The updated PWS and attachments indicated that the DCA proposed methods were approved and would be utilized to survey and collect ESA-corals from 9 of the recommended 24 sites. All ESA-listed colonies observed within 200-ft of the ETOF were to have pertinent qualitative/quantitative data and geographic data collected prior to the collection and transfer of each colony.

All ESA-listed corals were collected under the authorization of Florida Fish and Wildlife Commission (FWC) special activity licenses (SAL): SAL-22-2441-R (Appendix B). Coordination efforts, between DCA staff and Dr. David Gilliam's nursery staff for the transfer of the corals, occurred from early May until June 13, when the nursery staff indicate they would be in the field to receive the corals a single day (June 15) for the week DCA planned field activities (June 13-18). All collected colonies were transferred to Dr. David Gilliam's offshore coral nursery located to the north of Port Everglades on Jun 15, 2022.

1.2 Study Area

The Broward Segment III nourishment project area extends from state range monument R-86 to the north to R-128 in the south. The nine USACE approved sites fell between R-100 and R-125 encompassing approximately 9.7 acres of hardbottom habitat (Figure 1) and had an estimated 28 A. cervicornis colonies and 6 O. faveolata colonies (Table 1). Water depths within the collection sites ranged 4-6m. ESA-listed corals were collected from 7 of the 9 proposed sites. A. cervicornis were found as attached and unattached colonies, as well as individual fragments. Habitat within the majority of the sites was low relief hardbottom, with some of the northern sites having moderate relief with sand channels running in a north-south direction.

Table 1. The estimated number of colonies proposed for collection/relocation identified at USACE approved sites based on the provided 2020 draft report and GIS data.

Site	A. cervicornis	O. faveolata
72		1
92	1	
94	2	
96	1	
98	14	1
104	10	1
218		1
228		1
258		1
Segment 2 Total	28	6

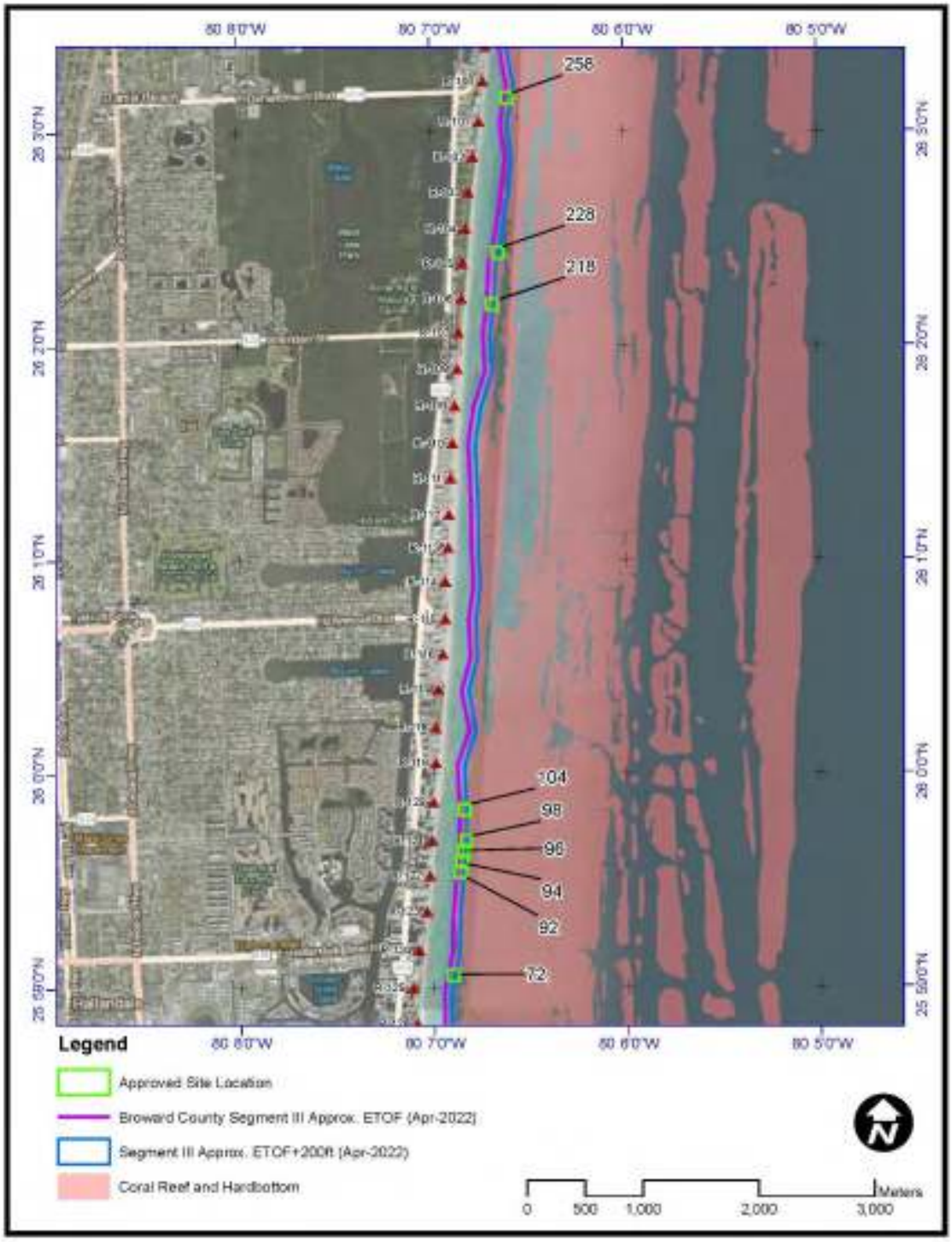

Figure 1. Map depicting the general location of the nine USACE approved ESA-coral collection sites for Segment III in Broward County, FL. The purple line indicates the approximate ETOF and the blue line represents the approximate 200-ft boundary.

2.0 METHODS

Initial survey efforts were conducted in order to locate and record all ESA-listed corals within 200-ft of the project ETOF. To delineate the 200-ft ETOF boundary, a weighted line (leadline) was deployed along the path of the 200-ft boundary from the vessel utilizing Hypack navigational software paired with a sub-meter differential GPS. The leadline provided a visual reference on the substrate for the divers to remain within the delineated survey area. The start and end points of the leadline were marked with surface buoys. Qualified divers surveyed all of the hardbottom to the west of the leadline and the locations of all A. cervicornis and O. faveolata colonies were recorded utilizing a diver-towed surface buoy. For each observed colony, species, colony ID number, the maximum dimension (cm), percent live tissue, and any other relevant observations were recorded.

ESA-listed coral collection/relocation was conducted by qualified personnel as outlined in the NOAA/NMFS "ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol" (included in Appendix A) and adhered to the standards outlined in the FWC special activities licenses that the collection activities were permitted under (Appendix B). To ensure that all surveyed colonies within the 200-ft ETOF boundary were collected the leadline was in the same manner as it was for the initial, survey efforts. In addition to the leadline, weighted lines with buoys were dropped near individual colonies, or groups of colonies, with specific location data. The buoys allowed the divers to confirm they were collecting the previously identified colonies.

For the collection process, like the surveys the dive team surveyed all of the habitat extending west of the leadline to the hardbottom edge to collect any additional corals that may have been missed during the initial surveys. Once colonies were found they were collected using hammer and chisels, for large A. cervicornis colonies and two O. faveolata colonies, and gardening clippers on smaller A. cervicornis colonies. Per the stipulation of the FWC SAL all A. cervicornis colonies had all dead branch ends removed, and all colonies greater than 25-cm longest dimension were cut into fragments less than 25-cm in longest dimension. Prior to the collection of each colony, maximum overall dimension (cm), and any other relevant observations were noted. Additionally, at least one photograph was taken of each colony prior to removal. Pursuant to the FWC SAL a visual health assessment was conducted for each coral prior to collection (Appendix B).

Collected colonies were placed in buckets while collection activities occurred underwater. Due to the time constraints of the coral nursery's field activities (June 15, 9:00AM-3:30PM) all A. cervicornis colonies were collected, trimmed/cleaned, and cached at two sites on the day prior to the transfer of the colonies to the nursery. Colonies collected from sites 92, 94, 96, and 98 were cached at site 96, and the remaining colonies collected at site 104 were cached at a central location within the boundaries of site 104. Due to the presence of recreational snorkelers and divers near the collection sites all cached colonies were placed on hardbottom surfaces with minimal sediment cover and macroalage cover. All O. faveolata colonies were collected on the day that the corals were transferred to the coral nursery.

3.0 Summary of Survey and Collection Efforts

During the initial survey efforts, a total of 39 ESA-listed corals were observed at 7 of the 9 sites, 37 A. cervicornis and 2 O. faveolata (Table 2, Figures 2 and 3). A red filamentous algae, likely Lyngbya spp., was present at most of the survey sites and remained for the collection and transfer efforts (Figure 4). During the collection efforts an additional 10 A. cervicornis colonies were observed, but 3 colonies were exhibiting more than 30% recent mortality (Figure 5), so seven additional colonies were collected (Table 3). A total of 155 ESA-coral fragments were collected, 145 A cervicornis fragments from 44 colonies and 10 fragments from the two O. faveolata colonies.

Table 2. The number of colonies of each species observed during the initial survey efforts at the nine USACE approved.

Site	A. cervicornis	O. faveolata	Total
72	0	0	0
92	1	0	1
94	2	0	2
96	6	0	6
98	5	0	5
104	23	0	23
218	0	0	0
228	0	1	1
258	0	1	1
Segment 2 Total	37	2	39

Table 3. The number of colonies of each species collected from the seven sites where colonies were initially observed.

Site	A. cervicornis	O. faveolata	Total
92	2	0	1
94	7	0	2
96	8	0	6
98	3	0	5
104	24	0	23
228	0	1	1
258	0	1	1
Segment 2 Total	44	2	46

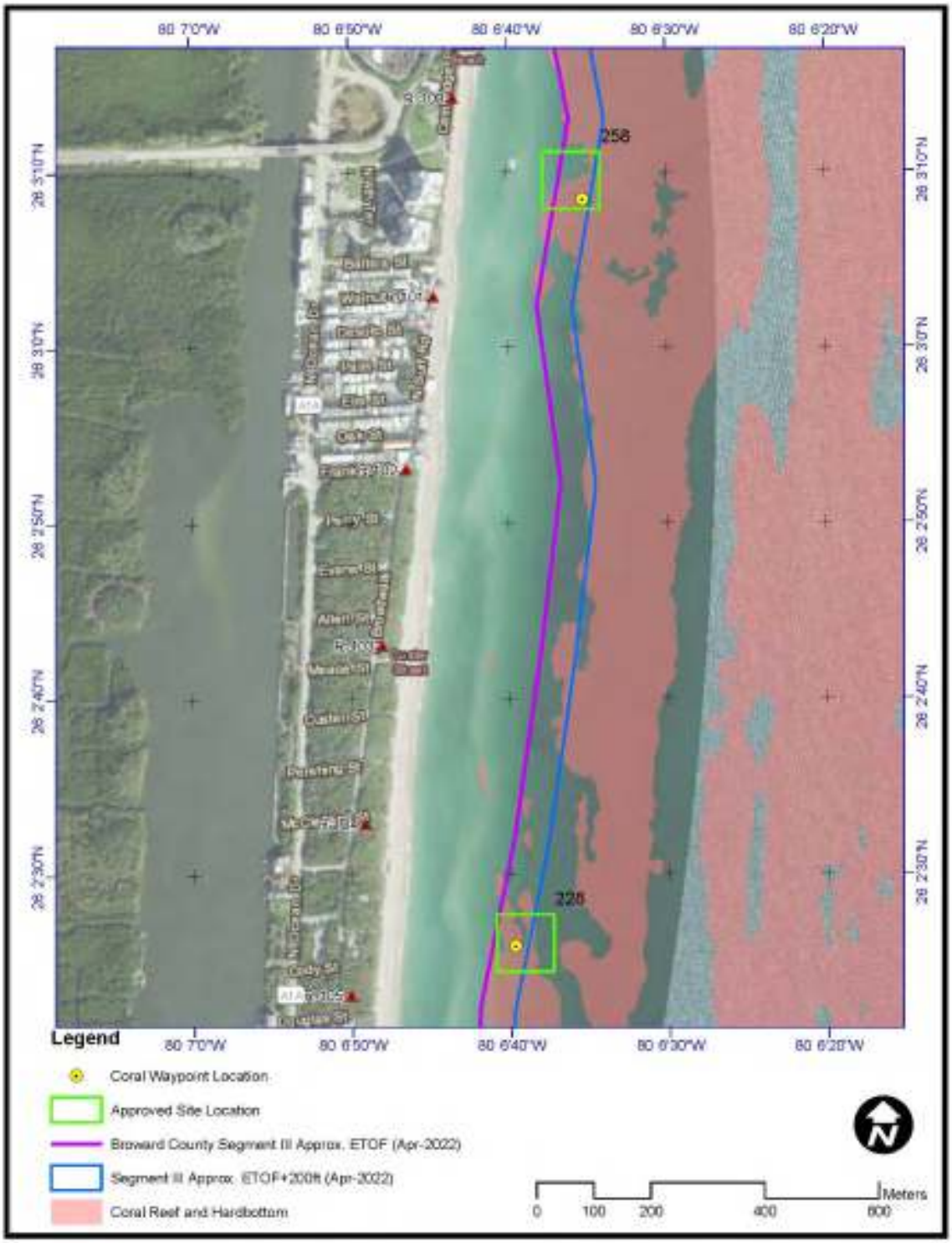
80 7'0"W
80 6'50"W
80 6'40"W
80 6'30"W
80 6'20"W
26 3'10"N
26 3'0"N
26 2'50"N
26 2'40"N
26 2'30"N
258
228
Legend
Coral Waypoint Location
Approved Site Location
Broward County Segment III Approx. ETOF (Apr-2022)
Segment III Approx. ETOF+200ft (Apr-2022)
Coral Reef and Hardbottom
0
100
200
400
800
Meters

Figure 2. Map depicting the location of the two O. faveolata colonies collected from Sites 228 and 258.

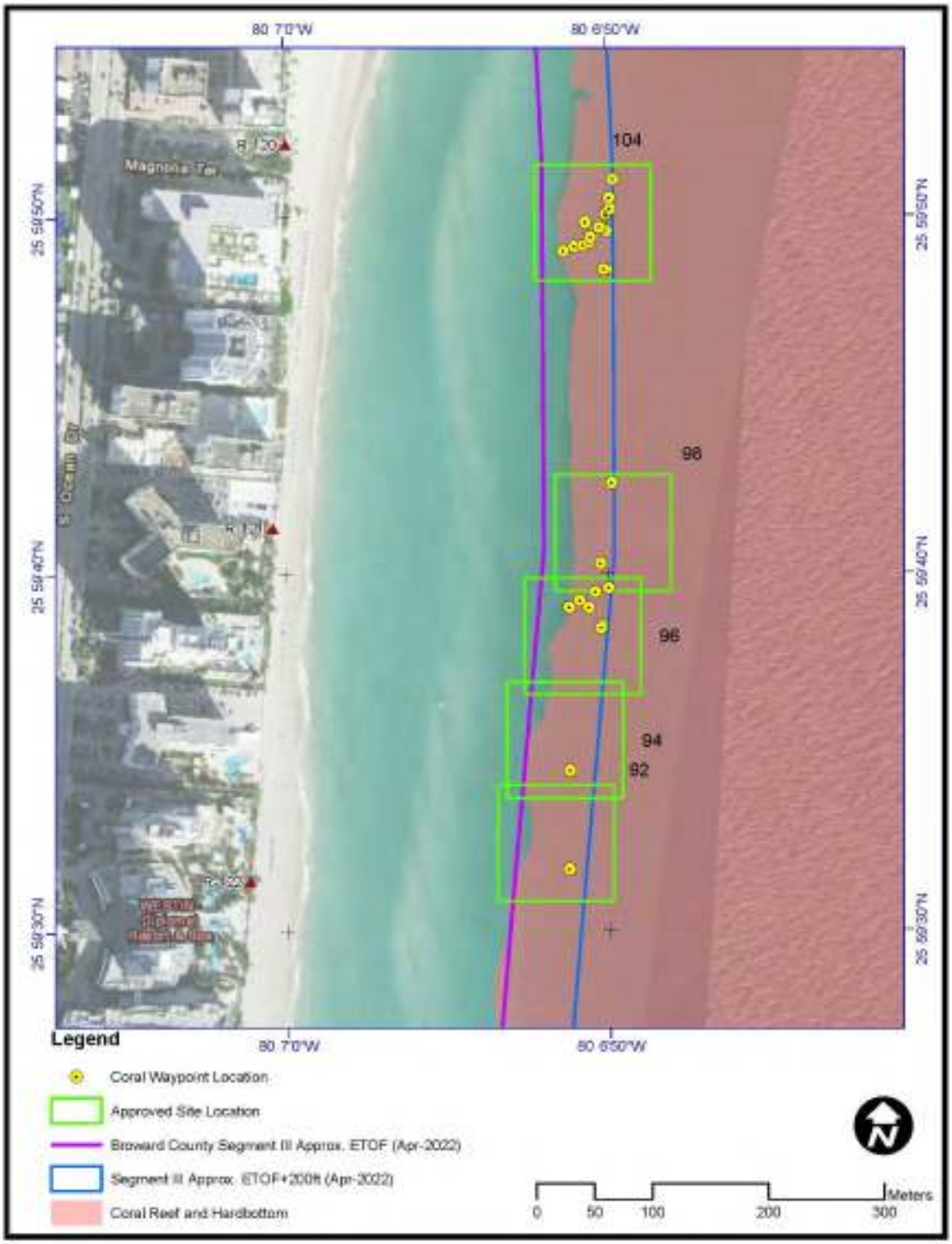

Figure 3. Map depicting the location of the A. cervicornis colonies collected from Sites 92, 94, 96, 98, and 104.

The two colonies that were not collected were A. cervicornis colonies observed at Site 87 and Site 105. Both colonies were suffering from significant recent mortality. The colony at Site 87 was recorded as having 5% live tissue, as well as being dislodged and covered by a dislodged octocoral. The colony at Site 105 was observed with more than 50% recent mortality due to disease.

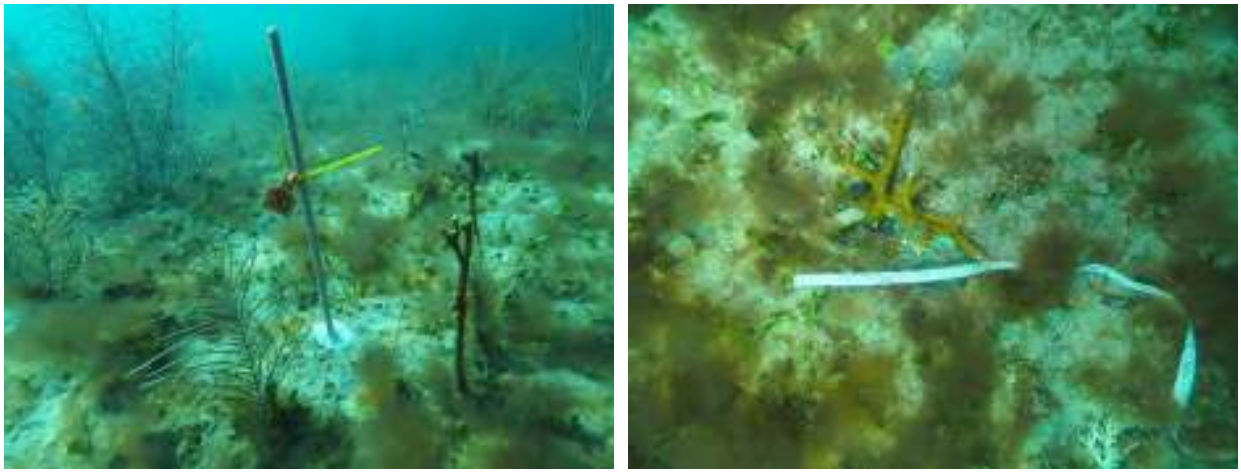

Figure 4. Images of the significant presence of filamentous algae collection Site 92.

Figure 5. Images of A. cervicornis colonies exhibiting significant recent mortality at Site 98 (left) and Site 104 (right).

Mean (±Std. Dev.) colony size (based on maximum dimension) of all the collected A. cervicornis colonies was 25.5cm (±8.2cm). The largest colony collected had a maximum dimension of 42cm and 90% live tissue. The two O. faveolata colonies that were collected had maximum dimensions of 65cm and 53 cm, at Sites 258 and 228 respectively, and bot colonies had at least 95% live tissue (Figure 6). Mean (± SD) percent live tissue for all collected A. cervicornis was 72% (±24%).

And 65% (24 of 37 initial survey colonies) were recorded as being loose/unattached, with three of the colonies experiencing competitive mortality due to sponge overgrowth and two additional colonies exhibiting mortality due to partial burial.

4.0 Transfer of Colonies

All collected colonies were transferred from the two A. cervicornis cache sites (Sites 96 and 104) and Sites 228 and 258, where the O. faveolata colonies were collected on the day of the transfers (June 15, 2022). Transfer efforts were coordinated with Dr. David Gilliam and one of his staff, Nicole Hayes (MS). Both Dr. Gilliam and Ms. Hayes suggested that the DCA field staff deliver the corals directly to the underwater coral tables at the nursery. Staff from the nursery assisted with the placement of the colonies/fragments on to the coral tables or into crates fixed to the coral tables (Figure 6). A total of 155 fragments from 46 colonies were delivered to the nursery by the end of the day.

Figure 6. Images of transferred colonies at the coral nursery. O. faveolata colonies awaiting stands to be placed on while divers place A. cervicornis colonies/fragments into crates (left), and all the A. cervicornis colonies/fragments collected from Site 104 securely stored in crates on top of the coral table.

5.0 Additional ESA-Colonies

During the initial survey efforts at Site 98, the dive team unknowingly entered Site 100 to the north and began recording coordinates for observed A. cervicornis colonies. The first initial coordinate was recorded just adjacent to the southern boundary of site 100 and the second point was 20-ft to the northeast. The dive team was recalled to the surface by the boat captain and were told they were recording points in Site 100. At the time of the recall the dive team saw several A. cervicornis near the last recorded waypoint. The dive team returned to the bottom and collected several more waypoints marking areas with multiple A. cervicornis colonies were observed (Figure 6). All remaining waypoints were less than 15-ft from one another. A total of seven

waypoints were collected marking 12 A. cervicornis colonies. While no colony specific data were collected, qualitative observations indicated that several of the colonies were attached securely to the substrate and overall health appeared to be good (Figure 7). After terminating the dive, upon ascension and observations from the surface, several more A. cervicornis colonies were observed within the project area. Due to Site 100 not being approved for surveys or collections, DCA only collected this information to provide to USACE, as work conducted within Site 100 was outside of the scope of the contract.

Based on the provided report and data used to compile the initial collection/relocation reports Site 100 potentially had the highest number of corals (30 A. cervicornis colonies) of any of the 24 recommended collection sites. Within a 10-minute casual survey more than 15 colonies were observed at the site. Additionally, during the field efforts a total of 26 A. cervicornis colonies were observed during the survey and collection efforts at Site 104, however based on the provided data it was estimated that there would be 10 colonies at the site. While it was agreed upon that the initial SARBO protocol was not ideal for these survey/collection efforts, more A. cervicornis colonies were collected at all sites, except one (Site 98) than expected based on the provided collection proposal, indicating that there could be many more ESA-listed A. cervicornis colonies remaining within the potential impact zone of the upcoming nourishment project.

Based on this information we have provided a list of additional sites that we recommend survey/collection efforts occur at prior to the start of the nourishment project (Table 4). Potentially 105 or more A. cervicornis colonies and a single O. faveolata colony could be within potential impact areas of the nourishment project. By pursuing survey/collection efforts at these additional sites all involved parties can be assured that they are in compliance with the standards established by the 2020 SARBO agreement, as well as the objectives set forth in the Performance Work Statement.

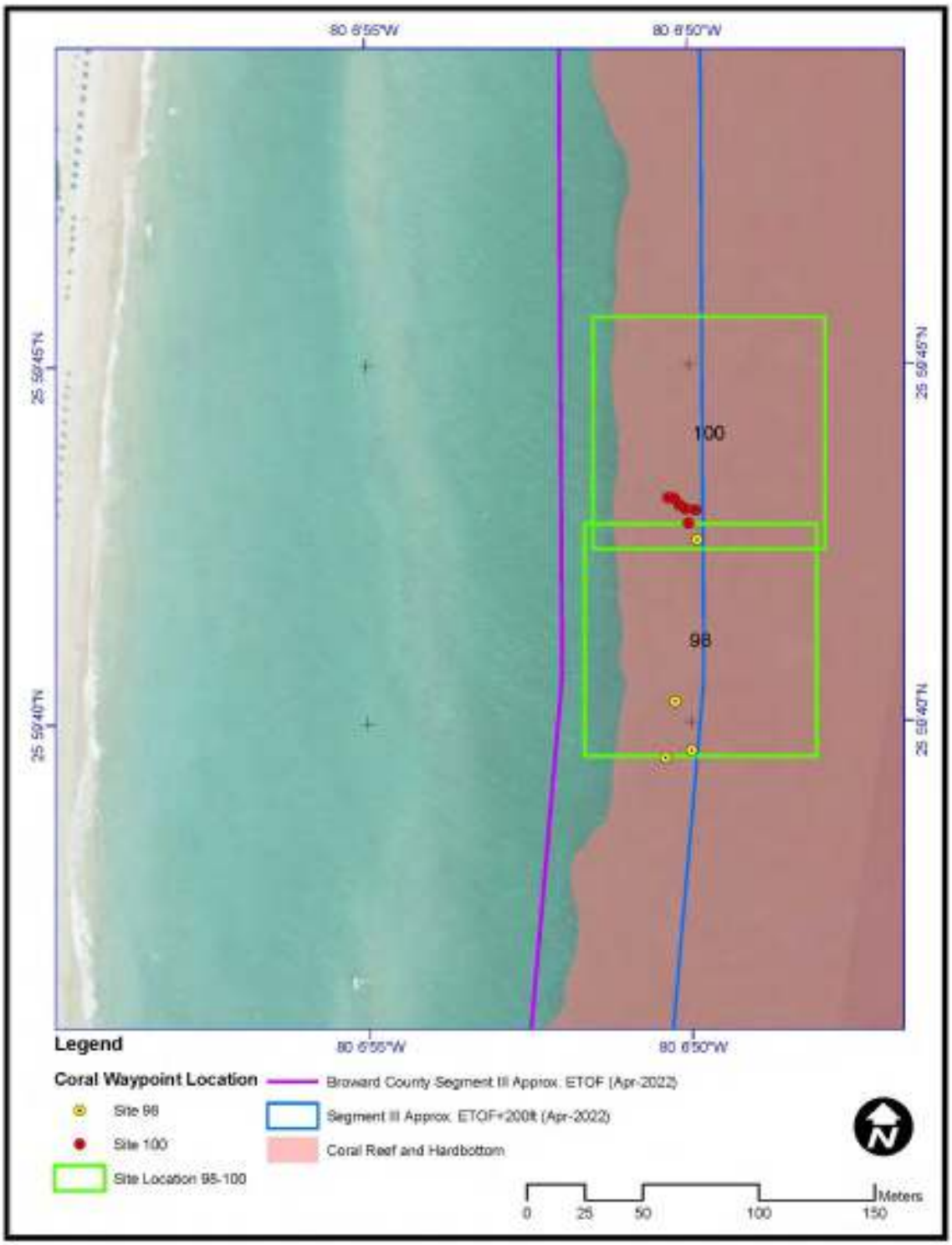

Figure 7. Map depicting the location of the A. cervicornis observed at Sites 98 and 100. Yellow dots indicate colonies observed at the USACE approved Site 98, that were collected, and red dots indicate the locations of colonies observed at Site 100, that were not collected.

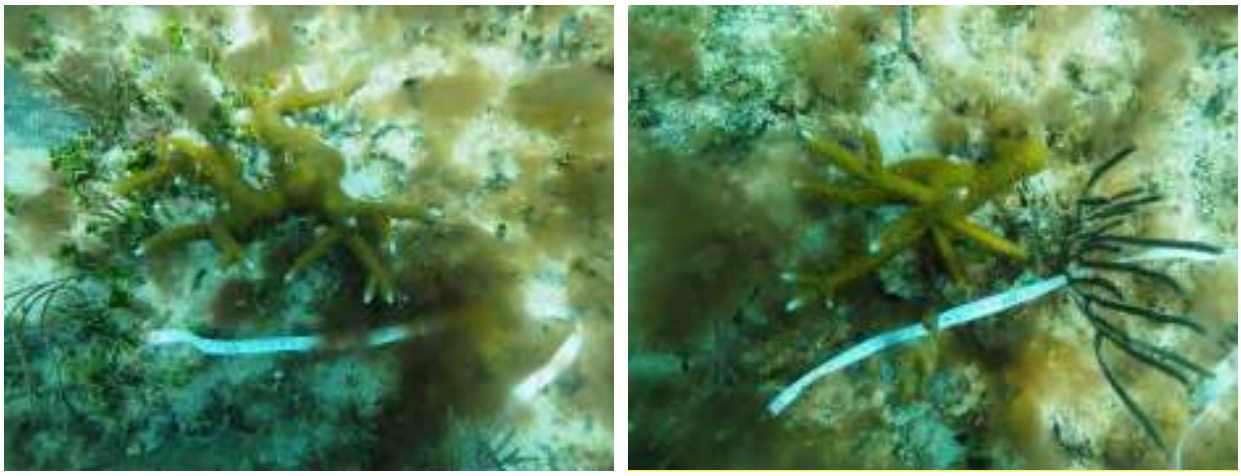

Figure 8. Images of healthy, attached colonies observed at Site 100, within 200-ft of the ETOF.

Table 4. Recommended additional sites for ESA-survey/collection activities if USACE decides to pursue additional efforts. Highlighted cells indicate sites that are highly recommended based on estimated number of colonies and proximity to other high density sites.

Additional Proposed Sites	Acres within 200-ft ETOF	A. Cervicornis	O. faveolata
46	0.04	10	
100	0.935	30	
102	0.884	17	
106	0.771	17	
108	0.358	6	
114	0.048	1	
146	0.684	1	
160	0.914	1	
242	0.448	5	1
244	0.651	17	
Total (n=10)	5.733	105	1

Per the specifications of the PWS the following information has been provided digitally to the USACE: field photographs (all collected corals), raw data and Excel summary spreadsheets, and scanned datasheets.

6.0 References

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Florida Fish and Wildlife Conservation Commission (FWC). 2017. Unified Florida Reef Tract Map. Available at: https://geodata.myfwc.com/documents/myfwc::unified-florida-reef-tract-map/about

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Appendix A

USACE Performance Work Statement Updated 2022

Attachment 1 – Survey Area Description

Attachment 2 - NMFS/SARBO Survey Protocol

Attachment 3 – SARBO Coral PDCs

PERFORMANCE WORK STATEMENT

BROWARD COUNTY SHORE PROTECTION PROJECT SEGMENT III BEACH RENOURISHMENT

DIVER-BASED ENDANGERED SPECIES ACT (ESA)-LISTED CORAL RELOCATION/COLLECTION PROTOCOL

July 2021

1. GENERAL INFORMATION

1.1 Description of Services:

This is a non-personal services contract to provide tasks as described below for the completion of a diver-based coral relocation/collection for the Broward County Shore Protection Project (located in Broward County, FL), at designated locations, to allow placement of material in areas immediately south of Port Everglades Inlet, specifically within a 1.2 mile long segment within the Dr. Von D. Mizell-Eula Johnson State Park, also called the Park, (from Port Everglades south jetty to approximately Statement Monument R-92) and a 5.8 mile long segment within the cities of Dania, Hollywood, and Hallandale (approximately R-98.3 to R-128). The Contractor shall provide all personnel, equipment, supplies, facilities, transportation, tools, materials, supervision, and other items to perform all services as defined in this Performance Work Statement (PWS) except for those items specified as government furnished.

1.2 Background:

The 2020 South Atlantic Regional Biological Opinion (SARBO) requires that beach nourishment projects covered under this Opinion complete a beach hardbottom survey to identify and map the location of any hardbottom located 500 ft seaward of the beach fill template equilibrium toe-of-fill (ETOF) as well as identify and record the presence of all Endangered Species Act (ESA)-listed corals within the beach hardbottom survey area. These hardbottom surveys must be completed prior to beach sand placement for beach nourishment projects within the range of ESA-listed corals in areas depicted by the two scenarios shown in Figure 52 of the 2020 SARBO (Appendix C "Coral" Section 2.3 "Beach Nourishment").

Divers will collect/relocate select ESA-listed corals that are found within the 500' survey area per guidance and approval provided by U.S. Army Corps of Engineers, Jacksonville District (the Government). The collection/relocation work are expected to be complete by November 1st, 2021, prior to the start of the upcoming renourishment event.

1.3 Objective:

The objective of this action is to conduct coral collection/relocation based on the project-specific review between the Government and National Marine Fisheries Service (NMFS) to protect ESA-listed corals from potential turbidity and sedimentation resulting from the upcoming beach nourishment.

1.4 Restrictions:

1. Personal Services: The Government shall neither supervise contractor employees nor control the method by which the contractor performs the required tasks. Under no circumstances shall the Government assign tasks to, or prepare work schedules for, individual contractor employees. It shall be the responsibility of the contractor to manage its employees and to guard against any actions that are of the nature of personal services or give the perception of personal services. If the contractor believes that any actions constitute, or are perceived to constitute personal services, it shall be the contractor's responsibility to notify the Procuring Contracting Officer (PCO) immediately.

2. Inherently Governmental: Avoidance of Performance Closely Associated with Inherently Governmental Functions. Task orders issued under this indefinite delivery/indefinite quantity (IDIQ) Contract will receive special consideration to avoid inclusion of services which are considered closely associated with inherently governmental functions. Under no circumstances will this IDIQ Contract be utilized in a manner which would require the Contractor to manage another contractor, nor in manner such as where the Contractor might influence official evaluations of other contractors; neither directly nor indirectly.

3. Brooks-Act Prohibition: Under this contract, the Contractor is prohibited from performing architect-engineer type services which require a registration by state law. The Contractor is prohibited from performing architect-engineer type services associated with the design or construction of real property (land and structures). The Contractor is prohibited from performing ancillary architect-engineer type services, which require supervision by a registered professional. The Contractor is prohibited from performing survey or mapping services associated with architect-engineer type planning, development construction, design, or alteration of real property.

1.5 Scope:

The contractor shall furnish all materials, equipment, supplies, personnel, and all other services required to perform the environmental services and Sustainment, Restoration and Modernization support outlined in this statement of work and as specifically identified in the individual task orders.

1.6 Period of Performance:

The period of performance shall be for 1 calendar year.

1.7 Place of Performance:
The work to be performed under this contract will be performed at designated locations between Hillsboro Inlet and Port Everglades Inlet, located in Broward County, Florida.

1.8 Recognized Holidays:

New Year's Day
Martin Luther King Jr.'s Birthday
President's Day
Memorial Day
Independence Day
Juneteenth
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day

2. CONTRACTOR ADMINISTRATION AND MANAGEMENT

2.1 Business Relations:

The contractor shall successfully integrate and coordinate all activity needed to execute the requirement. The contractor shall manage the timeliness, completeness, and quality of problem identification. The contractor shall provide corrective action plans, proposal submittals, timely identification of issues, and effective management of subcontractors. The contractor shall seek to ensure customer satisfaction and professional and ethical behavior of all contractor personnel.

2.2 Contractor Personnel, Disciplines, and Specialties:

Not applicable

2.3 Key Personnel:

All in-water work (*in-situ* data collection methods) and Quality Assurance/Quality Control (QA/QC) of the surveys and data collected will be completed by qualified biologists who meet at least the following minimum requirements:

1) Bachelor of Science in Marine Biology, Biology with a concentration in marine sciences, Environmental Science with a minor in Biology, or similar degree;
2) At least 3 years documented experience monitoring coral hardbottom / coral reef communities in South Florida;
3) Knowledge of marine benthic ecosystems and organisms, including but not limited to identification of Caribbean coral species.

The contractor shall provide a contract manager who shall be responsible for the performance of the work. The name of this person and an alternate who shall act for the contractor when the manager is absent shall be designated in writing to the contracting officer. The contract manager or alternate shall have full authority to act for the contractor on all contract matters relating to daily operation of this contract. The contract manager or alternate shall be available between *8:00 a.m. to 4:30p.m.*, Monday thru Friday except Federal holidays or when the Government facility is closed for administrative reasons.

2.4 Identification of Contractor Employees:

All contract personnel attending meetings, answering Government telephones, and working in other situations where their contractor status is not obvious to third parties are required to identify themselves as such to avoid creating an impression in the minds of members of the public that they are Government officials. They must also ensure that all documents or reports produced by contractors are suitably marked as contractor products or that contractor participation is appropriately disclosed.

2.5 Subcontract Management:

The contractor shall be responsible for any subcontract management necessary to integrate work performed on this requirement and shall be responsible and accountable for subcontractor performance on this requirement. The prime contractor will manage work distribution to ensure there are no Organizational Conflict of Interest (OCI) considerations. Contractors may add subcontractors to their team after notification to the Contracting Officer (KO) or Contracting Officer Representative (COR).

2.6 Contractor Travel:

Contractor will be authorized travel expenses consistent with the substantive provisions of the Joint Travel Regulation (JTR) and the limitation of funds specified in this contract. All travel requires Government approval/authorization and notification to the COR.

3. SECURITY

3.1 Security Requirements:

A security clearance is not required for the Contractor's employees.

3.2 Antiterrorism/Operation Security (AT/OPSEC) Requirements:

1. AT Level I Training - All contractor employees, to include subcontractor employees, requiring access to Army installations, facilities and controlled access areas shall complete AT Level I awareness training within 30 calendar days after contract start date or effective date of incorporation of this requirement into the contract, whichever is applicable. The contractor shall submit certificates of completion for each affected contractor employee and subcontractor employee, to the COR or to the Contracting Officer, if a COR is not assigned, within 5 calendar days after completion of training by all employees and subcontractor personnel. AT Level I awareness training is available at the following website: http://jko.jten.mil/courses/atl1/launch.html

2. Access and General Protection/Security Policy and Procedures - All contractor and all associated sub-contractors' employees shall comply with applicable installation, facility and area commander installation/facility access and local security policies and procedures (provided by government representative). The contractor shall also provide all information required for background checks to meet installation/facility access requirements to be

accomplished by installation Provost Marshal Office, Director of Emergency Services or Security Office. Contractor workforce must comply with all personal identity verification requirements (FAR clause 52.204-9, Personal Identity Verification of Contractor Personnel) as directed by DOD, HQDA and/or local policy. In addition to the changes otherwise authorized by the changes clause of this contract, should the Force Protection Condition (FPCON) at any installation or facility change, the Government may require changes in contractor security matters or processes.

3. For contractors requiring Common Access Card (CAC) - Before CAC issuance, the contractor employee requires, at a minimum, a favorably adjudicated National Agency Check with Inquiries (NACI) or an equivalent or higher investigation in accordance with Army Directive 2014-05 and Homeland Security Presidential Directive-12 (HSPD-12). Proposed language: "The contractor and all sub-contractors employees will be issued a CAC only if duties involve one of the following: (1) Both physical access to a DoD facility and access, via logon, to DoD networks on-site or remotely; (2) Remote access, via logon, to a DoD network using DoD-approved remote access procedures; or (3) Physical access to multiple DoD facilities or multiple non-DoD federally controlled facilities on behalf of the DoD on a recurring basis for a period of 6 months or more. At the discretion of the sponsoring activity, an interim CAC may be issued based on a favorable review of the FBI fingerprint check and a successfully scheduled NACI at the Office of Personnel Management."

4. Suspicious Activity Reporting Training (e.g. iWATCH, CorpsWatch, or See Something, Say Something) - The contractor and all associated sub-contractors shall receive a brief/training (provided by the RA) on the local suspicious activity reporting program. This locally developed training will be used to inform employees of the types of behavior to watch for and instruct employees to report suspicious activity to the project manager, security representative or law enforcement entity. This training shall be completed within 30 calendar days of contract award and within 30 calendar days of new employees commencing performance with the results reported to the COR NLT 5 calendar days after the completion of the training.

5. Contractor Employees Who Require Access to Government Information Systems - All contractor employees with access to a government info system must be registered in the ATCTS (Army Training Certification Tracking System) at commencement of services, and must successfully complete the DOD Information Assurance Awareness prior to access to the information systems and then annually thereafter IAW AR 380-67 (Personnel Security Program) and Homeland Security Presidential Directive 12 (Policy for a Common Identification Standard for Federal Employees and Contractors).

6. OPSEC Standing Operating Procedure/Plan - The Contractor shall develop an OPSEC SOP/Plan within 90 days of contract award. The OPSEC SOP/Plan must be reviewed and approved by the RA OPSEC Officer. The SOP/Plan will include the government's critical information, why it needs to be protected, where it is located, who is responsible for it and how to protect it. In addition, the contractor shall identify an individual who will be an OPSEC Coordinator.

7. OPSEC Training - All new contractor employees will complete Level I OPSEC Training within 30 calendar days of their reporting for duty. Additionally, all contractor employees must complete annual OPSEC awareness training. The contractor shall submit certificates of completion for each affected contractor and subcontractor employee, to the COR or to the contracting officer (if a COR is not assigned), within 5 calendar days after completion of training. OPSEC awareness training is available at the following websites: https://www.iad.gov/ioss/ or http://www.cdse.edu/catalog/operations-security.html

8. For Information Assurance (IA)/Information Technology (IT) Training - All contractor employees and associated sub-contractor employees must complete the DoD IA awareness training before issuance of network access and annually thereafter. All contractor employees working IA/IT functions must comply with DoD and Army training requirements in DoD 8570 01-M and AR 25-2 within six months of employment.

9. Escort Requirements - All contract employees, including subcontractor employees who are not in possession of the appropriate security clearance or access privileges, will be escorted in areas where they may be exposed to classified and/or sensitive materials and/or sensitive or restricted areas.

10. Pre-screen candidates using E-Verify Program - The Contractor must pre-screen Candidates using the E-verify Program (http://www.dhs.gov/E-Verify) website to meet the established employment eligibility requirements. The Vendor must ensure that the Candidate has two valid forms of Government issued identification prior to ensure the correct information is entered into the E-verify system. An initial list of verified/eligible Candidates must be provided to the COR no later than 3 business days after the initial contract award. When contracts are with individuals, the individuals will be required to complete a Form I-9, Employment Eligibility Verification, with the designated Government representative. This Form will be provided to the Contracting Officer and shall become part of the official contract file.

11. Threat Awareness Reporting Program - All new contractor employees will complete annual Threat Awareness and Reporting Program (TARP) Training provided by a Counterintelligence Agent, IAW AR 381-12. The contractor shall submit certificates of completion for each affected contractor and subcontractor employee(s) or a memorandum for the record, to the COR or to the contracting officer (if a COR is not assigned), within 5 calendar days after completion of training. Authorized web based TARP training for CAC card holders is available at the following website: https://www.us.army.mil/suite/page/655474

3.3 Physical Security:

The contractor shall be responsible for safeguarding all Government information. Government-furnished equipment, property, and facilities are not applicable to this task order.

3.4 Key Control:

Reserved.

3.4.1 Lost Keys:

Reserved.

3.4.2 Keys issued to Contractor:

Reserved.

3.4.3 Lock Combinations

Reserved.

4. QUALITY

4.1 Quality Control:

The contractor shall develop and maintain an effective quality control program to ensure services are performed in accordance with this PWS. The contractor shall develop and implement procedures to identify, prevent, and ensure non-recurrence of defective services. The contractor's quality control program is the means by which he assures himself that his work complies with the requirement(s) of the contract. After acceptance of the quality control plan the contractor shall receive the contracting officer's acceptance in writing of any proposed change to his QC system.

4.2 Quality Assurance:

The Government shall evaluate the contractor's performance under this contract in accordance with the Performance Requirements Summary (PRS). Additionally, the Government will use a Quality Assurance Surveillance Plan (QASP) in the inspection of the services. This plan is primarily focused on what the Government must do to ensure

that the contractor has performed in accordance with the performance standards. It defines how the performance standards will be applied, the frequency of surveillance, and the minimum acceptable defect rate(s).

4.3 Quality Assurance Surveillance Plan (QASP):

The Government shall monitor the Contractor's performance under this Task/Delivery Order in accordance with the Government's QASP.

4.4 Performance Requirements Summary:

The contractor service requirements are summarized into performance objectives that relate directly to mission essential items. The performance threshold briefly describes the minimum acceptable levels of service required for each requirement. These thresholds are critical to mission success.

5. GOVERNMENT CONTRACT ADMINISTRATION

5.1 Post Award Conference/Periodic Progress Meetings:

The Contractor agrees to attend any post award conference convened by the contracting activity or contract administration office in accordance with Federal Acquisition Regulation Subpart 42.5. The contracting officer, Contracting Officer Representative (COR), and other Government personnel, as appropriate, may meet periodically with the contractor to review the contractor's performance. At these meetings the contracting officer will apprise the contractor of how the government views the contractor's performance and the contractor will apprise the Government of problems, if any, being experienced. Appropriate action shall be taken to resolve outstanding issues. These meetings shall be at no additional cost to the government.

5.2 Contracting Officer Representative (COR):

The COR will be identified by separate letter. The COR monitors all technical aspects of the contract and assists in contract administration. The COR is authorized to perform the following functions: assure that the Contractor performs the technical requirements of the contract; perform inspections necessary in connection with contract performance; maintain written and oral communications with the Contractor concerning technical aspects of the contract; issue written interpretations of technical requirements, including Government drawings, designs, specifications; monitor Contractor's performance and notifies both the Contracting Officer and Contractor of any deficiencies; coordinate availability of Government-furnished property; and provide site entry of Contractor personnel. A letter of designation issued to the COR, a copy of which is sent to the Contractor, states the responsibilities and limitations of the COR, especially with regard to changes in cost or price, estimates or changes in delivery dates. The COR is not authorized to change any of the terms and conditions of the resulting order.

5.3 Contractor Performance Assessment Reporting System (CPARS):

This contract requires reporting in the Contractor Performance Assessment Reporting System (CPARS). Any task order awarded under this contract that is valued at greater than $1,000,000.00 will also be subject to reporting in CPARS. The contractor is responsible for providing and maintaining a representative in CPARS who has the authority to review and accept performance reports on behalf of the contractor.

6. OTHER REQUIREMENTS AND INFORMATION

6.1 Hours of Operation:

The contractor is responsible for conducting business, between the hours of 8:00 am to 4:30 pm Monday thru Friday, except Federal holidays or when the Government facility is closed due to local or national emergencies, administrative closings, or similar Government directed facility closings. For other than firm fixed price contracts,

the contractor will not be reimbursed when the government facility is closed for the above reasons. The Contractor must maintain at all times an adequate workforce for the uninterrupted performance of all tasks defined within this PWS when the Government facility is not closed for the above reasons. When hiring personnel, the Contractor shall keep in mind that the stability and continuity of the workforce are essential.

6.2 Other Direct Costs:

Reserved.

6.3 Data Rights:

The Government has unlimited rights to all documents/material produced under this contract. All documents and materials, to include the source codes of any software, produced under this contract shall be Government owned and are the property of the Government with all rights and privileges of ownership/copyright belonging exclusively to the Government. These documents and materials may not be used or sold by the contractor without written permission from the Contracting Officer. All materials supplied to the Government shall be the sole property of the Government and may not be used for any other purpose. This right does not abrogate any other Government rights.

6.4 Organizational Conflict of Interest:

Contractor and subcontractor personnel performing work under this contract may receive, have access to, or participate in the development of proprietary or source selection information (e.g., cost or pricing information, budget information or analyses, specifications or work statements, etc.), or perform evaluation services which may create a current or subsequent Organizational Conflict of Interest (OCI) as defined in FAR Subpart 9.5. The Contractor shall notify the Contracting Officer immediately whenever it becomes aware that such access or participation may result in any actual or potential OCI and shall promptly submit a plan to the Contracting Officer to avoid or mitigate any such OCI. The Contractor's mitigation plan will be determined to be acceptable solely at the discretion of the Contracting Officer and in the event the Contracting Officer unilaterally determines that any such OCI cannot be satisfactorily avoided or mitigated, the Contracting Officer may effect other remedies as he or she deems necessary, including prohibiting the Contractor from participation in subsequent contracted requirements which may be affected by the OCI.

6.5 Phase In/Phase Out:

Reserved.

7. DEFINITIONS AND ACRONYMS

7.1 Definitions:

CONTRACTOR. A supplier or vendor having a contract to provide specific supplies or service to the Government. The term used in this contract refers to the prime.

CONTRACTING OFFICER. A person with authority to enter into, administer, and or terminate contracts, and make related determinations and findings on behalf of the government. Note: The only individual who can legally bind the Government.

CONTRACTING OFFICER REPRESENTATIVE (COR). An employee of the U.S. Government appointed by the contracting officer to administer the contract. Such appointment shall be in writing and shall state the scope of authority and limitations. This individual has authority to provide technical direction to the Contractor as long as that direction is within the scope of the contract, does not constitute a change, and has no funding implications. This individual does NOT have authority to change the terms and conditions of the contract.

DEFECTIVE SERVICE. A service output that does not meet the standard of performance associated with the Performance Work Statement.

DELIVERABLE. All goods, out-puts, end products, services, work, work product, items, materials and property to be created, developed, produced, delivered, performed or provided by or on behalf of, or made available through, Contractor (or any agent, contractor or subcontractor of the contractor) in connection with this contract. Most deliverables take the form of a tangible product (hardware, software, data, written report, completed installation, etc.), but some can also be less tangible (meeting facilitator or custodial services).

KEY PERSONNEL. Contractor personnel that are evaluated in a source selection process and that may be required to be used in the performance of a contract by the Key Personnel listed in the PWS. When key personnel are used as an evaluation factor in best value procurement, an offer can be rejected if it does not have a firm commitment from the persons that are listed in the proposal.

PHYSICAL SECURITY. Actions that prevent the loss or damage of Government property.

QUALITY ASSURANCE. The government procedures to verify that services being performed by the Contractor are performed according to acceptable standards.

QUALITY ASSURANCE SURVEILLANCE PLAN (QASP). An organized written document specifying the surveillance methodology to be used for surveillance of contractor performance.

QUALITY CONTROL. All necessary measures taken by the Contractor to assure that the quality of an end product or service shall meet contract requirements.

SUBCONTRACTOR. One that enters into a contract with a prime contractor. The Government does not have privity of contract with the subcontractor.

WORKDAY. The number of hours per day the Contractor provides services in accordance with the contract.

WORK WEEK. Is defined as Monday through Friday, unless specified otherwise.

7.2 Acronyms:

ACOR	Alternate Contracting Officer's Representative
AFARS	Army Federal Acquisition Regulation Supplement
AR	Army Regulation
CCE	Contracting Center of Excellence
CFR	Code of Federal Regulations
CONUS	Continental United States (excludes Alaska and Hawaii)
COR	Contracting Officer Representative
COTR	Contracting Officer's Technical Representative
COTS	Commercial Off the Shelf
DA	Department of the Army
DD250	Department of Defense Form 250 (Receiving Report)
DD254	Department of Defense Contract Security Requirement List
DFARS	Defense Federal Acquisition Regulation Supplement
DMDC	Defense Manpower Data Center
DOD	Department of Defense
FAR	Federal Acquisition Regulation
HIPAA	Health Insurance Portability and Accountability Act of 1996
KO	Contracting Officer
OCI	Organizational Conflict of Interest
OCONUS	Outside Continental United States (includes Alaska and Hawaii)
ODC	Other Direct Costs
PIPO	Phase In/Phase Out
POC	Point of Contact
PRS	Performance Requirements Summary

PWS	Performance Work Statement
QA	Quality Assurance
QAP	Quality Assurance Program
QASP	Quality Assurance Surveillance Plan
QC	Quality Control
QCP	Quality Control Program

8. GOVERNMENT-FURNISHED PROPERY, EQUIPMENT, SERVICES AND MATERIALS

8.1 Property:

Reserved.

8.2 Equipment:

Reserved.

8.3 Services:

Reserved.

8.4 Materials:

Reserved.

9. CONTRACTOR REQUIREMENTS

9.1 Contractor Furnished Items – Kick off meeting minutes

9.2 Submittals - Dive Safety Plan in accordance with EM385-1-1, all raw data, draft and final Coral Relocation reports, draft and final Baseline Observation reports, draft and final Post Transplantation reports.

9.3 Contract Requirements.

10. PERFORMANCE REQUIREMENTS

10.1 Basic Services:

The Contractor shall provide services for all tasks as described below for the completion of diver-based coral relocation/collection for the Broward County Shore Protection Project Segment III Beach Renourishment Project, at designated locations, to allow placement of material in areas south of Port Everglades Inlet (from Port Everglades south jetty to approximately R-92 and approximately R-98.3 to R-128). See Attachment 1 for a graphic depiction of the beach nourishment area. Coral relocation/collection shall be conducted by qualified biologists meeting the minimum requirements as described in section 2.3. Documentation demonstrating appropriate expertise and experience is required to be provided to the Government with your proposal.

10.2 Task Heading and Standards:

Task 1: Kick-off Call:
Immediately following award of this contract, a kick-off conference call will be scheduled between the Government and the Contractor to consider a variety of issues, outline responsibilities, review schedule and deliverables, establish points-of-contact (POC), etc. The Contractor shall arrange the conference call and shall be responsible for the agenda and preparing minutes of the call/meeting and submitting to the Government.

Task 2: Identification of Coral Hardbottom and ESA-Listed Corals Field Activities

Presence of Coral Hardbottom and ESA-listed Corals:

Divers will identify and record the presence of all coral hardbottom and ESA-listed corals within the beach hardbottom survey area associated with placement of material in Broward Segment 3 Hollywood, Hallandale, and Dania Beach (HHD) section (approximately R-98.3 to R-128) (see Attachment 1 for a depiction of the survey area) according to the NMFS's ESA-Listed Coral Colony and *Acropora* Critical Habitat Survey Protocol updated in July 2019 (see Attachment 2). This protocol provides specific information on survey methods, QA/QC procedures, delineating *Acropora* critical habitat features, and data collection requirements. However, only Tier 1 surveys will be conducted. In addition to the requirements of the protocol, photographs must be taken of each coral. If this guidance is updated, the new NMFS survey protocol will be followed.

Task 3: Coral Hardbottom and ESA-Listed Corals Data Analysis and Reporting

Coral Hardbottom and ESA-Listed Corals Survey

Deliverables are described in the NMFS' 2019 ESA-Listed Coral Colony and *Acropora* Critical Habitat Survey Protocol with only the Tier 1 survey being conducted (Attachment 2) and will include:

- Georeferenced map (ArcGIS files) and latitude and longitude using decimal degrees (i.e., xx.xxxx°N, –xx.xxxx°W) for all coral hardbottom and ESA-listed corals identified by species.
- Map of the location of each colony of ESA-listed corals.
- Map of the location of *Acropora* critical habitat essential feature (i.e. coral hardbottom). Mapping the location of coral hardbottom both within the geographic boundaries of *Acropora* critical habitat and within the range of ESA-listed corals is required but indicate the area of coral hardbottom that is within *Acropora* critical habitat.
- Dimensions of the colony (length, width, and height, or longest dimension length [units = cm]), percent live tissue, and recent partial mortality.
- Water depth and general description of the vertical relief (high, medium, low) of the coral hardbottom feature where the colony is found.
- A thorough description of methods and techniques used in field investigations and data acquisition, as well as processing and data analysis, and findings of the survey.
- Photographs of all observed ESA-listed corals

Report Submittal. All data (*in-situ* transect coordinates, photo and video files, scanned data sheets, and Excel spreadsheets with raw data) will be available no later than 7 calendar days after all field data collection is complete. Information shall be presented in text, tabular, and graphic forms, whichever is most appropriate, effective, and advantageous to concisely communicate relevant information. All figures and tables shall have a number, title, appropriate explanatory notes, and a source note. In addition, all figures shall include appropriate reference points to help identify the location. All photographic still images and/or field notes collected during field activities shall be included in the report as an Appendix. The raw data submittal should also include a narrative summarizing the findings (e.g. dates and weather conditions during survey, absence/presence of coral hardbottom, absence/presence of ESA-listed corals, and any other significant/noteworthy observations). The draft survey report and map showing coral hardbottom and ESA-listed corals (if present) shall be provided to the Government no later than 15 days after all field data collection is complete. The final report shall be submitted within 10 calendar days of receipt of all Government comments. The Government shall review both draft and final versions of the document for accuracy of information and shall provide comments to the Contractor within 5 business days of receipt of the document. The Contractor shall address comments provided by the Government within 5 business days of receipt.

Task 4: ESA-Listed Coral Relocation/Collection Proposal

ESA-Listed Coral Relocation/Collection Proposal

The Contractor shall compile a spreadsheet list ("Proposed Coral Relocation/Collection List") and a georeferenced map (ArcGIS files) of ESA-listed corals proposed for relocation/collection using the coral hardbottom and ESA-listed corals survey information provided by the Government. The list will include ESA-listed corals which are located in the following ranges:

- All ESA-listed corals located within 200 ft of the ETOF

The Proposed Coral Relocation/Collection List will include the following information for each coral:

- Species
- Dimensions of the colony (length, width, and height, or longest dimension length [units = cm]), percent live tissue, and recent partial mortality
- Location of the coral in latitude and longitude using decimal degrees (i.e., xx.xxxxºN, –xx.xxxxºW)
- Notes describing any signs of active disease, bleaching, or other signs of stress
- Any other significant/noteworthy observations
- Proposed relocation site (including approximate location in latitude and longitude using decimal degrees (i.e., xx.xxxxºN, –xx.xxxxºW)), name of the coral rescue nursery, or acknowledgement that the coral should not be relocated due to active signs of disease or stress
- Location of colony from ETOF (distance in feet)

Relocation/Collection Sites: The Contractor shall first coordinate proposed collection of ESA-listed corals with coral rescue nursery(s). If more than the anticipated 30 ESA-listed corals are collected, coral nursery holding tanks are permitted to be used according to BMPs for no more than 2 weeks. If the coral rescue nursery(s) refuse collection of any of the proposed ESA-listed corals, the Contractor shall propose an appropriate relocation site for the remaining ESA-corals. The Contractor will provide the Government with a list of the coral rescue nursery(s) (e.g. nursery name, address, website, and phone number) that were coordinated with. The Contractor will propose a relocation site that is suitable habitat as described by 2020 SARBO Appendix C Section 5.2 "Relocation site selection" (see Attachment 3).

Colony Condition Precluding Relocation/Collection: No colony shall be collected or relocated if there are signs of active disease. No collection or relocation shall occur if there are signs of bleaching or other signs of stress.

Determination of Corals to be Relocated/Collected:
The Contractor shall provide the Proposed Coral Relocation/Collection List, georeferenced map of ESA-listed corals proposed for relocation/collection, and the list of coral rescue nursery(s) that the Contractor coordinated with to the Government for review. The Government will provide the Contractor with final approval of the ESA-listed corals to be collected/relocated within 10 calendar days of the Contractor's submittal.

Task 5: ESA-Listed Coral Relocation/Collection Field Activities
Divers will conduct ESA-listed coral collections/relocations within designated areas of Broward County Segment 3 (from Port Everglades south jetty to approximately R-92 and approximately R-98.3 to R-128) based on approval from the Government and according to the 2020 SARBO Appendix C Section 5 "Coral Relocation Protocol for ESA-Listed Corals" (see Attachment 3). This protocol provides specific information on qualified persons (section 5.1), relocation site selection (section 5.2), relocation techniques (section 5.3), and monitoring of transplanted corals (5.4). If this guidance is updated, the new NMFS survey protocol will be followed. If more than the anticipated 30 ESA-listed corals are collected, coral nursery holding tanks are permitted to be used according to BMPs for no more than 2 weeks.

Dive Safety Plan:
The Contractor shall prepare a Dive Safety Plan and submit for Government approval **no later than 7 calendar days** post award of the contract, and prior to commencement of the first dive.

(1) The Contractor's diving operations shall comply with all the requirements of Section 30 of the U.S. Army Corps of Engineers' "Safety and Health Requirements Manual," EM 385-1-1 (30 November 2014) and paragraphs 3 and 11 of Appendix P, "Contract Diving Operations" of Jacksonville District Regulation CESAJR 385-1-1, dated 1 September 1998. A diving operations plan and the other submittal items specified below must be reviewed and accepted by the District Diving Coordinator and the Safety Office prior to the commencement of any diving operations.

(2) The appropriate number of personnel shall be furnished for each dive, as required by paragraph 7, Dive Teams, of Appendix P to CESAJR 385-1-1.

(3) All diving shall be performed and conducted in accordance with the requirements of the following documents:

(a) U.S. Army Corps of Engineers, Safety and Health Requirements Manual, EM 385-1-1, Section 30.

(b) U.S. Army Corps of Engineers, Jacksonville District Regulation CESAJR 385-1-1, Appendix P "Contract Diving Operations."

(c) U.S. Navy Diving Manual, Volumes I and II (NAVSEA 0994-LP-001-9010 and NAVSEA 0994-LP-001-9020).

(d) 29 CFR, Part 1910, Subpart T, OSHA Regulations.

(4) The Contractor shall submit the following items after award of the contract, with sufficient time allowed for review by the District Diving Coordinator, prior to performing the first dive:

(a) A safe diving practices manual as specified in paragraph 30.A.11 of EM 385-1-1.

(b) Dive Operations Plan to include all the items specified in paragraph 30.A.13 of EM 385-1-1. This plan shall contain information specific to the diving operations to be performed on each dive. A Dive Log shall be maintained for each dive undertaken to include name of diver, name of dive team members, diving mode, surface and underwater conditions, water depth and bottom time, and nature and description of work performed. A generalized, philosophical discussion of diving, or an enumeration of diving-related theory shall NOT be accepted for the Dive Operations Plan.

(c) Activity Hazard Analysis, pursuant to Appendix P, paragraph 3.c. shall be submitted. This must address specific hazards anticipated for each diving operation to be performed and must specifically address other work of any kind being performed concurrently that interface with or affect the diving operations. Applicable lock out, tag out, and safe clearance procedures must also be included in the Analysis.

(d) Up-to-date resume denoting diving-related training and experience for each diver.

(e) Medical certification from a physician as to each diver's fitness/suitability for diving, as required by paragraph 30.A.12 of EM 385-1-1. This certification must be from a licensed physician within the 12 months immediately preceding any dive performed under the contract and must be renewed at 12-month intervals.

(f) Proof of current CPR and First-Aid training for each member of the dive team, as required by paragraph 30.A.08 of EM 385-1-1.

(g) Copies of certifications and/or documentation to demonstrate that any pressurized air tanks (SCUBA, Surface supplied air systems, "bail-out bottles", etc.) to be used by the divers have been visually inspected at 12-month intervals and hydrostatically tested at 5-year (60-month) intervals, as required by paragraph 30.B.03.f. (3) of EM 385-1-1. Breathing air supply hoses, helmets, and masks shall be visually inspected and meet specifications contained in paragraphs 30.E.06 and 30.E.07.

(h) Copies of certifications and/or documentation to demonstrate that the compressor(s) used to provide breathing air for the divers have been tested at six-month intervals and meet the air purity requirements specified in paragraph 30.E.05 of EM 385-1-1.

(i) Identification of emergency and first aid equipment (first aid kit, oxygen resuscitation system, backboard) to be available at the dive location during any diving operations, pursuant to paragraph 30.E.11 of EM 385-1-1.

(j) Emergency Management Plan, pursuant to paragraph 30.A.13.a. (8). This must address emergency procedures, to include a means of notification, telephone numbers (for law enforcement, ambulance,

hospital, doctors, and recompression chamber), nearest U.S. Coast Guard (USCG) emergency assistance and rescue center, and location of evacuation routes.

Diver training and QA/QC procedures:
Prior to initiating fieldwork, the entire dive survey team (boat operators, divers, data transcribers, and QA/QC reviewers) will hold a training session to discuss the proper completion of survey protocols, field data sheets, and proper species identification. An appropriate QA/QC protocol should include the following:

1. Test dive of a complete transect. If more than one dive team is employed, then the test dive should be replicated by each diver pair. If a single dive team is employed, then the test dive should be repeated with the divers swapping duties.
2. Results of repeated test transects should not vary by more than 10%.
3. Training should be documented, and all divers should sign the training record.
4. All field data sheets should be signed by the divers and a separate QA/QC reviewer.

The QA/QC reviewer should be a separate qualified biologist who is responsible for verifying survey results and ensuring proper implementation of the survey protocols.

Task 6: Monitoring of Transplanted ESA-Listed Corals
Monitoring shall not be conducted for ESA-listed corals that are collected for coral rescue nursery(s).

Monitoring shall be conducted for ESA-listed corals that are relocated. Monitoring shall be conducted at 1 week, 1 month, 3 months, 6 months, and 12 months post-relocation.

Monitoring of relocated corals shall be conducted according to the 2020 SARBO Appendix C Section 5 "Coral Relocation Protocol for ESA-Listed Corals" (see Attachment 3). This protocol provides specific information on qualified persons (section 5.1) and monitoring of transplanted corals (5.4). If this guidance is updated, the new NMFS survey protocol will be followed.

Task 7: ESA-Listed Coral Relocation and Monitoring Data Analysis and Reporting
Initial Relocation/Collection Summary Report. A draft and final report describing the relocation/collection field work will be submitted. All raw data (e.g. GPS-coordinates, photo and video files, scanned data sheets, and Excel spreadsheets with raw data, etc.) shall be available no later than 7 calendar days after all field data collection is complete. The report will include:

- A thorough description of the methods and techniques used in the field.
- A description of the number of corals successfully collected for coral rescue nursery(s), number of corals successfully transplanted to the relocation site, and any unsuccessful collections/relocations with an explanation of contributing factors.
- Any other significant/noteworthy observations.

Baseline Observations at the Transplant Location Report.
If relocation of ESA-listed corals is conducted, a draft and final report for the baseline observations at the transplant location shall be submitted. All raw data (e.g. GPS-coordinates, photo and video files, scanned data sheets, and Excel spreadsheets with raw data, etc.) shall be available no later than 7 calendar days after all field data collection is complete. This report is described in the 2020 SARBO Appendix C Section 5.4 "Monitoring of Transplanted Corals". The report will include:

- Record the species and the number on the plastic identification tag adjacent to each transplanted colony.
- Record the widest length, width, and height of the coral, percent live tissue, and site depth at mean high water of each colony at both the original location and the transplant location.
- Record the GPS location (in decimal degrees) or the compass bearing and distance (in feet) from a known fixed point, and photograph each transplanted coral with a scale in the photo.
- A thorough description of methods and techniques used in field investigations and data acquisition, as well as processing and data analysis.

Post-Transplant Success and Survival Reports.

If relocation of ESA-listed corals is conducted, draft and final reports shall be submitted for each monitoring event required by the post-transplant success and survival monitoring. All raw data (e.g. GPS-coordinates, photo and video files, scanned data sheets, and Excel spreadsheets with raw data, etc.) shall be available no later than 7 calendar days after all field data collection is complete. These reports are described in the 2020 SARBO Appendix C Section 5.4 "Monitoring of Transplanted Corals" and will include:

- 1 week monitoring checks for attachment success; immediately reattach any corals that are not firmly attached to the hardbottom; percent mortality (report in 10% increments) for each of the monitored transplanted corals.
- 1 and 3-month monitoring records sediment cover on the colonies (sediment dusting, sediment accumulation, partial burial, burial of the base, burial, or sediment halo if present) and colony condition (bleaching, % live tissue, and presence of disease, fouling, or predation).
- 6 and 12-month monitoring records colony size, percent live tissue, sediment cover on the colonies, and colony condition.
- All reports will include a table with the percent mortality (reported in 10% increments) for each of the monitored transplanted corals.
- All reports will include a thorough description of methods and techniques used in field investigations and data acquisition, as well as processing and data analysis.
- All reports will address success of transplanting corals. The success of transplanting corals is met if 85% of all of the ESA-listed corals/coral colonies that are transplanted survive the transplant procedure. Survival of each coral transplanted is measured by determining if the individual has less than 25% partial mortality of the live tissue. The 1-year survival rate may consider the health of existing corals in the surrounding area, meaning that the survival rate may be adjusted if all corals in the area are affected by an external factor such as coral bleaching or disease.

Report Submittals. All data (e.g. GPS-coordinates, photo and video files, scanned data sheets, and Excel spreadsheets with raw data, etc.) shall be available no later than 7-calendar days after all field data collection is complete. Information shall be presented in text, tabular, and graphic forms, whichever is most appropriate, effective, and advantageous to concisely communicate relevant information. All figures and tables shall have a number, title, appropriate explanatory notes, and a source note. In addition, all figures shall include appropriate reference points to help identify the location. All photographic still images and/or field notes collected during field activities shall be included in the report as an Appendix.

If applicable, the draft report and map showing the location of the transplanted ESA-listed corals shall be provided to the Government no later than 15 days after all field data collection is complete. The final report shall be submitted within 10 calendar days of receipt of all Government comments. The Government shall review both draft and final versions of the document for accuracy of information and shall provide comments to the Contractor within 5 business days of receipt of the document. The Contractor shall address comments provided by the Government within 5 business days of receipt.

The Contractor shall provide to the Government one (1) electronic copy and 3 bound hard copies of both the draft and final reports. Each hard copy of the report shall also include a CD with all data and text of the report in electronic format, including, but not limited to, the following: photographs, sub-surface graphic representation, and/or GIS mapping. All documents provided from the Contractor shall be in MS Word, MS Excel, and Adobe Acrobat format. All final Adobe Acrobat documents shall be Section 508 Compliant. All graphics shall be saved as .jpeg or comparable files. All GIS files shall be in ArcView (shapefile) or comparable format.

All documents provided from the contactor shall be submitted to:

Broward County Segment III Coral Relocation/Collection Protocol
POC: Nolan Lacy
USACE-PD-EQ
701 San Marco Blvd
Jacksonville, FL 32207
nolan.m.lacy@usace.army.mil

11. REGULATIONS AND PUBLICATIONS

The Contractor must abide by all applicable regulations, publications, manuals, and local policies and procedures. *(For example, insert AR 25-2, AR 530-1.)*

Technical Publications: All work performed under this contract shall be in accordance with the following publications, and contractor's personnel shall be familiar with and comply with same. Publications may be found at http://140.194.76.129/publications/.

- Corps of Engineers Manual EM 385-1-1 - Safety and Health Requirements Manual.
- Corps of Engineers, Labor Relations Manual ER 1180-1-8.
- Quality Assurance Representatives Guide EP 415-1-261, Volumes 1 through 4.
- Department of the Army, Engineering Regulation ER 1180-1-6, 30 September 1995 - Construction Quality Management.
- SAD QA Manual

12. CONTRACTOR MANPOWER AND REPORTING

Accounting for Contract Services (FEB2007)

The Office of the Assistant Secretary of the Army (Manpower & Reserve Affairs) operates and maintains a secure Army data collection site where the contractor will report ALL contractor manpower (including subcontractor manpower) required for performance of this contract. The contractor is required to completely fill in all the information in the format using the following web address: https://contractormanpower.army.pentagon.mil. The required information includes: (1) Contracting Office, Contracting Officer, Contracting Officer's Technical Representative; (2) Contract number, including task and delivery order number; (3) Beginning and ending dates covered by reporting period; (4) Contractor name, address, phone number, e-mail address, identity of contractor employee entering data; (5) Estimated direct labor hours (including subcontractors); (6) Estimated direct labor dollars paid this reporting period (including subcontractors); (7) Total payments (including subcontractors); (8) Predominant Federal Service Code (FSC) reflecting services provided by contractor (and separate predominant FSC for each subcontractor if different); (9) Estimated data collection cost; (10) Organizational title associated with the Unit Identification Code (UIC) for the Army Requiring Activity (the Army Requiring Activity is responsible for providing the contractor with its UIC for the purposes of reporting this information; (11) Locations where contractor and subcontractors perform the work (specified by zip code in the United States and nearest city, country, when in an overseas location, using standardized nomenclature provided on website); (12) Presence of deployment or contingency contract language; and (13) Number of contractor and subcontractor employees deployed in theater this reporting period (by country). As part of its submission, the contractor will also provide the estimated total cost (if any) incurred to comply with this reporting requirement. Reporting period will be the period of performance not to exceed 12 months ending September 30 of each government fiscal year and must be reported by 31 October of each calendar year. Contractors may use a direct XML data transfer to the database server or fill in the fields on the website. The XML direct transfer is a format for transferring files from a contractor's systems to the secure website without the need for separate data entries for each required data element at the website. The specific formats for the XML direct transfer may be downloaded from the website.

13. EXHIBITS AND ATTACHMENTS

13.1 Exhibit A – Performance Requirements Summary

13.2 Exhibit B – Deliverables

EXHIBIT A

Performance Requirements Summary

Performance Objective (The Service required—usually a shall statement)	**Standard**	**Performance Threshold** (This is the maximum error rate. It could possibly be "Zero deviation from standard")	**Method of Surveillance**
PRS # 1. The contractor shall provide environmental investigations.	The contractor shall follow approved work plans associated with individual calls.	Any deviation shall be preapproved by the contracting officer in writing. No more than one customer complaint per quarter.	100 % reporting
PRS # 2. The contractor shall provide environmental compliance services.	The contractor shall follow approved work plans associated with individual calls.	Any deviation shall be preapproved by the contracting officer in writing. No more than one customer complaint per quarter.	100 % reporting

EXHIBIT B

Deliverable Schedule

Deliverable	Frequency	# of Copies	Medium/Format	Submit To
Kick Off Meeting Minutes	Once (1) No later than 3 calendar days following the kick-off meeting. The kick-off call shall be held within 5 calendar days following award of the contract.	One (1) digital copy	All documents provided from the contractor shall be in MS Word or MS Excel and Adobe Acrobat format. All graphics shall be saved as jpeg or comparable files. All GIS files shall be in ArcView (shapefile) or comparable format.	COR Nolan Lacy, PD-EQ Jacksonville District, U.S. Army Corps of Engineers 701 San Marco Blvd Jacksonville, FL 32207 Nolan.M.Lacy@usace.army.mil
Dive Safety Plan	Once (1) No later than 7 calendar days after contract award	One (1) digital copy and one (1) hard copy	[Same as above]	[Same as above]
All raw data (in-situ transect coordinates, photo and video files, scanned field data sheets, and Excel spreadsheets with raw data)	Once (1) No later than 7 calendar days after field data collection is complete	One (1) digital copy and on (1) hard copy on CDs	Raw data shall be provided in Geo-referenced Microsoft Excel or delineated text file. All documents shall be in MS Word and Adobe Acrobat format and Section 508 Compliant. All graphics shall be saved as jpeg or comparable files. All GIS files shall be in ArcView (shapefile) or comparable format.	[Same as above]
Proposed Coral Relocation/Collection List	Once (1) No later than 45 days after completion of coral hardbottom survey	One (1) digital copy	[Same as above]	[Same as above]
Draft Initial Relocation/Collection Summary Report	Once (1) No later than 15 calendar days after field data collection is complete	[Same as above]	[Same as above]	[Same as above]
Final Initial Relocation/Collection Summary Report	Once (1) No later than 10 calendar days after receipt of all draft	[Same as above]	[Same as above]	[Same as above]

Deliverable	Frequency	# of Copies	Medium/Format	Submit To
	report comments.			
Draft report for the Baseline Observation at the Transplant Site Report (if coral relocation is conducted)	Once (1) No later than 15 calendar days after field data collection is complete	One (1) digital copy, plus three (3) hard copies with three (3) CDs (one with each hard copy)	[Same as above]	[Same as above]
Final report for the Baseline Observation at the Transplant Site Report (if coral relocation is conducted)	Once (1) No later than 10 calendar days after receipt of all draft report comments.	[Same as above]	[Same as above]	[Same as above]
Draft reports for the Post-Transplant Success and Survival Reports (for each of the 5 monitoring events, if coral relocation is conducted)	Once (1) No later than 15 calendar days after field data collection is complete	[Same as above]	[Same as above]	[Same as above]
Final reports for the Post-Transplant Success and Survival Reports (for each of the 5 monitoring events, if coral relocation is conducted)	Once (1) No later than 10 calendar days after receipt of all draft report comments.	[Same as above]	[Same as above]	[Same as above]

Attachment 1: Survey Area Description

The Contractor will conduct surveys to locate, record, and collect/relocate Endangered Species Act (ESA) listed corals at the Hollywood, Hallandale, Dania Beach (HHD) portion (R-98.3 to R-128) of Segment 3 of the Broward County Shore Protection Project (see Figure 1).

The ESA-listed coral surveys will only occur in the same 10,000 sq m survey sites where ESA-listed corals were previously identified and reported in the March 2020 Summary Report (total of 10 sites). See Table 1 for information on the sites. Surveys will be conducted as described in the Performance Work Statement (PWS) but the extent of the survey will be limited to starting at the ETOF within the site and extending seaward 200 ft (not 500 ft). ESA-listed coral surveys and associated collection/relocation work can occur concurrently. All ESA-listed corals identified during the survey will need to be collected/relocated as described below and in the PWS.

The following collection/relocation methods will be used and are similar to the methods utilized at Segment 2: The Contractor will utilize Hypack navigation software with a sub-meter differential GPS unit to deploy a weighted line (leadline) along the path of the 200-ft ETOF boundary within each identified site. This leadline provides a visual reference on the substrate for the divers to remain within 200-ft of the ETOF. Qualified divers will swim all of the hardbottom to the west of the leadline and collect any *A. cervicornis* or *O. faveolata* colonies that occur within the delineated area. For every colony that is observed and/or collected; species, colony ID number, the maximum dimension (cm), percent live tissue, and any other relevant observations will be recorded. The GPS locations of each colony will be recorded prior to collection/relocation. At least one photograph will be taken of each colony before removal. All collection efforts will adhere to the standards set forth by the 2020 South Atlantic Regional Biological Opinion for Dredging and Material Placement Activities in the Southeast United States (SARBO)[1] and the FWC special activities license (SAL) that the collections will be permitted under. If colonies need to be fragmented or fragmentation occurs during the collection process the total number of fragments that result from each colony's collection will be recorded as well. Any colonies exhibiting disease or excessive stress will not be relocated.

[1] The 2020 SARBO is available for download on NMFS' website: https://www.fisheries.noaa.gov/content/endangered-species-act-section-7-biological-opinions-southeast (Scroll to the heading "U.S. Army Corps of Engineers" and click the document link.)

Figure 1. Map showing the Hollywood, Hallandale, Dania Beach (HHD) portion (R-98.3 to R-128) of Segment 3 of the Broward County Shore Protection Project.

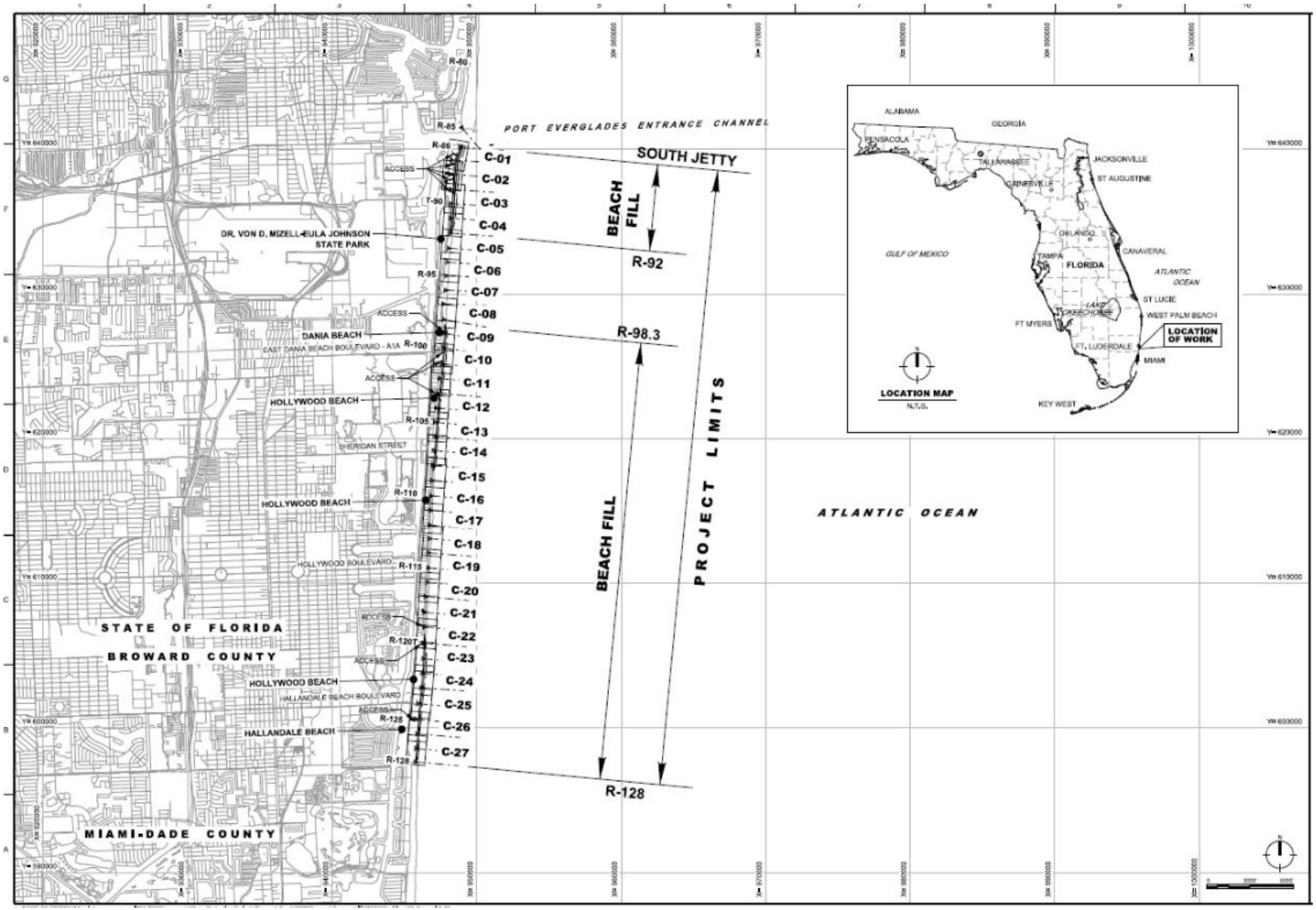


Table 1. Survey sites where ESA-listed corals were located in Broward Segment 3 (HHD) within 200' of the ETOF.

Distance to ETOF	Site	Latitude	Longitude	Species	< 5 cm	5 cm - 10 cm	11 cm - 25 cm	26 cm - 50 cm	>50 cm	Total # of Colonies
<100 ft	258	26.05264	-80.110014	*Orbicella faveolata*				1		**1**
100 ft -200 ft	72	25.9843	-80.11504	*Orbicella faveolata*		1				**1**
	92	25.99235	-80.114381	*Acropora cervicornis*			1			**1**
	94	25.99315	-80.114298	*Acropora cervicornis*		1	1			**2**
	96	25.99396	-80.114139	*Acropora cervicornis*			1			**1**
	98	25.99476	-80.113875	*Acropora cervicornis*		1	3	1		**5**
				Orbicella faveolata					1	**1**
	104	25.99717	-80.114034	*Acropora cervicornis*			7	3		**10**
				Orbicella faveolata					1	**1**
	218	26.03657	-80.111399	*Orbicella faveolata*				1		**1**
	228	26.04058	-80.110893	*Orbicella faveolata*					1	**1**
	104	25.99717	-80.114034	*Acropora cervicornis*		1				1
***Relocation of Acropora cervicornis* Total**					**0**	**3**	**13**	**4**	**0**	**20**
***Relocation of Orbicella faveolata* Total**					**0**	**1**	**0**	**2**	**3**	**6**

ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol

Updated July 2019

Objective

To outline recommended survey methods for determining the distribution and abundance of coral species listed under the Endangered Species Act (ESA) and the amount of Acropora critical habitat at sites under ESA Section 7 consultation. The methods should be applicable to a broad range of project scales. ESA-listed coral species include *Acropora cervicornis* (staghorn coral), *Acropora palmata* (elkhorn coral), *Orbicella annularis* (lobed star coral), *Orbicella faveolata* (mountainous star coral), *Orbicella franksi* (boulder star coral), *Dendrogyra cylindrus* (pillar coral), and *Mycetophyllia ferox* (rough cactus coral).

Problem

Two aspects make quantitative sampling for coral species difficult:
Patchy and clumped distribution, with colonies as small as 0.01 m2, which may be clumped together within a sub-area of the project area; and

1. Stratified distribution, with occurrence perhaps limited to a particular depth gradient or substrate type within a project area.
2. Additionally, hard bottom habitat can be interspersed with sand patches, making it difficult to accurately determine the amount of Acropora critical habitat present in a project area.

Recommended Methods for Critical Habitat Delineation

Surveying to identify the presence of coral hard bottom is important both for delineating the Acropora critical habitat essential feature and as a simplified way to identify areas where ESA-listed coral species may occur. The staghorn and elkhorn coral critical habitat essential feature is substrate of suitable quality and availability (i.e., consolidated hard bottom or dead coral skeletons free from fleshy macroalgae or turf algae and sediment cover); such substrate supports successful larval settlement, recruitment, and reattachment and recruitment of asexual fragments. If available, recent benthic habitat maps (as approved by NMFS) can be used to identify hard bottom areas and to estimate the amount of critical habitat present in the project area. If recent habitat maps are not available, high-resolution geophysical surveys will likely be necessary. Diver conducted surveys can be used to help ground-truth the presence and distribution of hard bottom habitat. Diver surveys can be conducted in conjunction with the surveys for species distribution as described below.

Recommended Methods for Species Distribution:

The most appropriate approach depends on scale, and the amount of expected error depends on the approach. Unless a complete survey of the entire area is done, the estimated distribution and

abundance of these species may be significantly in error. With the exception of very small project areas, efficient field sampling may require sampling in two stages. A preliminary visual reconnaissance of the site should be conducted to locate any visible occurrences of ESA-listed coral species regardless of size. Following the preliminary reconnaissance, a more comprehensive sampling should be initiated. All surveys should be completed by divers (or snorkelers if water depths are shallow and visibility is adequate) working in teams of two. Divers should swim at a speed slow enough to detect small corals and maintain a depth of approximately 1m from the bottom.

When using the following survey methods, survey personnel should record the following:

1. Species name;
2. Single largest linear dimension of the colony or length, height, and width (units = mm);
3. Rank of percentage live tissue and recent partial mortality (i.e., 1-25%, 26-50%, 51-75%, 76-100%);
4. GPS coordinates of each colony (if possible) or GPS location of each survey site (unit = decimal degrees and state datum) along with a description of where each colony occurs (measurement along a transect or location within a quadrant); and
5. Site map with locations of each colony.

Small Project Area (< ~0.1 hectare or 0.25 acre)

Conduct a visual reconnaissance of the entire project area. Reconnaissance can be limited to areas of hard bottom. Record the required information (items 1-5 above) for all ESA-listed coral colonies encountered. The total amount of hard bottom surveyed must also be provided so that a density of corals can be calculated.

Intermediate to Large Project Area (> ~0.1 hectare or ~0.25 acre)

Data should be collected at 1 sampling site per every 10,000 m^2 within the project area. Sampling can be limited to the portion of the project site that contains hard bottom (i.e., where the species may occur). The portion that contains unconsolidated sediment can be omitted from the sampling area. At each sampling site, a 2-tiered survey will be conducted.

1. Divide the area to be surveyed into plots of 10,000 m^2 (100 m X 100 m). Swim the whole plot using a grid pattern, noting any ESA-listed coral colonies. Placing two intersecting 100 m long transects to divide the plot into 4 quadrants may be helpful for orientation within the plot. If 5 or fewer colonies of any ESA-listed species are encountered, collect the required data (items 1-5 above) on those colonies. Density will be calculated by number of colonies (by species) divided by the amount of hard bottom per 10,000 m^2 (estimated using recent habitat maps or geophysical survey as defined above). No further surveying is required at the sampling plot, so proceed to the next sampling plot. If more than 5 colonies of any ESA-listed coral species are encountered, proceed to 2nd tier (item #2 below).
2. Conduct 3 non-overlapping belt transects at 3 locations within each 100 m by 100 m plot. Each belt transect should measure 4 m X 50 m and be placed over as much hard bottom as possible. Record the required data (items 1-5 above) for all colonies encountered along the transects. Also record the habitat transitions from hard bottom to sand along the transects and calculate

the proportion of the surveyed transect that is hard bottom. This calculation is necessary to determine the density of corals. Density of corals reported as number of colonies by species per site (calculated as number of coral colonies per area of actual hard bottom surveyed in water).

Staff Qualifications

All field work and Quality Assurance/Quality Control (QA/QC) of the surveys and data collected will be completed by qualified biologists who meet at least the following minimum requirements (1) Bachelor of Science in Marine Biology, Biology with a concentration in marine sciences, Environmental Science with a minor in Biology, or similar degree; (2) At least 3 years documented experience monitoring coral hardbottom / coral reef communities in South Florida; (3) Knowledge of marine benthic ecosystems and organisms, including but not limited to identification of Caribbean coral species.

QA/QC

Prior to initiating fieldwork, the entire dive survey team (boat operators, divers, data transcribers, and QA/QC reviewers) will hold a training session to discuss the proper completion of survey protocols, field data sheets, and proper species identification. An appropriate QA/QC protocol should include the following:

1. Test dive of a complete transect. If more than 1 dive team is employed then the test dive should be replicated by each diver pair. If a single dive team is employed then the test dive should be repeated with the divers swapping duties.
2. Results of repeated test transects should not vary by more than 10%.
3. Training should be documented and all divers should sign the training record.
4. All field data sheets should be signed by the divers and a separate QA/QC reviewer.

The QA/QC reviewer should be a separate qualified biologist who is responsible for verifying survey results and ensuring proper implementation of the survey protocols.

Surveyor's name_____ Date_____ Site ID _____
Site Latitude_____ Site Longitude_____

Transect ID_____ Surveyor signature_____ QA/QC review signature_____
Start Latitude_____ Start Longitude _____
End Latitude_____ End Longitude_____

Species name	Length	Width	Height	% Live Tissue	% Recent Mortality	Latitude	Longitude	Location along Transect

Habitat Transition Line - Note habitat type and changes

0m 50m

Appendix C. 2020 SARBO Coral PDCs

The PDCs in this appendix apply to all projects that occur within the range of ESA-listed corals, as defined in in this appendix. These requirements are in addition to any other applicable PDCs outlined in in the 2020 SARBO.

Alternative review: In limited instances, a project may be authorized under the 2020 SARBO if it does not adhere to all applicable PDCs, under the Alternative Process for Project Specific Review and Inclusion of Substantially Similar Projects or Projects with Substantially Similar Effects outlined in Section 2.9.5 of the 2020 SARBO. As described in the 2020 SARBO, projects that do not strictly comply with all applicable PDCs, but are substantially similar, or projects with substantially similar effects, may be authorized under 2020 SARBO if the project undergoes separate review and approval by NMFS prior to beginning work. Projects that cannot meet all relevant PDC requirements or that do not fit under the alternative review process outlined in Section 2.9.5 of the Opinion, will require individual Section 7 consultation. In addition, any area previously authorized or permitted to be dredged or have material placed in a separate individual Section 7 consultation may be maintained to the same dredge or fill template under this Opinion if it meets all of the PDCs of this Opinion.

1 Description of the Areas Coral PDCs Apply

Coral PDC Section 1.1 provides information on Acropora critical habitat, designated to protect critical habitat for elkhorn and staghorn corals. The 5 other ESA-listed coral species (boulder star, lobed star, mountainous star, pillar, and rough cactus coral) may occur in the 2020 SARBO action area, but NMFS has not designated critical habitat for those species. Coral PDC Section 1.2 defines the geographic range of all ESA-listed corals in which adherence to the Coral PDCs is required by the 2020 SARBO.

1.1 *Acropora* Critical Habitat

According to the Final Rule designating Acropora critical habitat (73 FR 72210, Publication Date November 26, 2008), the physical feature essential to the conservation of elkhorn and staghorn corals is: substrate of suitable quality and availability to support larval settlement and recruitment, and reattachment and recruitment of asexual fragments. `Substrate of suitable quality and availability_ is defined as natural consolidated hard substrate or dead coral skeleton that is free from fleshy or turf macroalgae cover and sediment cover.

The Final Rule designated 4 specific areas of critical habitat:

1. the Florida area, which comprises approximately 1,329 square miles (3,442 km²) of marine habitat;
2. the Puerto Rico area, which comprises approximately 1,383 square miles (3,582 km²) of marine habitat;
3. the St. John/St. Thomas area, which comprises approximately 121 square miles (313 km²) of marine habitat;

4. the St. Croix area, which comprises approximately 126 square miles (326 km2) of marine habitat.

Figure 49 and Figure 50 provide images of critical habitat, and geographic information system (GIS) data layers of critical habitat maps are available for download on the NMFS website at https://sero.nmfs.noaa.gov/maps_gis_data/index.html.

Note the shoreward boundary is the 6-ft (1.8 m) contour from Boynton Inlet to Government Cut, Miami-Dade County and is mean low water line in all other areas. Assessment of project effects on critical habitat does not consider the omitted areas presented in the Final Rule designating critical habitat (73 FR 72209, Publication Date November 26, 2008), and described in Coral PDC Section 1.1.1 below.

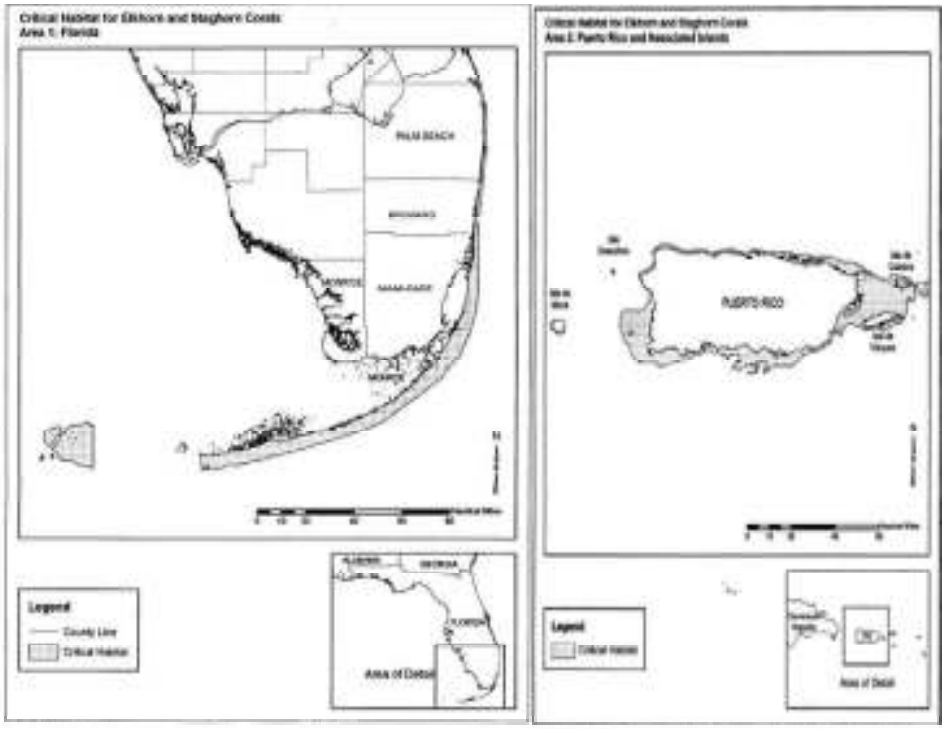


Figure 49. The left image is for Acropora critical habitat Area 1 (Florida Unit) and the right image is for Area 2 (Puerto Rico and Associated Islands).

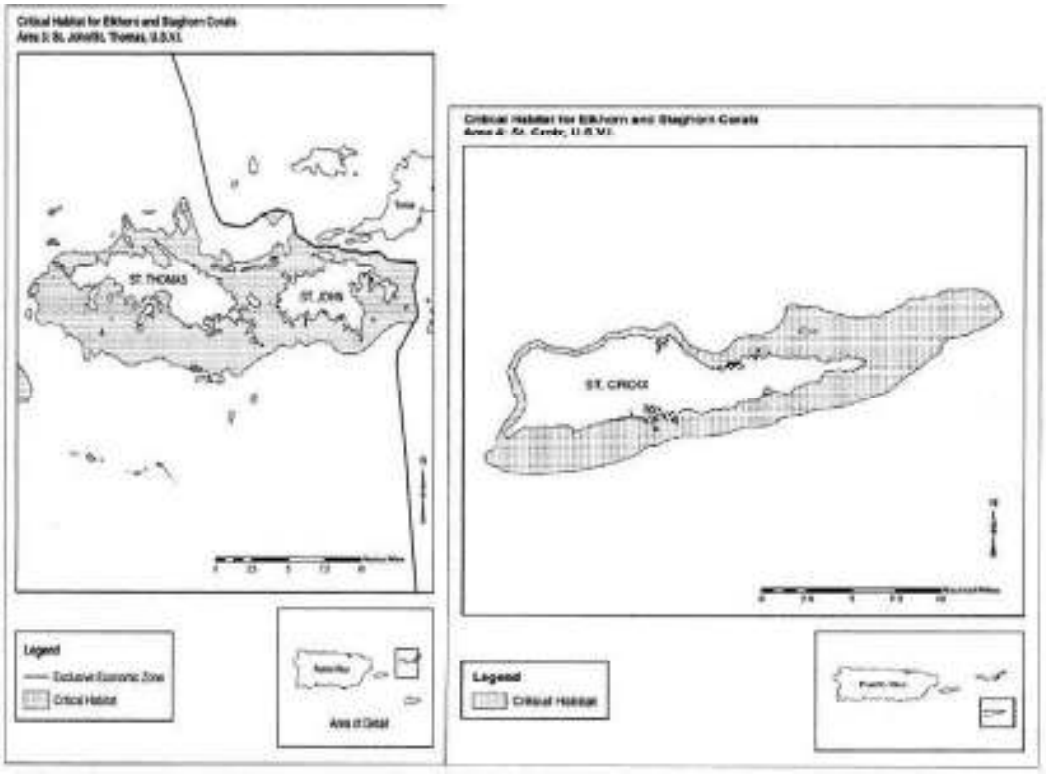


Figure 50. The left image is for Acropora critical habitat Area 3 (St. Thomas/St John, U.S. Virgin Islands Unit) and the right image is for Area 4 (St. Croix, U.S. Virgin Islands Unit).

1.1.1 Areas Omitted from Acropora Critical Habitat

As defined in the Final Rule (73 FR 72209, Publication Date November 26, 2008), Acropora critical habitat does not include the following particular areas where they overlap with the areas described above:

1. All areas subject to the 2008 Naval Air Station Key West Integrated Natural Resources Management Plan.
2. All areas containing existing (already constructed) federally authorized or permitted man-made structures such as aids-to-navigation, artificial reefs, boat ramps, docks, pilings, maintained channels, or marinas.
3. All waters identified as existing (already constructed) federally authorized channels and harbors as follows:
   (i) Palm Beach Harbor; (ii) Hillsboro Inlet; (iii) Port Everglades; (iv) Miami Harbor; (v) Key West Harbor; (vi) Arecibo Harbor; (vii) San Juan Harbor; (viii) Fajardo Harbor; (ix) Ponce Harbor; (x) Mayaguez Harbor; (xi) St. Thomas Harbor; and (xii) Christiansted Harbor.

In addition to the above, 1 military site known as the Dania Restricted Anchorage Area, comprising approximately 5.5 mi² (14.3 km²), excluded from critical habitat because of national security impacts. This excluded area is represented by the break in Acropora critical habitat that is shaded in pink in Figure 51 below.

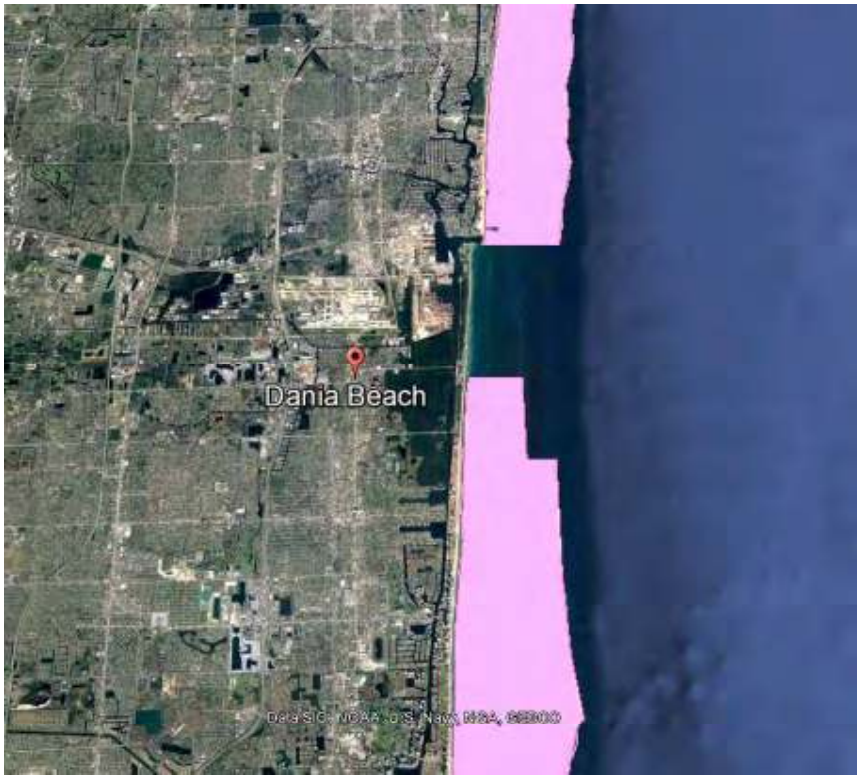


Figure 51. Acropora critical habitat exclusion in the Dania restricted anchorage area shown as the break in the Acropora critical habitat area shaded pink.
Image from ø 2018 Google, data SIO, NOAA, U.S. Navy, NGA, GEBCO.

1.2 Areas and terms defined for the 2020 SARBO

1.2.1 Definition of the range of ESA-listed corals

For the purposes of the 2020 SARBO, the range of ESA-listed corals is defined as all areas from the St. Lucie Inlet in Martin County, Florida south through the Florida Keys, Puerto Rico and the U.S. Virgin Islands from mean low water line to 262 ft (80 m) depth. While the range of ESA-listed corals includes the area designated as Acropora critical habitat, the Coral PDCs encompass a larger area in order to be protective of the entire range where ESA-listed corals may be present.

1.2.2 Coral Hardbottom

Corals may grow on any hard surface including both natural, consolidated hard substrate and man-made structures, such as seawalls, groins, jetties, bulkheads, dock pilings, and aids to navigation, within the range of corals. For the purposes of the 2020 SARBO and consistent with the Final Rule designating Acropora critical habitat (73 FR 72210, Publication Date November 26, 2008), only natural substrate is considered to contain the essential habitat feature necessary to support ESA-listed corals. Areas containing this habitat feature within the range of ESA-listed corals will be referred to as coral hardbottom throughout the rest of this document.

For purposes of the 2020 SARBO, coral hardbottom is defined in the same way as the essential feature for Acropora critical habitat: as substrate of suitable quality and availability to support

larval settlement and recruitment, and reattachment and recruitment of asexual fragments. `Substrate of suitable quality and availability_ is defined as natural consolidated hard substrate or dead coral skeleton that is free from fleshy or turf macroalgae cover and sediment cover.

For purposes of the Coral PDCs, we use the presence of coral hardbottom as a way to identify areas where ESA-listed corals may be found. This includes:

- All areas within the range of ESA-listed corals (defined in Coral PDC Section 1.2.1 which includes, but is not limited to, Acropora critical habitat) that has substrate of suitable quality and availability to support larval settlement and recruitment, and reattachment and recruitment of asexual fragments (as defined in the Acropora critical habitat rule).
- Areas excluded by the Acropora critical habitat Final Rule (Coral PDC Section 1.1.1) because they lack the essential habitat feature are also excluded as coral hardbottom habitat for purposes of this Opinion. It is important to note that ESA-listed coral colonies may be located in areas excluded from Acropora critical habitat (e.g., on man-made structures or natural consolidated substrate in excluded areas), and effects to corals in these areas will be considered in this Opinion. The Coral PDCs do not require surveying for or reporting of corals growing on surfaces other than coral hardbottom (e.g., on man-made structures).
- Areas containing the essential habitat feature that were excluded from Acropora critical habitat are not excluded as coral hardbottom habitat for the purposes of this Opinion. The Coral PDCs require surveying for or reporting of corals growing on coral hardbottom containing substrate of suitable quality and availability to support larval settlement and recruitment, and reattachment and recruitment of asexual fragments.
- For the purposes of this Opinion, coral hardbottom extends within the range of corals in Florida from the 6-ft (1.8 m) contour (waterward of the beach, shore, or inlet) to the 262-ft (80 m) contour and in the U.S. Caribbean from the mean low water line to 262-ft (80 m) contour. While Acropora critical habitat identified the depth range for Acropora corals to extend to only 30 m, other ESA-listed corals can be found up to 80 m deep.

1.3 Hardbottom survey area

The Coral PDCs require surveying to identify the presence of coral hardbottom as a protection for both Acropora critical habitat feature and as a simplified way to identify areas where ESA-listed corals may occur. The areas, distances, and survey methods required to identify coral hardbottom located near the dredge or beach nourishment projects covered under the 2020 SARBO are provided in the Coral PDCs.

Once coral hardbottom is identified based on the hardbottom surveys, additional measures may be required to complete the project including limiting certain types of equipment used, restricting the length of time construction can occur near coral hardbottom, or relocating the ESA-listed corals in the hardbottom area, as described by project type in the Coral PDCs.

2 Requirements for All Dredge and Material Placement Projects Within the Range of ESA-listed Corals

The following PDCs apply to all projects within the defined range of ESA-listed corals (Coral PDC Section 1.2.1 above). These PDCs are in addition to any other applicable PDCs provided in the 2020 SARBO.

2.1 Equipment and Surveying

The following PDCs apply to all projects within the defined range of ESA-listed corals that include channel and borrow area dredging.

CORAL.1 All vessel anchoring and spudding is limited to unconsolidated and uncolonized areas (i.e., sand areas lacking coral hardbottom and uncolonized by corals).

CORAL.2 Dredging sediment composition
Sediment type in dredge areas will be surveyed prior to dredging by employing a scientific sampling survey that provides a representative sample of the sediment from all areas of the dredge project footprint. Samples will be collected within 2 years prior to dredging of navigation channels and 5 years prior to dredging in borrow areas. Samples will be sent for a laboratory analysis of sediment grain size.

2.2 Dredging within the range of ESA-listed Corals

CORAL.3 Dredging that requires the penetration of rock or other hard substrate is not allowed.

CORAL.4 Emergency dredging of navigation channels
Maintenance channel dredging within the range of ESA-listed corals that is required after a natural disaster will be handled under the emergency consultation process[87] if the work performed is completed within 2 months of the natural disaster. Emergency consultation procedures are outlined in the NMFS website at https://www.fisheries.noaa.gov/content/emergency-consultations-southeast. If the maintenance dredging begins more than 2 months after the natural disaster, the dredging will follow the requirements of the 2020 SARBO to minimize the additional effects to ESA-listed corals and Acropora critical habitat analyzed in the 2020 SARBO.

[87] The regulations regarding ESA Section 7 consultations for emergency circumstances such as situations involving acts of God, disasters, casualties, national defense or security emergencies, etc., allow for response activities that must be taken to prevent imminent loss of human life or property (50 CFR 402.05 (a)).

CORAL.5 Maintenance dredging of navigation channels and dredging in borrow areas.

- The type of dredging allowed based on the equipment type, sediment type that will be dredged (PDC CORAL.2), dredging time limits, and proximity of work to coral hardbottom (defined in Coral PDC Section 1.2.2) is listed in Table 54.
- Any dredging within the range of corals that will dredge material over 10% fines is not covered under this Opinion, except within the semi-enclosed portions of the Port of Miami Harbor, Port Everglades, and San Juan Harbor defined below.
- The semi-enclosed portions of the Port of Miami Harbor, Port Everglades, and San Juan Harbor defined below are NOT subject to the limitations in Table 54 within the ports/harbor areas shoreward of the line formed by the Global Positioning System (GPS) points provided below. Dredging in these areas may be done by any equipment type and of material with any percent fines, in compliance with all other relevant PDCs. The USACE will minimize turbidity to the maximum extent practicable to ensure turbidity does not result in sedimentation cover of corals outside of the port or harbor.
  - Port of Miami 25.7642444éN, 80.1307306éW and 25.7623889éN, 80.1337694éW
  - Port Everglades 26.0955167éN, 80.1056694éW and 26.0925139éN, -80.1081694éW
  - San Juan Harbor 18.4508306é, 66.1289278é and 18.4588917éN, 66.1166083éW

CORAL.6 High-resolution geophysical surveys sufficient to detect and delineate any hardbottom areas will be used to fulfill hardbottom identification requirements in the Coral PDCs. These surveys will be conducted within 2 years prior to channel dredging or beach nourishment projects and within 5 years prior to borrow site dredging. Geophysical surveys must follow the G&G PDCs in Appendix G, and geotechnical surveys, if used to collect sediment samples, are not allowed to penetrate coral hardbottom.

CORAL.7 All equipment with overflow

- Equipment with overflow will be positioned as far from hardbottom as possible and preference will be given to placing overflow equipment in areas where the tides and currents move turbidity away from hardbottom.
- To the extent possible, vessels will be operated in a way to minimize the turbidity plume from overflow through all available methods. These methods may include minimizing air bubbles through adjustment of the `green valve_ in hopper dredges, limiting overflow to times when the vessel and currents are moving in the same direction, limiting overflow by not requiring complete filling of the vessel holding area, or other new methods or technologies developed to minimize turbidity.
- Specific requirements for overflow and turbidity are specified by activity in C-BEACH and C-PIPE.

Table 54. Channel and Borrow Area Dredging Scenarios Covered under the 2020 SARBO within the Range of ESA-Listed Corals.
Authorization is based on the distance between the dredging activity and adjacent hardbottom relative to percent fines.

	Presence of Hardbottom	No Hardbottom 0-1000 ft				Hardbottom • 0-500 ft from Channels • 0-400 ft from Borrow Areas				Hardbottom • 500-1000 ft from Channels • 400-1000 ft from Borrow Areas No Hardbottom • 0-500 ft from Channels • 0-400 ft from Borrow Areas			
Dredge Type	Percent Fines	0-5%	Time Limit	5-10%	Time Limit	0-5%	Time Limit	5-10%	Time Limit	0-5%	Time Limit	5-10%	Time Limit
Mechanical		•	None	•	None	X	NA	X	NA	X	NA	X	NA
Cutterhead		•	None	•	None	•	< 18 days	•	< 18 days	•	None	•	< 18 days
Hopper w/ no overflow		•	None	•	None	•	< 18 days	X	NA	•	< 18 days	•	< 18 days
Hopper w/ overflow		•	None	•	None	X	NA	X	NA	•	< 18 days	X	NA
Bed Leveling		•	None	•	None	•	< 18 days	X	NA	•	< 18 days	•	< 18 days
Water Injection		X	NA	X	NA	X	NA	X	NA	X	NA	X	NA
Support vessel w/ overflow		•	None	•	None	X	NA	X	NA	X	NA	X	NA

• = Dredge type allowed
X = Dredge Type Not Allowed
NA = Time limit not applicable

2.3 Beach Nourishment

The following PDCs apply to all projects within the range of ESA-listed corals that include beach nourishment. These PDCs assume that the material to be placed on the beach is less than 10% fines.[88] Placement activities covered under SARBO within the range of ESA-listed corals is limited to beach nourishment (e.g., nearshore placement, side-cast dredging, and ODMDS placement are not covered).

C-BEACH.1 Sand placement for beach nourishment projects will be limited to the previously authorized/permitted and constructed beach fill template (defined as the area where sand is placed between the existing mean high water line waterward to the previously approved and constructed ETOF, as shown in Figure 52. Beach fill templates are provided in SARBA Appendix B for previously authorized projects constructed by the USACE Civil Works. Other beach nourishment evaluated and constructed under an individual Section 7 consultation can also be nourished under this Opinion to the previously permitted and constructed beach template.

- If the entire limits of the previously authorized/permitted beach fill template has not been constructed, this Opinion does not cover projects that place sand on coral hardbottom in areas not previously constructed.
- If coral hardbottom occurs within the previously authorized/permitted and constructed beach fill template (i.e., areas where sand has been previously placed/constructed), hardbottom in this area is not considered as functioning Acropora critical habitat or `coral hardbottom_ as defined in Coral PDCs Section 1.2 for projects outside of the range of Acropora critical habitat within the range of ESA-listed corals. Beach sand placement on coral hardbottom in this area is covered under the 2020 SARBO.
- New beach nourishment projects (those not described in the SARBA Appendix B or those without an individual Section 7 consultation that analyzed the effects to ESA-listed corals and Acropora critical habitat features) within the defined range of ESA-listed corals are not covered under this Opinion.

- Beach nourishment projects in the U.S. Caribbean are not covered under the 2020 SARBO.

[88] Note that this also meets the state of Florida˜s definition of beach quality sand under Florida Administrative Code Chapter 62B-41.007(2)(j) and Chapter 62B-41.007(2)(k), which provide limitations of the percent fines placed based on the location the material is acquired.

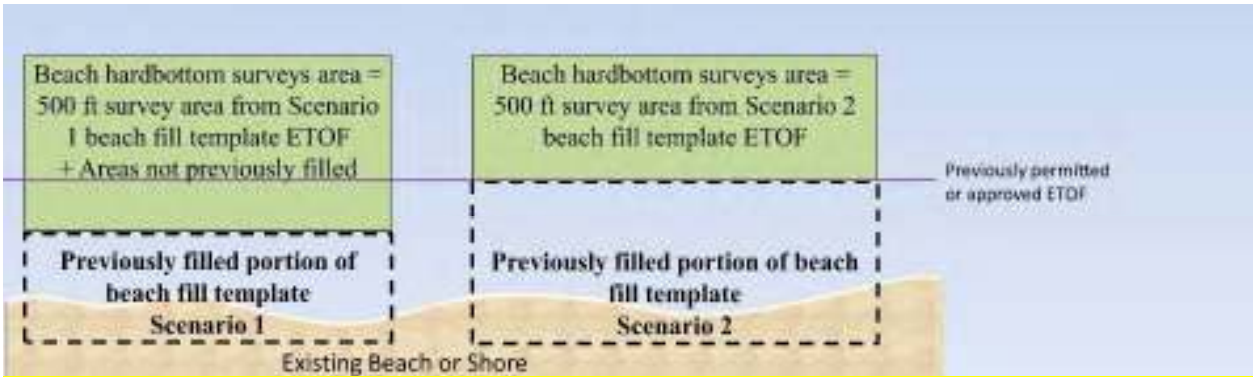


Figure 52. Illustration showing the areas described in the beach nourishment PDCs (Green box represents survey area and dotted line box represents area previously nourished)

C-BEACH.2 Hardbottom surveys will be completed within 2 years prior to beach sand placement for beach nourishment projects within the range of ESA-listed corals (range defined in Coral PDC Section 1.2.1). The surveys areas (referred to as the beach hardbottom survey area) are depicted in using 2 scenarios to describe the survey area.

- If the initial hardbottom survey was conducted using a geophysical survey, the areas identified as hardbottom will be verified using diver surveys, as described in CORAL PDC Section 3. Geophysical surveys must follow the G&G PDCs in Appendix G.
- Beach hardbottom survey area (shown in green in above) will be completed to identify and map the location of any hardbottom located 500 ft waterward of the beach fill template ETOF.
- If the beach fill template includes areas previously permitted/ authorized areas that were NOT previously filled (shown as beach fill template scenario 1 in Figure 52), hardbottom surveys will also be completed in that area of the fill template not previously filled. Areas previously permitted/authorized and previously filled do not require hardbottom surveys within the fill template (scenario 2). Placement of sand on hardbottom and coral within the previously filled beach template is covered under this Opinion.
- If coral hardbottom is NOT identified within the beach hardbottom survey area, then placement of beach quality sand can proceed without additional surveys or monitoring.
- If coral hardbottom IS identified within the beach hardbottom survey area, then all coral hardbottom and ESA-listed corals will be mapped and recorded, as described in CORAL PDC Section 3, and the USACE will contact NMFS for a project-specific review to determine whether coral relocation is appropriate based on anticipated impacts to the identified corals according to the specific site condition through the process outlined in the 2020 SARBO Section 2.9. Conditions that may be considered when evaluating if corals need to be relocated include the composition of sand that

will be placed, hydrographic conditions, proximity to coral, and past experience with similar projects in the area.

C-BEACH.4 Beach nourishment projects will minimize turbidity to ensure that sedimentation does not result in burial of coral or hardbottom outside of the ETOF. Turbidity may be minimized using methods such as the construction of a shore parallel dike in beach areas where sand is hydraulically pumped onto the beach to allow settling of sand prior to discharge of the return water back into the ocean.

C-BEACH.5 If surveys and reports are required by Florida Department of Environmental Protection for beach nourishment projects, all reports provided to Florida Department of Environmental Protection as part of biological monitoring plans will be submitted to NMFS. If the surveys indicate damage or sediment burial of ESA-listed corals or coral hardbottom outside of the ETOF, then NMFS will use the available information provided in the reports to calculate any estimated impact to Acropora critical habitat essential features and/or take of ESA-listed corals to determine if the effects exceed the effects analyzed in the 2020 SARBO.

2.4 Pipelines Requirements

The following PDCs apply to all projects within the range of ESA-listed corals that include the placement of floating or submerged pipelines.

C-PIPE.1 Only existing pipeline corridors provided in SARBA Appendix B are covered under this Opinion. No pipeline corridors were identified in the U.S. Caribbean.

C-PIPE.1 All pipelines (anchored or floating) will be placed in a 25-ft-wide pipeline corridor that is selected to minimize and avoid placing the pipeline on coral hardbottom to the maximum extent practicable. Beach nourishment pipeline corridors are typically pre-defined and reused for each nourishment event to minimize additional impacts.

C-PIPE.2 All pipelines will be of sufficient size or weight to prevent movement outside the 25-ft-wide pipeline corridor. Additional anchoring may be needed to achieve this requirement. Floating pipeline or risers will be used when pipelines cross coral hardbottom.

C-PIPE.3 Pipeline Pre-Construction Surveys

- Hardbottom survey area: Hardbottom will be identified within the 25-ft wide pipeline placement corridor and within 100 ft of both sides of it for a total of a 225-ft wide pipeline survey area. If the initial survey is a geophysical survey, the areas identified as hardbottom will be verified using diver surveys, as described in CORAL PDC Section 4.1.
- If coral hardbottom is identified within the 225-ft wide pipeline survey area:
    - A diver survey will be conducted to map the extent of coral hardbottom within the 225-ft wide pipeline survey area and to document all ESA-listed corals within the 25-ft wide pipeline placement corridor, according to the pipeline pre-construction survey protocol outlined in Coral PDC Section 4.1.
    - All ESA-listed corals within the corridor that cannot be avoided (i.e. those within the pipeline footprint whose physical location will result in direct impact of the coral) will be relocated according to the coral relocation protocol outlined in Coral PDC Section 5.

C-PIPE.4 Pipeline During-Construction Surveys
If coral hardbottom is identified within the 225-ft wide pipeline survey area, then additional pipeline during-construction surveys (outlined in Coral PDC Section 4.2) will be required for the length of time that the pipeline is in place. Divers will swim along both sides of the pipe in all areas where the pipe crosses coral hardbottom to determine if there is movement of the pipeline and /or discharge of slurry anywhere along the length of the pipeline. The pipeline during-construction surveys will monitor for the movement of submerged pipelines and support structures for floating pipelines placed near or over hardbottom and to monitor for a discharge of slurry/leaks anywhere along the length of a submerged pipeline near hardbottom or floating pipeline placed over hardbottom. The

pipeline during-construction surveys will be conducted within 24 hours after the pipeline is activated with sand pumping through it, and surveys will continue twice per week until the pipeline is removed, weather and sea conditions permitting.

C-PIPE.5 If a pipeline leak is observed during the pipeline during-construction survey or by the dredging/ pumping crew, the following actions are required:

- Turbidity measurements will be immediately taken at the source of leak (e.g., pipeline / pump station leak site). Substantial leaks are those that result in a turbidity reading that exceeds 29 nephelometric turbidity units the leak site.
- All dredging / pumping / filling operations will cease immediately if a substantial leak is found.
- All dredging / pumping / filling operations will also cease immediately if impacts to coral hardbottom resources are observed, such as sediment accumulation on coral hardbottom and/or physical damage to ESA-listed corals.
- NMFS staff will be notified within 24 hours of documented / observed substantial leaks resulting in turbidity, sedimentation accumulation, or physical impacts to coral hardbottom.
- Dredging / pumping/ filling operations can resume once corrective action has been verified to stop the leak or correct the cause of physical damage.

C-PIPE.6 If movement of the pipeline is observed (in the course of the pipeline during-construction surveys or by the dredging/pumping crew), then the pipeline will be secured in a manner that significantly reduces movement (e.g., anchoring in areas uncolonized by ESA-listed corals along the pipeline or floating collars).

C-PIPE.7 Pipeline Post-Construction Surveys
Following completion of dredging activities and pipeline demobilization, the following actions are required:

- After the pipeline is removed, the entire length of the pipeline will be visually surveyed for damage using the pipeline post-construction survey methods outlined in Coral PDC Section 4.3.
- If a pipeline leaks and/or physical impacts to coral hardbottom or ESA-listed corals have occurred, then a detailed pipeline impact assessment survey is required to document the extent of the impact as outlined in Coral PDC Section 4.4.
- All post construction reports will be provided to NMFS 60 days following the removal of the pipeline in a digital format as defined in Section 2.9 of the 2020 SARBO.

C-PIPE.8 If the pipeline post-construction survey (Coral PDC C-PIPE.7) indicates physical damage or sediment burial of ESA-listed corals or coral hardbottom from the pipeline, then NMFS will use the available information provided in the pipeline surveys to calculate the estimated impact to Acropora critical habitat essential

features and/or take of ESA-listed corals to determine if the effects exceed the effects analyzed in the 2020 SARBO.

3 Beach Nourishment Survey Protocol

3.1 Survey Objectives

The objectives of the beach nourishment survey protocol are to identify and map the location of all coral hardbottom and ESA-listed corals located (1) between the proposed beach fill template ETOF and 500 ft waterward of the ETOF and (2) within portions of beach fill templates permitted but previously unfilled for beach nourishment projects covered under the 2020 SARBO (these areas are referred to as the beach hardbottom survey area). If ESA-listed corals are identified in the beach hardbottom survey area, the USACE will coordinate with NMFS to conduct a project-specific review to determine if coral relocation is necessary to protect corals from potential turbidity and sedimentation resulting from the beach nourishment. Conditions that may be considered when evaluating if corals need to be relocated include the composition of sand that will be placed, hydrology, proximity to coral, and past experience with similar projects in the area.

3.2 Surveys for Beach Nourishment Projects

For beach nourishment projects covered under this Opinion, the location of hardbottom may be identified using high-resolution geophysical surveys and will then be visually verified by divers. Divers will swim all areas of hardbottom and map the extent of all hardbottom areas within the beach hardbottom survey area described in Coral PDCs Section 2.3. Hardbottom in the survey area will be identified and also documented if the hardbottom meets the definition of coral hardbottom, defined in Coral PDC Section 1.2.2.

Divers will also identify and record the presence of all ESA-listed corals within the beach hardbottom survey area, according to the ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol, Updated July 2019 (https://www.fisheries.noaa.gov/southeast/consultations/regulations-policies-and-guidance). The protocol provides information on staff qualifications, QA/QC procedures, delineating Acropora critical habitat features, coral survey protocols, and data collection requirements. If this guidance is updated, the new NMFS survey protocol will be followed.

3.3 Survey Reports for Beach Nourishment Projects

Surveys will report the information listed below to NMFS within 60 days of the completion of the survey. This information will be collected and reported as described in the 2020 SARBO Section 2.9. The ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol does not provide a reporting form for surveys associated with beach nourishment projects, but the forms in the protocol can be adapted to this survey type. If this guidance is updated, the new NMFS survey protocol will be followed. The information reported will include:

1. Georeferenced map (ArcGIS files) and GPS coordinates for all hardbottom and ESA-listed corals identified by species.
2. Map of the location of each colony of ESA-listed corals.

3. Map of the location of Acropora critical habitat essential feature (i.e. coral hardbottom). Mapping the location of coral hardbottom both within the geographic boundaries of Acropora critical habitat and within the range of ESA-listed corals is required, but indicate the area of coral hardbottom that is within Acropora critical habitat.
4. Dimensions of the colony (length, width, and height, or longest dimension length [units = cm]), percent live tissue, and recent partial mortality.
5. Water depth and general description of the vertical relief (high, medium, low) of the coral hardbottom feature where the colony is found.
6. Report summarizing field-data collection.

4 Pipeline Survey Protocol

The following protocols apply to the PDCs required when a pipeline is placed within the range of ESA-listed corals, as defined Coral PDC Section 1.2 above.

4.1 Pipeline Pre-Construction Survey

If coral hardbottom is identified by the geophysical surveys within the 225-ft wide pipeline survey area (25-ft wide pipeline placement corridor and within 100 ft of both sides of it), then the area will be visually surveyed by divers.

- Divers will swim all of the 225-ft wide pipeline survey area where the pipeline will cross coral hardbottom.
- Divers will swim side-by-side, from offshore to inshore, at a distance of 1 m above the surface and will photograph any coral hardbottom that occurs within the proposed pipeline footprint for comparison in the post-construction survey. Photos will be taken from approximately 1 m above the surface and will be focused straight down. A meter stick will be included in the photo for scale. Photos will be numbered and corresponding coral hardbottom patches on the habitat maps will be noted.
- All ESA-listed corals visible within the 25-ft wide pipeline placement corridor will be identified, and any that cannot be avoided (i.e. those within the pipeline footprint whose physical location will result in a direct impact of the coral) will be relocated according to the coral relocation protocol (Coral PDC Section 5). ESA-listed corals within the 25-ft wide pipeline placement corridor that will not be relocated (i.e. those not within the physical pipeline footprint) will be recorded (species name, maximum dimension, and location) and photographed for post-construction comparison.

4.2 Pipeline During-Construction Corridor Survey

If coral hardbottom is identified within the 225-ft wide pipeline survey area, then pipeline during-construction coral surveys are required.

- Diver surveys will start immediately (within 24 hours) following pipeline placement, weather and sea conditions permitting.

- Divers will swim along both sides of the pipe in all areas where the pipe crosses coral hardbottom to determine if there is movement of the pipeline and /or discharge of slurry anywhere along the length of the pipeline. In the event that movement or discharge/slurry is discovered, the measures described in C-PIPE.5 will be followed.
- Diver will inspect the pipe twice per week, weather and sea conditions permitting, until the pipeline is removed.

4.3 Pipeline Post-Construction Survey

A post-construction diver visual inspection will be conducted following construction and after the pipeline is removed.

- After the pipeline is removed, divers will survey the 25-ft wide pipeline placement corridor in the areas where the pipeline crossed coral hardbottom.
- Divers, working in teams of 2, will swim side-by-side at a distance of 1 m above the surface and will photograph any coral hardbottom that occurs within the 25-ft wide pipeline placement corridor. Photos will be taken from approximately 1 m above the surface and will be focused straight down. A meter stick will be included in the photo for scale. Photos will be numbered, and corresponding coral hardbottom patches on the habitat maps will be noted.
- Comparisons will be made between the pre- and post-construction photographs, and any damage to ESA-listed coral or designated critical habitat will be reported to NMFS within 30 days. Reports will indicate if the damage is believed to be unrelated to the project and the reason for the determination.

4.4 Pipeline Impact Assessment Survey

If pipeline leaks or physical impacts (damage or burial) to coral hardbottom or ESA-listed corals have occurred, then a detailed quantitative impact assessment is required per Coral PDC C-Pipe 8.

- Divers, working in teams of 2, will visually survey any area where a leak has been detected or physical damage to coral hardbottom has been recorded during any of the pipeline surveys above.
- Impact assessments will include a delineation (using GPS) of all areas in which coral hardbottom has been damaged, injured, buried, or stressed and will extend out to the furthest extent of such damage, even if the damage extends beyond 225-ft wide pipeline survey area.
- The condition of impacted benthic organisms will be assessed, photographed, and documented.

A pipeline impact assessment survey form has not been developed, but can be completed in coordination with NMFS. At a minimum, the following information will be collected, recorded, and submitted in a digital spreadsheet according to the guidelines in 2020 SARBO Section 2.9.3.1:

- Species name of all ESA-listed corals that have been impacted;
- Dimensions of any impacted colony including the diameter or longest dimension (units = cm);

- Percent live tissue and recent percent mortality (recorded in 10% increments);
- Photograph: Photos will be taken from a position directly above the coral from a distance that allows the entire colony to be in the frame, and a ruler will also be included in the photo for scale. For corals exhibiting signs of sediment stress, close-up photographs will be taken to document stress;
- Sediment cover: Any dusting or accumulation of sediments and all signs of sediment stress will be reported, including the presence of a sediment halo (or partial mortality typically around the base of the colony), the presence of sediment or partial mortality in concave areas of encrusting and massive shaped colonies, and the presence of sediment or partial mortality on the upslope side of colonies growing on steep surfaces;
- GPS coordinates of each impacted colony;
- Site map with locations of each colony and each area of coral hardbottom impacted;

4.5 Pipeline Coral Survey Reports

Results of pipeline coral surveys listed below will be reported to NMFS as described in the bullets below and according to the reporting requirements outlined in the 2020 SARBO Section 2.9.

- Pre-construction pipeline corridor survey: Reported within 10 days of survey completion.
- During-construction pipeline corridor survey: Reported to NMFS within 24 hours if a pipeline leak or impacts to coral hardbottom or ESA-listed corals are detected. All during-construction survey reports will be submitted with the post-construction report.
- Post-construction pipeline corridor survey: Reported to NMFS within 60 days of the removal of the pipeline along with the during-construction reports.
- Pipeline impact assessment survey: Reported to NMFS within 30 days of completion of the survey.

All pipeline coral survey reports will include (1) the data sheets used during the survey (no specific format is required), (2) the photographs collected during the impact assessment, and (3) the GPS coordinates of the location(s) of any impacted coral hardbottom and/or ESA-listed coral. GIS mapping results for areas with impacted resources will also be provided, as a collection of shapefiles (ArcGIS files). For shapefiles, polygons will represent the in situ delineated edge of each area containing impacted resources. The specific data that will be collected is provided for each survey type in this section.

5 Coral Relocation Protocol for ESA-Listed Corals

All coral relocation completed for beach nourishment or pipeline placement projects covered under the 2020 SARBO will be completed as described below.

The USACE may contact NMFS prior to a coral relocation project (from either a beach nourishment or pipeline placement project) to determine, through a project specific review, if it

may be appropriate to give relocated ESA-listed corals to a coral nursery instead of relocated to a nearby location. If corals are provided to a coral nursery, no monitoring of transplant success (Coral PDC Section 5.4) is required.

For beach nourishment projects, the USACE will contact NMFS prior to relocating corals located between the proposed beach fill template ETOF and 500 ft waterward of the ETOF and in areas of the permitted beach fill template that have not been previously filled, to determine if relocation is necessary based on the likelihood of turbidity or sedimentation reaching corals within this area. This assessment will consider the material to be placed, site conditions, hydrology, and likelihood of potential burial of corals in the area during or after sand placement.

5.1 Qualified person

All relocation and reporting activities will be conducted by staff that meet the requirements outlined in the ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol, Updated July 2019 (https://www.fisheries.noaa.gov/southeast/consultations/regulations-policies-and-guidance). If this guidance is updated, the new NMFS survey protocol will be followed.

5.2 Relocation site selection

All relocation of ESA-listed coral will be to suitable habitat:

- Relocation sites will occur near the coral˘s original location, but not within 1,000 ft of the pipeline, dredging footprint, or sand placement area. Relocated corals will be placed in water depths from the mean high water line to 30 m (98 ft) and be within a similar depth as the origin coral location (+/- 5 ft).
- Relocation sites must consist of coral hardbottom or dead coral skeleton that is free from fleshy macroalgae cover and sediment cover.
- Relocation sites will have appropriate water quality (based on water quality data and local knowledge) and minimal chances of other disturbances (future coastal construction, boat groundings, damage caused by curious divers/fisherman).

5.3 Relocation techniques

All colonies will be collected carefully using a hammer and chisel. Upon collection, the colonies will be kept at the original depth until transplantation commences (i.e., cached on site). Transplantation will occur as soon as operationally feasible, but no more than 24 hours after the colony is removed from its original location. During transportation to the transplant site, the corals will be kept in seawater at all times, covered with a lid or towel during transport, and maintained at a water temperature within 2 degrees of ambient water temperature. Transplanted colonies will be placed no closer than 0.75 m from each another.

5.4 Monitoring of Transplanted Corals

Depending on the numbers of relocated corals, all or a subset of those corals will be monitored to determine the success of transplanting. If large numbers of corals are relocated, a subset of

colonies representing an appropriate cross section of the species and size classes will be monitored. If the number of corals relocated are 100 or more, the USACE will use power analysis on the total number of relocated corals to determine an appropriate subset of corals to be monitored. The subset will be sufficient to detect a 10% change. The subset will not be less than 20% of the total. The subset will be selected randomly across sites to be representative of the relocated corals. All transplanted corals will be monitored using the methods listed below. Transplanted colonies will be monitored at the time of the transplantation (baseline) and at 5 post-transplant monitoring events. Monitoring requirements here are intended to align with the Florida Fish and Wildlife Conservation Commission coral relocation monitoring guidelines. At the time this Opinion was issued the monitoring guidelines were not yet posted to their website. We will include the link on SERO's Dredge webpage (https://www.fisheries.noaa.gov/content/southeast-dredging) once they do. Reports documenting the transplantation of corals will be submitted to NMFS as required by the PDCs, including the project specific information, and reporting information outlined in the 2020 SARBO Section 2.9. In addition, the transplantation information listed below will be reported:

- Baseline Observations at the transplant location
    - Record the species and the number on the plastic identification tag adjacent to each transplanted colony.
    - Record the widest length, width, and height of the coral, percent live tissue, and site depth at mean high water of each colony at both the original location and the transplant location.
    - Record the GPS location (in decimal degrees) or the compass bearing and distance (in feet) from a known fixed point, and photograph each transplanted coral with a scale in the photo.
- Monitor post-transplant success and survival
    - Monitoring should be conducted at 1 week, 1, month, 3 months, 6 months, and 12 month post-relocation. The purpose of the monitoring events are as follows:
    - 1 week monitoring checks for attachment success; immediately reattach any corals that are not firmly attached to the hardbottom.
    - 1 and 3-month monitoring records sediment cover on the colonies (sediment dusting, sediment accumulation, partial burial, burial of the base, burial, or sediment halo if present) and colony condition (bleaching, % live tissue, and presence of disease, fouling, or predation).
    - 6 and 12-month monitoring records colony size, percent live tissue, sediment cover on the colonies, and colony condition.
    - Post-transplant monitoring reports, including photographs, will be submitted to NMFS within 30 days of each monitoring event. Reports will include a table with the information described above and percent mortality (reported in 10% increments) for each of the monitored transplanted corals.

1 Year Post-Transplant Success Criteria for a Specific Project
The success of transplanting corals by project (e.g., corals transplanted for x pipeline project or y beach nourishment project) is met if 85% of all of the ESA-listed corals/coral colonies that are transplanted for that project survive the transplant procedure. Survival of each individual coral or colony transplanted for the project is measured by determining if the individual coral or colony has less than 25% partial mortality of the live tissue. The 1-year survival rate may consider the health of existing corals in the surrounding area, meaning that the survival rate may be adjusted if all corals in the area are effected by an external factor such as coral bleaching or disease. During the 2020 SARBO annual review (2020 SARBO Section 2.9.4), a summary will be provided of all ESA-listed corals transplanted associated with all projects covered under this Opinion.

Coral Transplanting Success Criteria for All Projects Covered under this Opinion
The success of coral transplanting under this Opinion will be tracked as part of the 2020 SARBO annual review (2020 SARBO Section 2.9.4) to ensure at least 85% of all corals transplanted for all projects that occur over a 5-year period survive based on the reports for each individual project that transplanted corals. This timeframe was selected to allow time for multiple projects to be completed and monitored for 1 year to determine the success of transplanting corals covered under this Programmatic Opinion. If this 5-year transplanting success metric is not met, the USACE has the option to either reinitiate consultation to consider the effects of the additional loss of corals not considered in this Opinion or to outplant corals of the same species of corals that did not meet the success criteria. Outplanting is the process of moving corals grown in a coral nursery to the relocation site where corals were transplanted. If trained staff perform the coral transplanting, it is expected that the success criteria rate will be met based on monitoring results from similar past projects. If outplanting is chosen, the number of corals transplanted is determined according to the multipliers listed in Table 55 to replace a similar amount of live coral tissue and assure success of the second transplanting. Monitoring success of the second transplanting is completed in the same way as the first transplanting event.

Table 55. Outplanting Ratio if the Coral Relocation Survival Rate was not Met
Minimum outplant sizes are 15 cm for Acropora, 10 cm for Dendrogyra, and 2.5 cm for Orbicella.

Coral Size (cm)	Multiplier for Acropora Corals (i.e., elkhorn and staghorn)	Multiplier for Orbicella Corals (boulder star, mountainous star, lobed star)	Multiplier for Dendrogyra Corals (Pillar)
1-20	1	5	1
21-30	2	10	2
31-40	3	15	3
41-50	4	21	4
51-60	5	27	5
61-70	5	33	6
71-80	6	40	7
81-90	7	46	8
91-100	8	53	9
101-110	9	60	11
111-120	10	68	12

Appendix B

FWC Special Activity Licenses and FWC Visual Health Assessment Protocols

Special Activity License

Florida Fish and Wildlife Conservation Commission
Division of Marine Fisheries Management
620 S. Meridian St., Mail Station 4B3, Tallahassee, Florida 32399-1600
Phone: 850-487-0554 • email: SAL@MyFWC.com
https://myfwc.com/license/saltwater/special-activity-licenses/

Issued to: William Precht
Dial Cordy and Associates, Inc.
1011 Ives Dairy Road, Suite 210
Miami, FL 33179

License #: SAL-22-2441-R
Effective Date*: 05/23/2022
Expiration Date: 11/22/2022

Purpose: Harvest and release of marine organisms for mitigation purposes pursuant to FWC rule 68B-8, F.A.C.

Licensee Signature _____ Date 6/01/2022

Not valid unless signed. By signature, confirms that all information provided to issue the license is accurate and complete, and indicates acceptance and understanding of the provisions and conditions listed below. **Any false statements or misrepresentations when applying for this license may result in felony charges and will result in revocation of this license.**

Authorized by: Lisa Gregg, Program and Policy Coordinator for: Eric Sutton, Executive Director

Authorizing Signature Lisa Gregg Date May 23, 2022

Project: Broward County Segment 3 Beach Nourishment

Authorized Activities: All other required project-related federal, state or local authorizations must be obtained first before engaging in any activity authorized by this license.

Authorized to harvest, transport, cache and transfer to Nova Southeastern University any amount of any species of coral, including ESA-listed species. Holding and transport time between completion of harvest and completion of transfer should be limited to as little time as possible.

The following manipulations must be conducted to *Acropora cervicornis* coral species after harvest and prior to transfer to Nova Southeastern University:

1) For colonies >25cm in longest dimension:
    a. fragment into ≤25cm fragments in longest dimension
    b. remove dead branch ends
2) For colonies <25cm in longest dimension:
    a. remove dead branch ends

Health Certification
A visual health assessment must be conducted for each coral prior to harvest and pursuant to the attached "FWC Coral and Octocoral Visual Health Assessment Protocols for Mitigation Relocation Activities" (Protocols). Corals that do not meet the criterion established in these Protocols may not be harvested and must be noted as such in reporting requirements.

Release Authorization
A Release Authorization is not required for the harvest, transport and transfer of coral, provided that each coral meets the criterion established in the attached Protocols. Corals that do not meet the criterion established in these Protocols may not be harvested.

Authorized Locations: State waters of Broward County, with the following specifications and exceptions:

1) Corals may be harvested from and transferred to, the following entities and locations:
    - Harvest locations are limited to within ~200 ft. of the Equilibrium Toe of Fill (ETOF) as identified by project-associated FDEP, USACE and Broward County permits.
    - Cache and transfer entities and location are as follows:
      Dr. Dave Gilliam (transfer)
      Corals may be transferred to Dr. Gilliam on the water, from vessel to vessel
      Dr. Abigail Renegar (cache)
      Nova Southeastern University - Guy Harvey Oceanographic Center
      8000 North Ocean Drive
      Dania, FL 33004
2) This license does not authorize any activity in federal waters, unless species-specific FWC regulations are extended into federal waters by FWC rule.
3) This license does not authorize any activity within any state park, unless a state park permit has also been obtained from the Florida Department of Environmental Protection, Division of Recreation and Parks.
4) This license does not authorize any activity within any federal park, unless a federal park permit has also been obtained from the National Park Service.
5) This license does not authorize any activity within any Manatee Limited Entry Area (No Entry or Motorboat Prohibited Zones – list attached to this license).

Authorized Personnel: Victoria Basham, Ryan Fura, Robert Hunsaker, Alex Modys, William Precht, Jason Schmidt.

Authorized Gear:

1) Quadrats and transect lines.
2) Hand collection.
3) Hammer, chisel.
4) Wire brushes
5) Marine epoxy and/or cement.
6) Putty knives.
7) Tags, nails.
8) Baskets, mesh bags.
9) Pliers, bone cutters.

Reporting Requirements: Future SALs and SAL renewals are contingent upon successful fulfillment of reporting requirements. In order to complete the licensing process and fulfill reporting requirements, the following documentation must be submitted to SAL@MyFWC.com upon license renewal or within 30 days after expiration of the SAL, whichever occurs first:

1) An activity report detailing all SAL-related harvest, cache and transfer activities. The activity report is a report other than any publications or technical, monitoring, or final reports. The activity report must include the scientific name, numbers and sizes of the marine organisms harvested, cached, and transferred, and must identify any corals that could not be harvested because they did not meet the criteria in the Visual Health Assessment Protocols.
2) All reporting documentation required by other project-associated permits must be submitted to SAL@MyFWC.com and identified as reporting requirements for license number SAL-22-2441-R.
3) Any publications and/or reports resulting from activities conducted under the authority of this license must include the notation that the activity was conducted under FWC license number SAL-21-2441-R.

License Conditions and Provisions

Law Enforcement Notification: Notification must be made to the nearest FWC Law Enforcement Dispatch Center 24 hours prior to conducting any SAL related activities. An advanced float plan detailing locations, dates, and times of activities shall constitute sufficient notice, provided that authorized personnel do not deviate from the float plan and the float plan is filed with the nearest FWC Law Enforcement Dispatch Center at least 24 hours prior to conducting SAL related activities.

Prohibited Activities:

1) The following are considered prohibited species and may not be harvested or possessed unless specifically authorized by this license:
    a. Invertebrates: anemone, giant Caribbean (Genus Condylactis), conch, queen (*Strombus gigas*); coral, black (Order Antipatharia); coral, fire (Genus *Millepora*); coral, hard and stony (Order Scleractinia); live rock (non-aquacultured; includes any formations created by tube worms of the family Sabellariidae); sea fan, common (*Gorgonia ventalina*); sea fan, Venus (*Gorgonia flabellum*); starfish, Bahama (*Oreaster reticulatis*); urchin, longspine (*Diadema antillarum*).
    b. Bony Fishes: bonefish (Family Albulidae); grouper, Goliath (*Epinephelus itajara*); grouper, Nassau (*Epinephelus striatus*); silverside, key (*Menidia conchorum*); spearfish, longbill (*Tetrapturus pfluegeri*); spearfish, Mediterranean (*Tetrapturus belone*); sturgeon (Family Acipenseridae); topminnow, saltmarsh (*Fundulus jenkinsi*).
    c. Cartilaginous Fishes: dogfish, spiny (*Squalus acanthias*); sawfish, largetooth (*Pristis pristis*); sawfish smalltooth (*Pristis pectinata*); shark, Atlantic angel (*Squatina dumeril*); shark, basking (*Cetorhinus maximus*); shark, bigeye sand tiger (*Odontaspis noronhai*); shark, bigeye sixgill (*Hexanchus nakamurai*); shark, bigeye thresher (*Alopias superciliosus*); shark, bignose (*Carcharhinus altimus*); shark, Caribbean reef (*Carcharhinus perezii*); shark, Caribbean sharpnose (*Rhizoprionodon porosus*); shark, dusky (*Carcharhinus obscurus*); shark, Galapagos (*Carcharhinus galapagensis*); shark, great hammerhead (*Sphyrna mokarran*); shark, lemon (*Negaprion brevirostris*); shark, longfin mako (*Isurus paucus*); shark, narrowtooth (*Carcharhinus brachyurus*); shark, night (*Carcharhinus signatus*); shark, sandbar (*Carcharhinus plumbeus*); shark, sand tiger (*Carcharias taurus*); shark, scalloped hammerhead (*Sphryna lewini*); shark, sevengill (*Heptranchias perlo*); shark, silky (*Carcharhinus falciformis*); shark, sixgill (*Hexanchus griseus*); shark, smalltail (*Carcharhinus porosus*); shark, smooth hammerhead (*Sphyrna zygaena*); shark, tiger (*Galeocerdo cuvier*); shark, whale (*Rhincodon typus*); shark, white (*Carcharodon carcharias*); ray, manta (species of the genus Manta and Mobula); ray, spotted eagle; (*Aetobatus narinari*).
2) Special Activity Licenses do not authorize any harvest of marine mammals or marine turtles, but may authorize the harvest of any other marine organism identified as a Florida Endangered or Threatened Species, or a Species of Special Concern, pursuant to Chapters 68A-27 and 68B-8, F.A.C. (list available here: https://myfwc.com/media/1945/threatened-endangered-species.pdf)
3) Marine organisms harvested pursuant to a SAL may not be sold or consumed unless specifically authorized by this license.

General License Conditions:

1) Any authorized personnel conducting activities pursuant to a Special Activity License (SAL) must have a copy of the license signed by both the Commission and the license holder, complete with all attachments as specified on the license, in his/her possession while conducting any activities requiring the SAL.
2) Special Activity Licenses may be suspended or revoked if authorized personnel listed on the license have violated FWC rules or statutes or other laws or rules relating to the subject matter of the license, terms or conditions of the license, or have submitted false or inaccurate information on their application.
3) Special Activity Licenses are non-transferable.

Attachments to Follow:

- "FWC Coral and Octocoral Visual Health Assessment Protocols for Mitigation Relocation Activities"
- "Definitions of Coral and Octocoral Terminology"
- Manatee Limited Entry Areas
- FWC Division of Law Enforcement, Special Activity License Notification Locations & Numbers

A person whose substantial interests are affected by FWC's action may petition for an administrative proceeding (hearing) under sections 120.569 and 120.57 of the Florida Statutes. A person seeking a hearing on FWC's action shall file a petition for hearing with the agency within 21 days of receipt of written notice of the decision. The petition must contain the information and otherwise comply with section 120.569, Florida Statutes, and the uniform rules of the Florida Division of Administration, chapter 28-106, Florida Administrative Code. If the FWC receives a petition, FWC will notify the Permittee.

FWC Special Activity License
Coral Visual Health Assessment Protocols
for In-Water Harvest and Release Activities

For purposes of these Florida Fish and Wildlife Conservation Commission (FWC), Special Activity License (SAL) Coral Visual Health Assessment Protocols for In-Water Harvest and Release Activities (Protocols), the term "release" is defined as the introduction, reintroduction, outplanting, relocation, transfer, translocation, transplantation of any coral into or within any in-water location.

The SAL Health Certification process for in-water harvest and release activities consists of a visual health assessment with established criteria as outlined in these Protocols.

The visual health assessment must be conducted for each coral pursuant to the criteria in these Protocols to ensure that all corals appear to be in good health, are free from suspected disease and conditions that may impact coral health, and that the presence of predators/competitors/overgrowth has been minimized. The visual health assessment must be conducted immediately prior to removal from any in-water location (including nurseries), and may need to be conducted again before the release activity is completed (i.e., immediately prior to removal and again immediately prior to removal from any and all temporary holding locations established to facilitate the release activity).

Corals that do not meet the visual health assessment criteria cannot be harvested and released to other in-water locations. If any part of a coral does not meet all of the criteria for the visual health assessment process, no part of the coral may be harvested then released to an in-water location, even if the affected areas of the coral are removed so that the remaining part of the coral does meet the visual health assessment criteria. Such corals may alternatively be harvested and transferred to a land-based nursery for quarantine and treatment pursuant to veterinary advice. Subsequent release activities would follow requirements for land-based nursery release activities.

Corals that are located in any temporary holding location and do not pass the visual health assessment criteria must be removed and appropriately disposed of on land, or transferred to a land-based nursery for quarantine and treatment pursuant to veterinary advice. Subsequent release activities would follow requirements for land-based nursery release activities.

Field personnel conducting coral visual health assessments should be proficient with species identification, and trained in survey techniques, coral condition assessment, coral disease, and predator/competitor/overgrowth identification and removal, to assure accuracy of the assessment.

Detached Corals

Visually assessing coral health becomes increasingly subjective when a coral is detached from a source coral, substrate or structure, and is found lying on the seafloor (e.g., coral of opportunity, coral nursery orphans). If there is any doubt that observed abnormalities or conditions may be attributed to active or suspect disease rather than from lying on the sea floor, do not collect and relocate the detached coral to any other in-water location for any reason.

Visual Health Assessment Criteria

Each coral must be evaluated and meet the following visual health assessment criteria prior to harvest or release:

1) Each coral harvested or released may not show any visible signs of active or suspect disease based on the presence of:

    a. Stress indicators such as: bleaching, partial bleaching, paling, tissue sloughing (caused by sedimentation), swelling or thinning, and excessive mucous production.

- **Exception**: Exception to this "stress indicators" criterion is automatically provided for the harvest of detached corals lying on the sea floor unless observed abnormalities or conditions may be attributed to active or suspect disease.

- **Exception**: Exception to this "stress indicators" criterion is automatically provided for corals that are being harvested or released from interior waterways, unless observed abnormalities or conditions may be attributed to active or suspect disease.

  ***Note 1**: Harvest and release of corals from interior waterways with tissue appearing pale to partially bleached (< 100% of coral tissue) is acceptable as color loss is recognized as a part of coral species' normal state when growing in interior waterways.

  ***Note 2**: Harvest and release of corals from interior waterways with tissue appearing pink or purple (e.g., *Siderastrea, Madracis, Porites* spp.) as a bleaching response, but not in association with active lesions, tissue damage, or any other visible signs of active or suspect disease, is acceptable as such pigmentation is associated with non-pathogenic bacterial/microbial communities.

b. Recent mortality greater than 5% tissue loss exposing underlying skeleton not due to predation/competition/overgrowth, and recent mortality greater than 10% tissue loss exposing underlying skeleton due to predation/competition/overgrowth.

   - **Exception**: Old mortality is acceptable for corals that will be harvested or released.

c. Active disease such as: rapid tissue loss, tissue sloughing (not caused by sedimentation), stony coral tissue loss disease (SCTLD), white/black/yellow/red band diseases, white pox or plague diseases, white Beggiatoa mats, dark (purple) spot/blotch diseases, and growth anomalies.

d. Suspect disease indicators such as bands, spots, lesions, microbial mats, and cyanobacteria colonization.

2) Predators such as fireworms (*Hermodice carunculata*) or snails (e.g., *Coralliophila* spp.) must be removed (e.g., peeled off) prior to relocation.

3) Competitors and overgrowth (e.g., sponges, tunicates, ascidians, octocorals, zoanthids, corallimorphs, macroalgae, cyanobacteria) on old mortality must be removed (e.g., peeled, scrubbed using wire or plastic brushes, tweezed) as much as possible prior to harvest or release. Corals that have non-native, encrusting and/or overgrowing species on them (e.g., Genus *Symplegma*, Genus *Botryllus*) that cannot be removed may not be harvested or released.

   - **Exception**: Corals containing boring sponges of the Genus *Cliona* (e.g., *Cliona deletrix*) are generally discouraged for harvest or release.

   - **Exception**: Corals with established algal lawns and associated skeletal lesions and pale spots created by farming damselfishes may be harvested and released.

- **Exception**: Corals containing stramenopile protists that are often confused with competition and overgrowth and appear as white aggregate coatings on the coral surface or embedded in the mucus layer, may be harvested and released.

FWC Definitions for Coral and Octocoral Terminology

"Axis" is the central supporting skeletal structure of an octocoral made of proteinaceous gorgonin or calcium carbonate that is commonly dark brown to black in color.

"Bleaching" is the loss of color within coral or octocoral tissue due to the loss or reduction in number of endosymbiotic algae (i.e., zooxanthellae; Genus *Symbiodinium*). During bleaching, tissue is present but is pale to clear in color for corals and pale to white in octocorals, and for corals the white skeleton is visible underneath. A coral or octocoral may be "bleached" where 100% of tissue is affected by loss of zooxanthellae, "partially bleached" where < 100% of tissue is affected by loss of zooxanthellae and a portion of the tissue remains a healthy color, or "pale" where tissues have not completely lost all zooxanthellae and appear lighter in color especially compared to other corals and octocorals of the same species.

"Cache" is a temporary holding location to facilitate coral and octocoral relocation and transfer activities.

"Coral" is an organism of any life stage or any part thereof (including gametes), that meets a regulatory definition of "coral" for the Florida Fish and Wildlife Conservation Commission, the Florida Department of Environmental Protection, National Marine Fisheries Service (NOAA Fisheries) as it pertains to the Southeast Region, the Florida Keys National Marine Sanctuary, or the National Park Service as it pertains to National Park areas within Florida.

"ESA-listed species" are species that are listed pursuant to the federal Endangered Species Act.

"Holdfast" is the base of an octocoral that attaches the colony to the substrate.

"Interior waterway" is an aquatic area that has experienced physical restructuring of the shoreline (e.g., inner port harbors, marinas, seawalls), or a naturally occurring area of low flushing (e.g., shallow bays).

"Introduction" is the intentional or unintentional release of a coral or an octocoral into an area and/or habitat in which it is not known to have naturally existed.

"Mitigation" is an action that is taken to avoid, minimize or offset potential negative effects from an activity.

"Nursery" is a land or water-based location where authorized coral holding, propagation, rearing, acclimation or staging activities occur.

"Octocoral" are anthozoan cnidarians (any part of the species of the Subclass Octocorallia), with polyps bearing eight pinnate tentacles and eight complete septa, excluding encrusting octocorals (e.g., *Erythropodium caribaeorum*, *Briareum asbestinum*).

"Old mortality" is the non-living portion of exposed coral skeleton that has been overgrown by algae and other biofouling organisms, and/or where the corallite structure has eroded over time and may not be identifiable to the species level. "Old mortality" is not readily determinable from "Recent mortality" in octocorals.

"Outplanting" is the removal of a coral from any land or water-based nursery and placing such coral into any in-water location outside of a nursery.

"Plume" is the thin pinnate (feather-like) branches and thin tissue branchlets that extend from all sides of the main branches of an octocoral.

"Recent mortality" as it pertains to coral is the non-living portion of recently exposed coral skeleton (i.e., skeleton is white and corallite structures are intact and identifiable), including the development of fine "fuzz" or limited turf algae on exposed skeleton (i.e., skeleton is yellowish in appearance and corallite structure may be slightly eroded but still identifiable to species level), indicating that the mortality occurred within a couple of days to weeks prior to observation.

"Recent mortality" as it pertains to octocoral is the non-living portion of recently exposed octocoral axis skeleton (i.e., axis is dark brown to black), which can include the development of fine "fuzz" or turf algae on exposed axis, indicating that the mortality occurred within a few days prior to observation. Some dark live tissue around recent mortality can indicate healthy tissue regrowth over the exposed axis.

"Release" is the introduction, outplanting, placement, reintroduction, stocking, relocation, transfer, translocation, or transplantation of any coral or octocoral into or within any in-water location.

"Relocation" is any movement of a coral at any life stage from any in-water location to another in-water location. Relocation includes translocation and transplantation, but excludes outplanting and transfer. Relocation occurs between a "removal site" (the in-water site where a coral was first acquired), and a "relocation site" (the in-water location to which the coral is physically moved to), and may potentially include a "temporary holding site" (a location where corals are temporarily held in cache to facilitate relocation-associated activities).

"Rod" is a thickly branched upright form of octocoral, typically with secondary branches and thick tissues.

"Seafan" is an octocoral that is flat and fan-shaped with interconnected net-like branching with thin tissues.

"Transfer" is the physical conveyance of coral or octocoral between eligible entities.

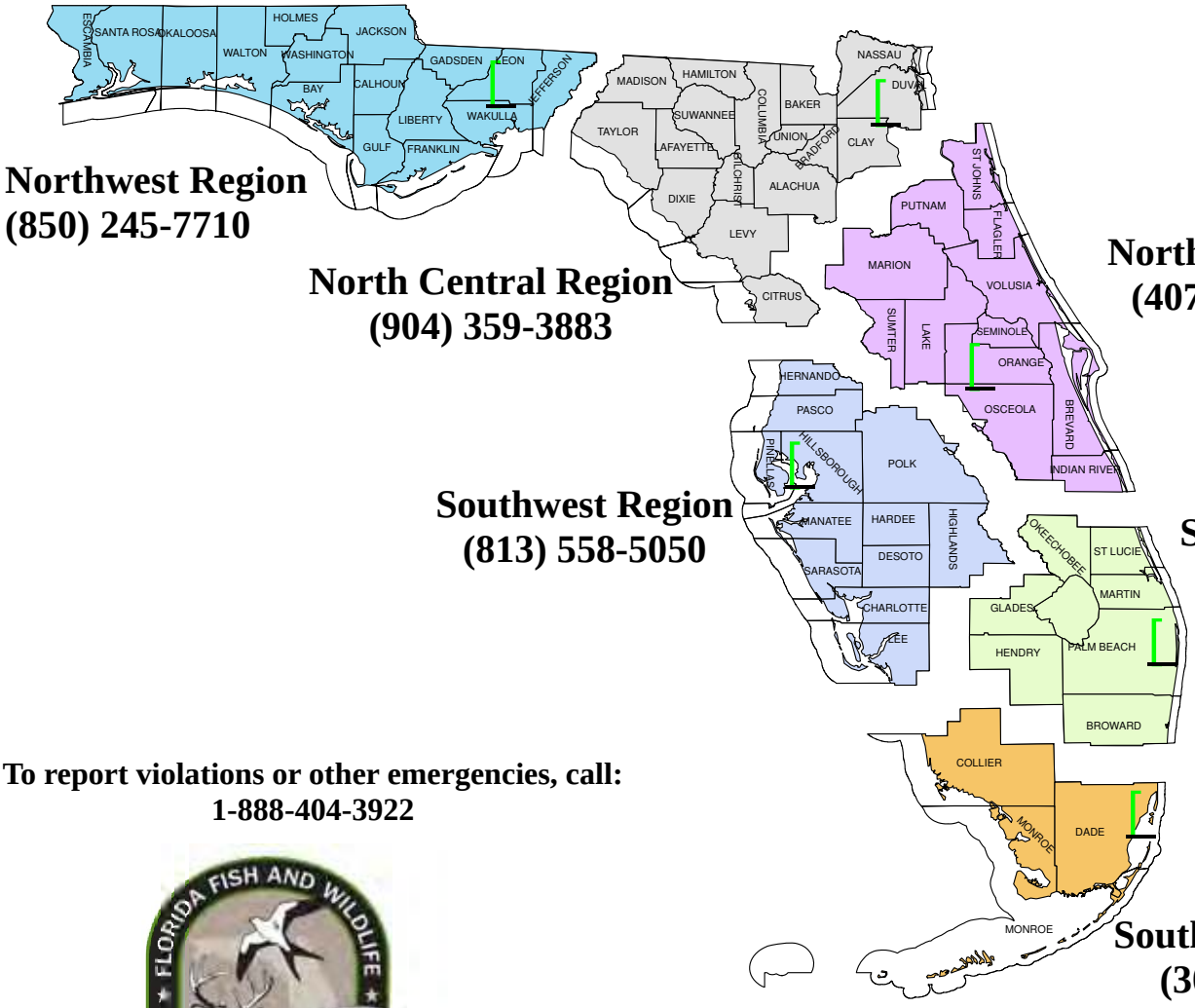
"Translocation" is the in-water movement of a coral or octocoral from an area of suitable habitat to another area of suitable habitat, with or without consideration of historic distribution.

"Transplantation" is the in-water movement of coral or octocoral from one place to another.

FWC MANATEE PROTECTION NO ENTRY AND MOTORBOATS PROHIBITED ZONES IN EFFECT AS OF APRIL 2016

County	*Restriction and Location*	*Citation in Fla. Admin. Code*
Brevard County	No Entry Zones (November 15 – March 31)	
	Reliant (formerly OUC) Power Plant (Indian River)	68C-22.006(2)(a)1., FAC
	FPL Power Plant (Indian River)	68C-22.006(2)(a)2., FAC
	Motorboats Prohibited Zone (Year-round)	
	C-54 Canal (off the Sebastian River)	68C-22.006(2)(b)2., FAC
	Motorboats Prohibited Zone (November 15 – March 31)	
	Reliant (formerly OUC) Power Plant (Indian River)	68C-22.006(2)(b)1., FAC
Broward County	No Entry Zones (Year-round)	
	FPL Port Everglades Power Plant	68C-22.010(2)(a)1., FAC
	FPL Lauderdale Power Plant	68C-22.010(2)(a)2., FAC
Citrus County	No Entry Zones (November 15 – March 31)	
	Blue Waters area of the Homosassa River (2 zones)	68C-22.011(1)(m), FAC
Collier County	No Entry Zone (Year-round)	
	Basin off of Henderson Creek	68C-22.023(1)(a), FAC
Hillsborough County	No Entry Zone (November 15 - March 31)	
	TECO-Big Bend Power Plant	68C-22.013(2)(a), FAC
Indian River County	No Entry Zone (November 15 – March 31)	
	Vero Beach Power Plant	68C-22.007(1)(e), FAC
Lee County	No Entry Zone (November 15 – March 31)	
	FPL Tice Power Plant (Orange River)	68C-22.005(2)(a), FAC
Miami-Dade County	No Entry Zones (Year-round)	
	Virginia Key Area	68C-22.025(1)(e)1., FAC
	Black Creek Canal	68C-22.025(1)(e)2., FAC
	No Entry Zones (November 15 - April 30)	
	Biscayne Canal	68C-22.025(1)(f)1., FAC
	Little River	68C-22.025(1)(f)2., FAC
	Coral Gables Canal	68C-22.025(1)(f)3., FAC
	Motorboats Prohibited Zone (Year-round)	
	Fisher Island Area	68C-22.025(1)(d), FAC
Palm Beach County	Motorboats Prohibited Zone (November 15 - March 31)	
	FPL Riviera Beach Power Plant	68C-22.009(1)(e), FAC
Sarasota County	No Entry Zone (Year-round)	
	Pansy Bayou	68C-22.026(2)(c), FAC
	No Entry Zone (November 15 – March 15)	
	Warm Mineral Springs / Salt Creek	68C-22.026(3)(b), FAC
St. Lucie County	No Entry Zone (Year-round)	
	Harbor Branch Canal Basin	68C-22.008(2)(a), FAC
	Motorboats Prohibited Zone (November 15 - March 31)	
	Moore's Creek	68C-22.008(2)(b), FAC
Volusia County	Motorboats Prohibited Zone (October 15 - April 15)	
	Blue Spring	68C-22.012(2)(d), FAC

FWC Division of Law Enforcement
Regional Communication Center Contact Information



Northwest Region
(850) 245-7710

North Central Region
(904) 359-3883

Northeast Region
(407) 275-4150

Southwest Region
(813) 558-5050

South Region Alpha
(561) 625-5128

South Region Bravo
(305) 470-6863

To report violations or other emergencies, call:
1-888-404-3922

The numbers listed are manned 24 hours daily. If SAL holders need to provide information via fax, please request the fax number from dispatcher.

0 50 100 200 Miles

The holder of a SAL must notify the nearest Commission Law Enforcement Dispatch Center not later than 24 hours prior to conducting activities under a SAL. Notification may consist of a float plan detailing locations, dates, and times of activities. Deviations from the float plan are permitted only after 24-hour advance notification to the nearest Commission Law Enforcement Dispatch Center. Float plans are valid for the duration of the SAL unless rescinded by the SAL holder.

FWC-DMFM/kpm
Rev. 09/2010

Appendix C

Submitted Coral Collection/Relocation List

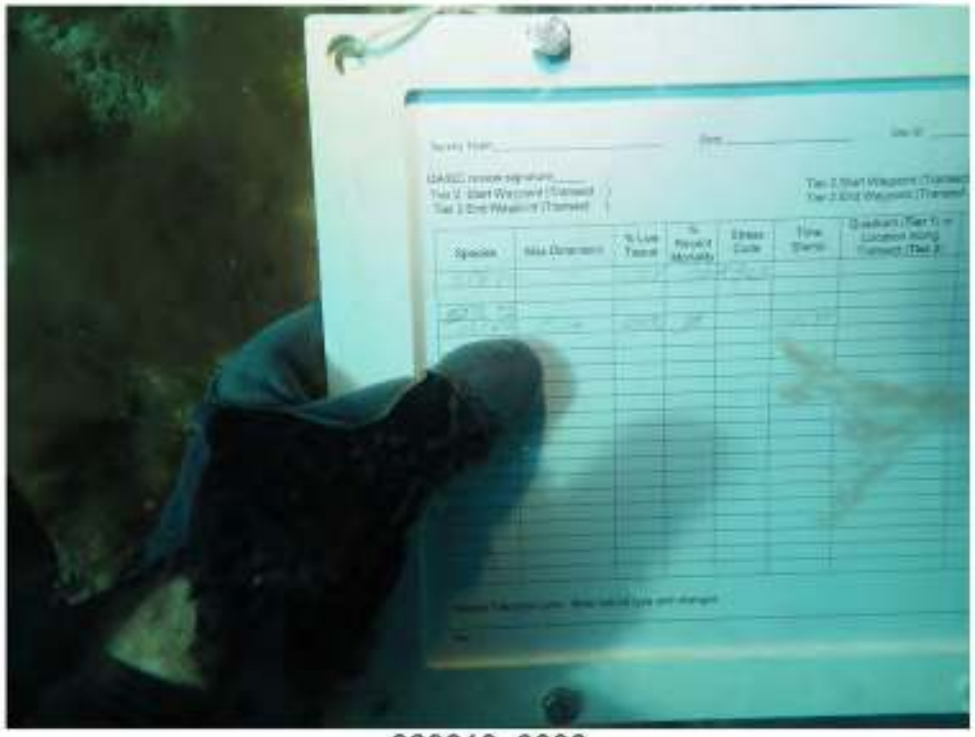
(December 2021)

Site	A. Cervicornis	O. faveolata	Total
46	10		10
48	**Additional Site for 2021**		
72		1	1
90	**Additional Site for 2021**		
92	1		1
94	2		2
96	1		1
98	14	1	15
100	30		30
102	17		17
104	10	1	11
106	17		17
108	6		6
110	10		10
112	2		2
114	1		1
116	**Additional Site for 2021**		
146	1		1
160	1		1
218		1	1
228		1	1
242	5	1	6
244	17		17
258		1	1
Total	145	7	152

Rows highlighted in green are the 9 USACE approved sites for the survey and collection efforts. Rows highlighted in yellow are the 12 additional sites that DCA recommended in December 2021. Sites 48, 90, and 116 were also included in the list due to the higher densities of colonies in the sites adjacent to the east.

Appendix D

Field Photographs



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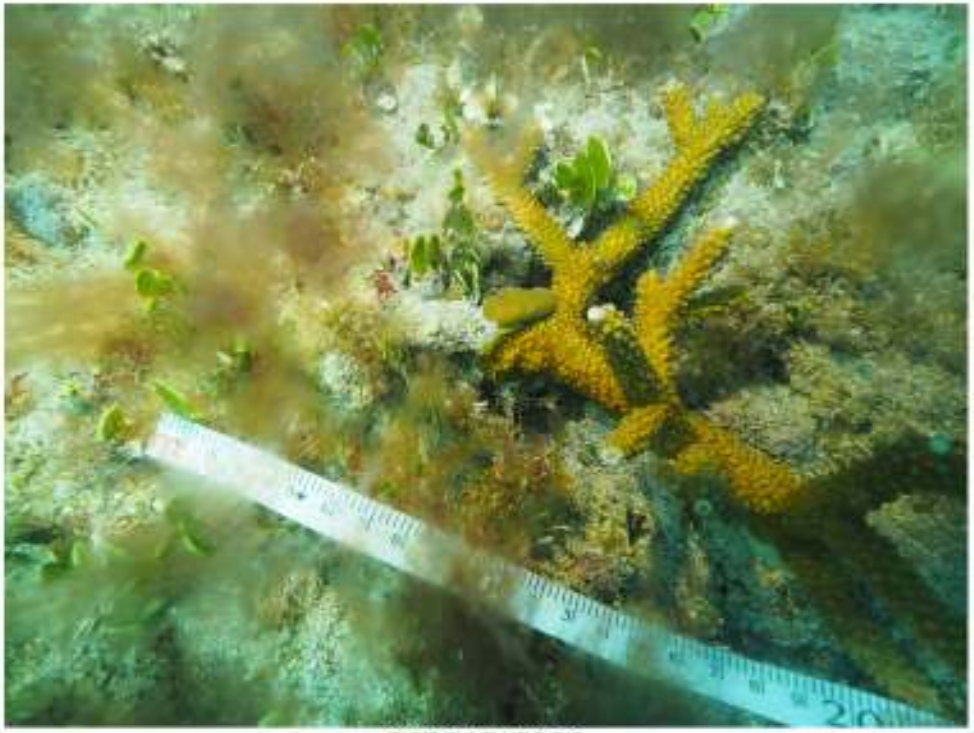

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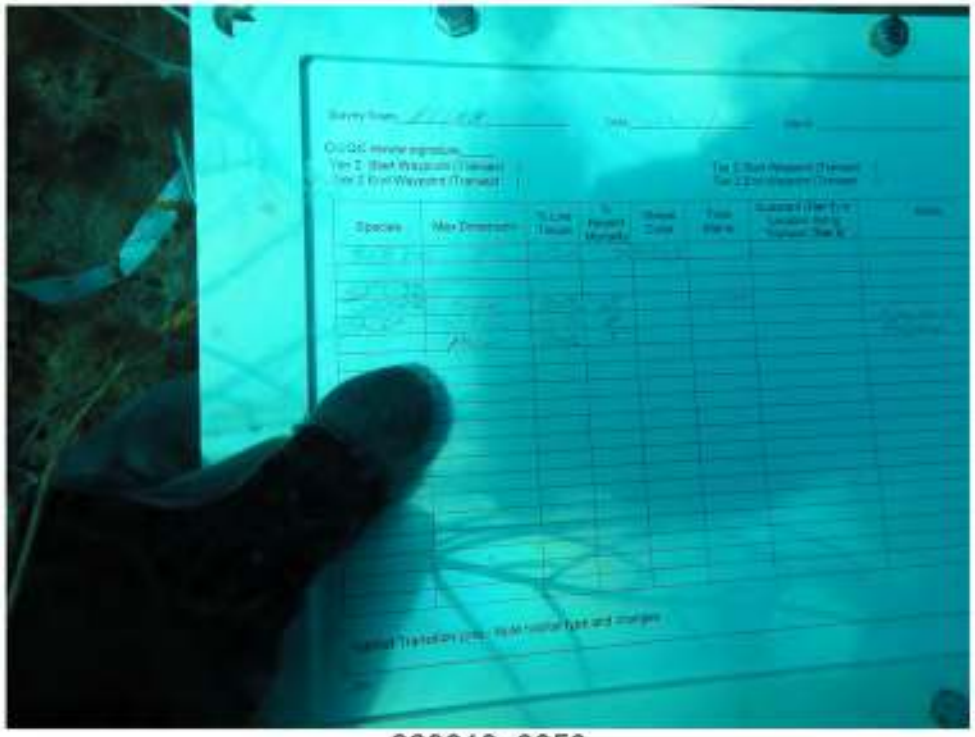

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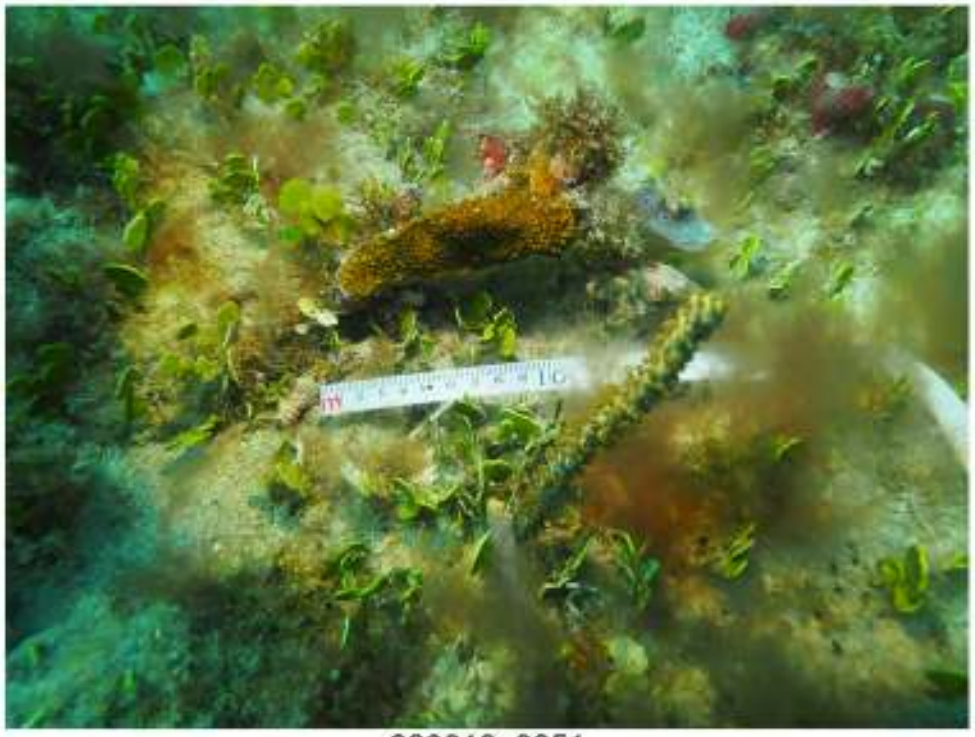

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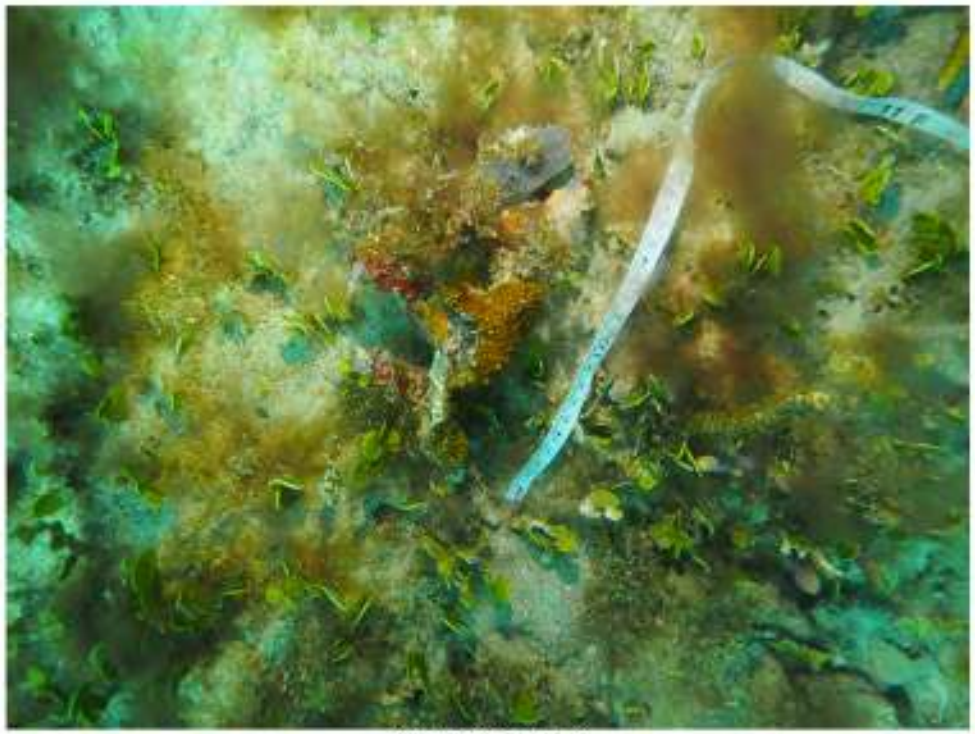

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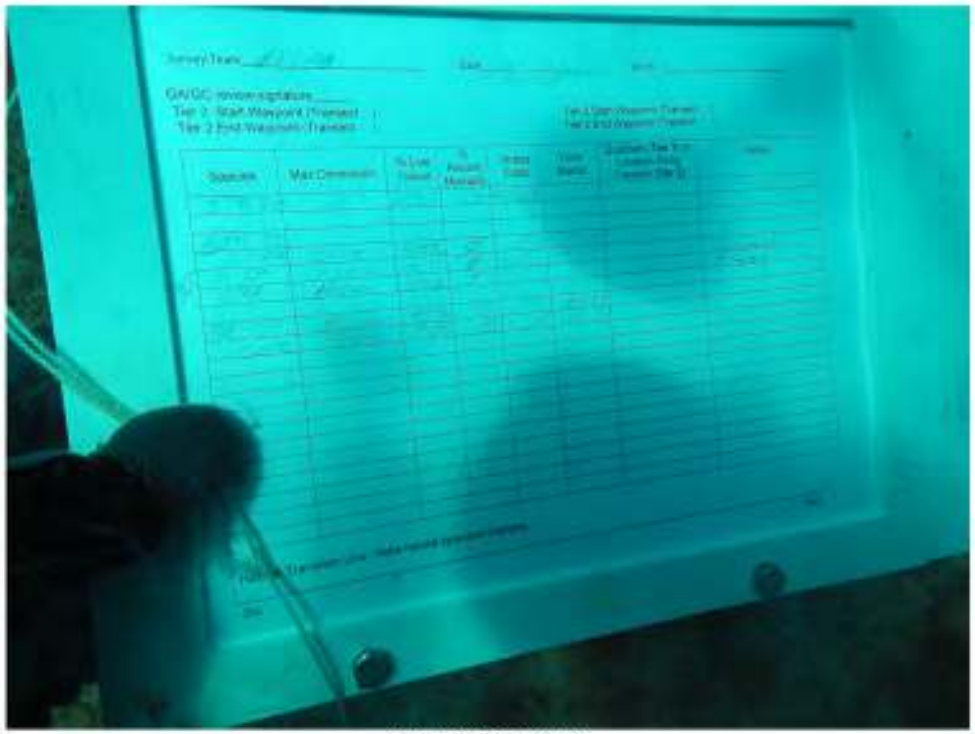

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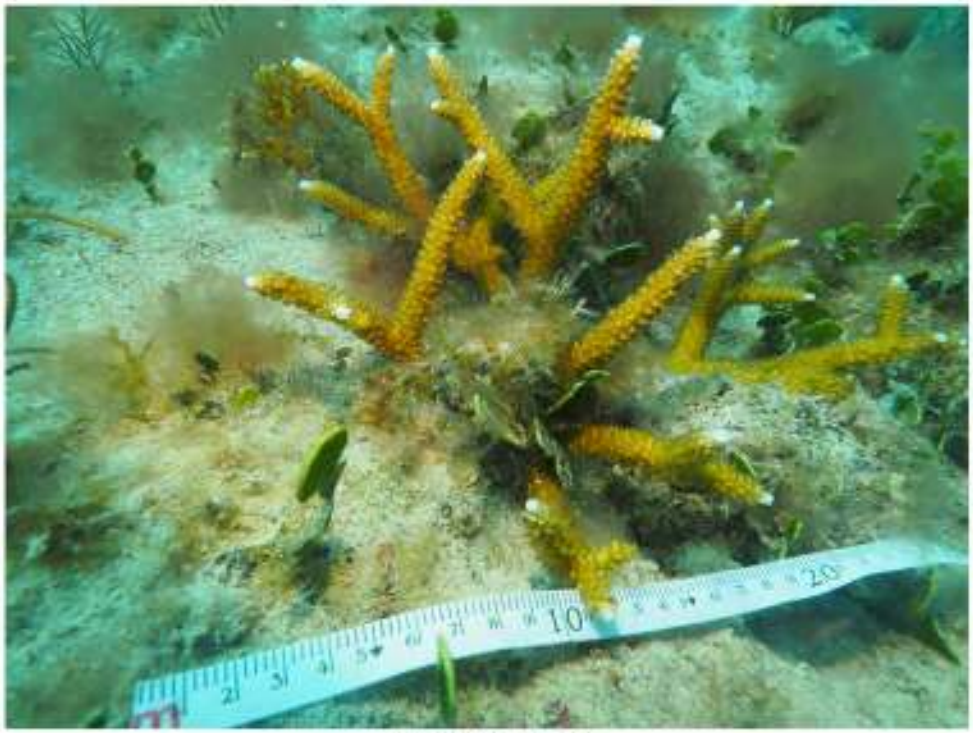

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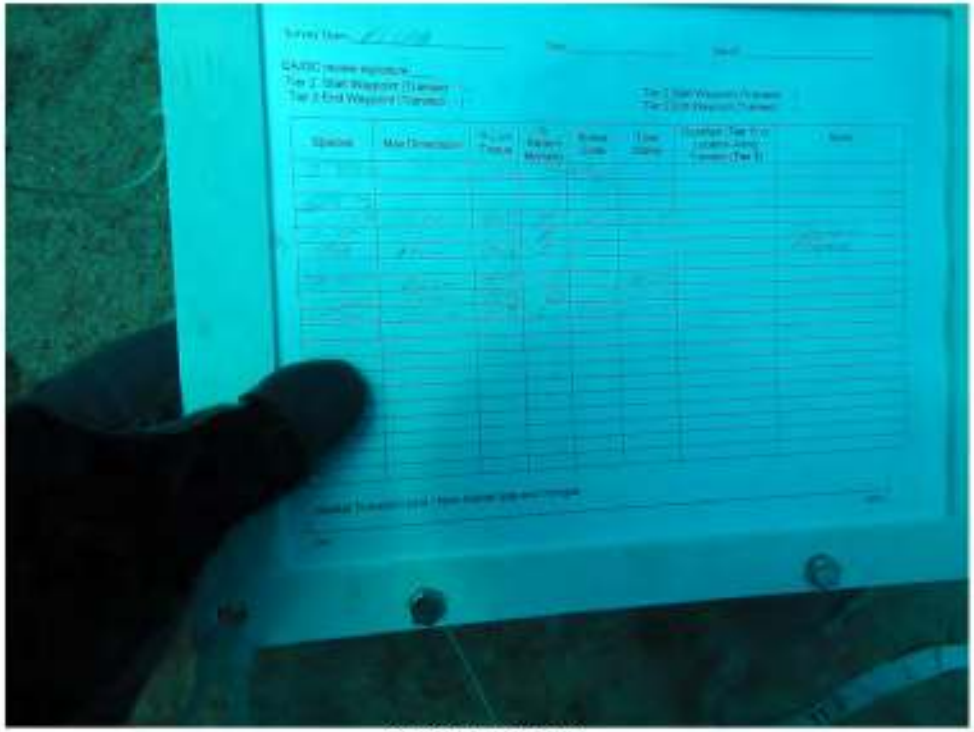

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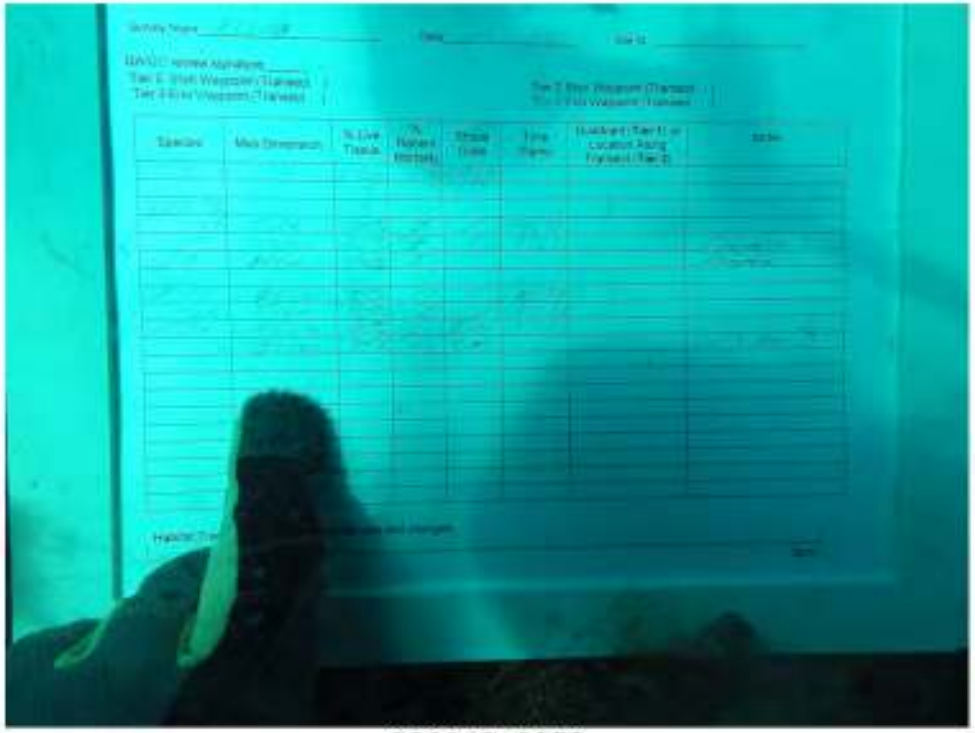

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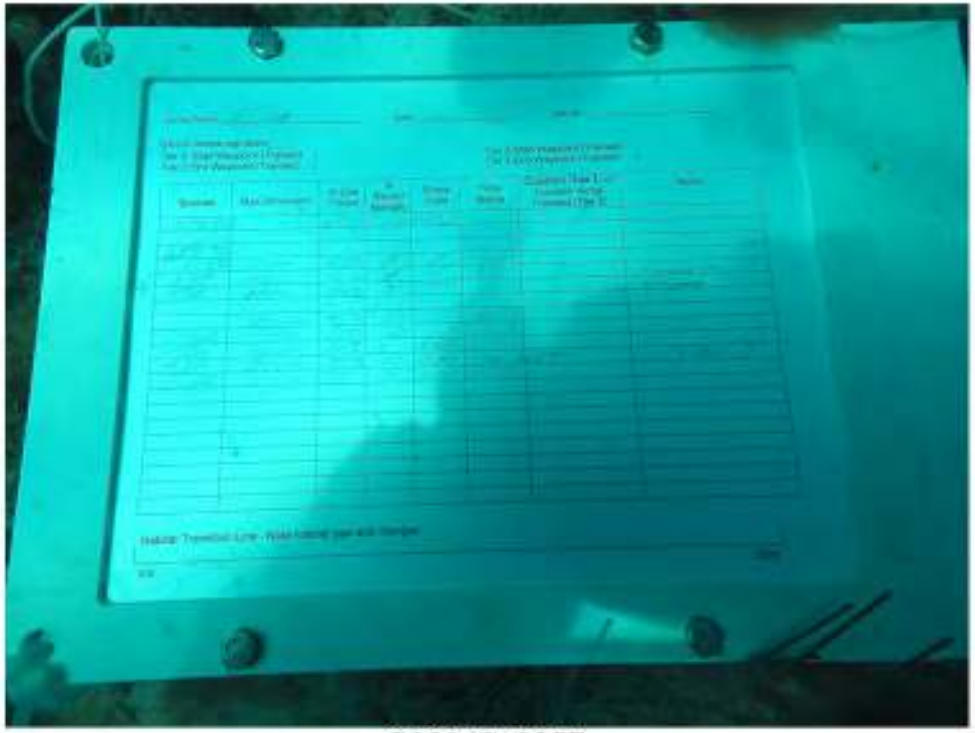

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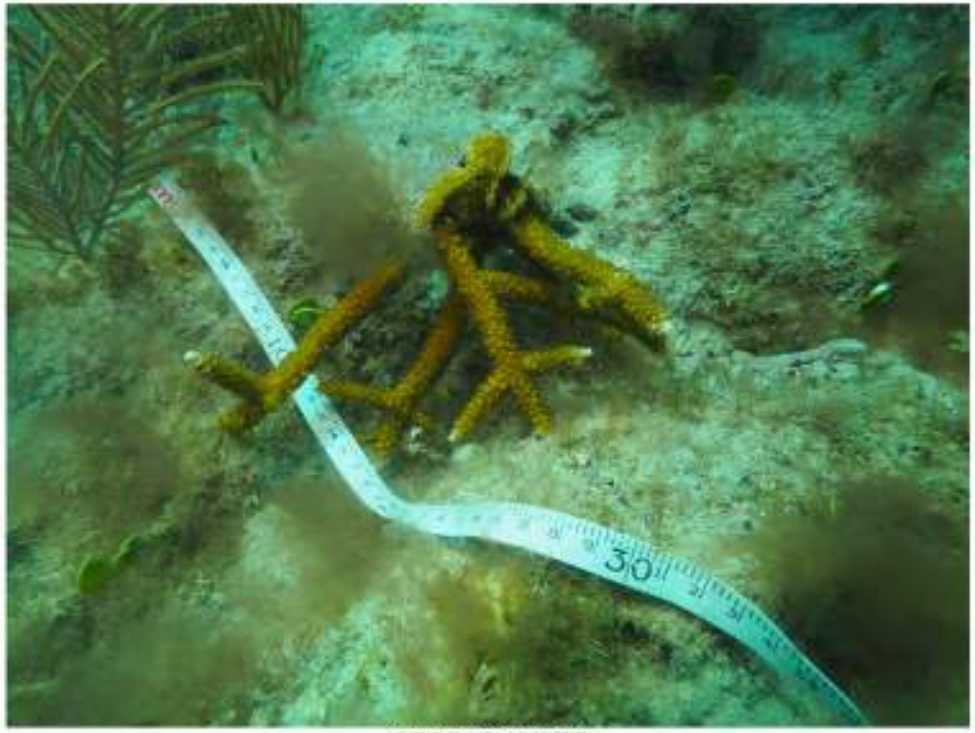

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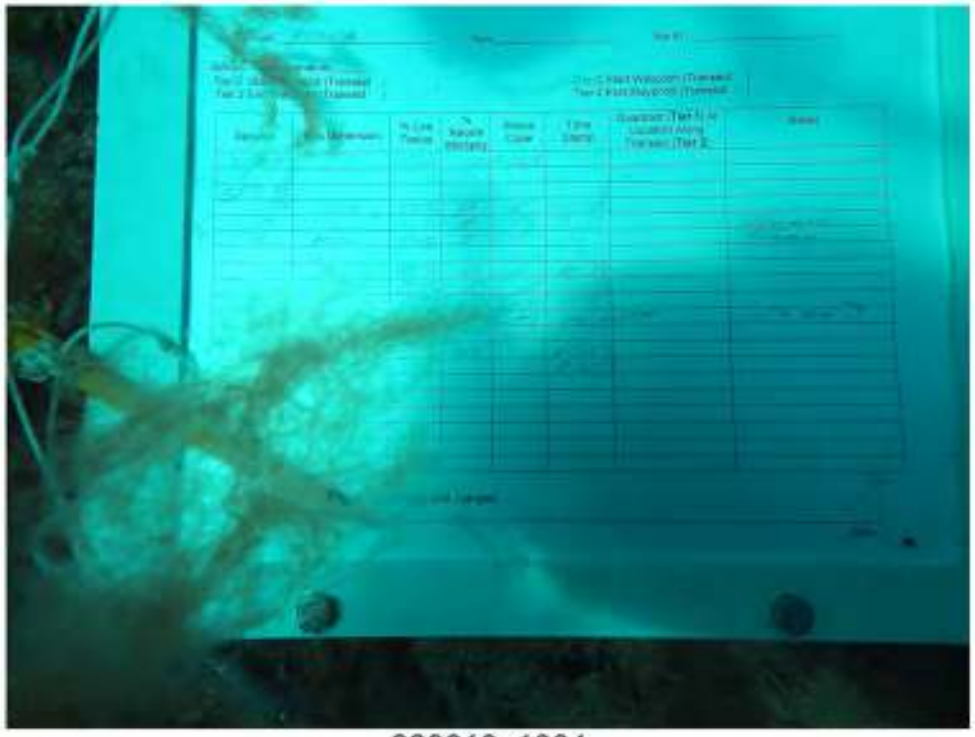

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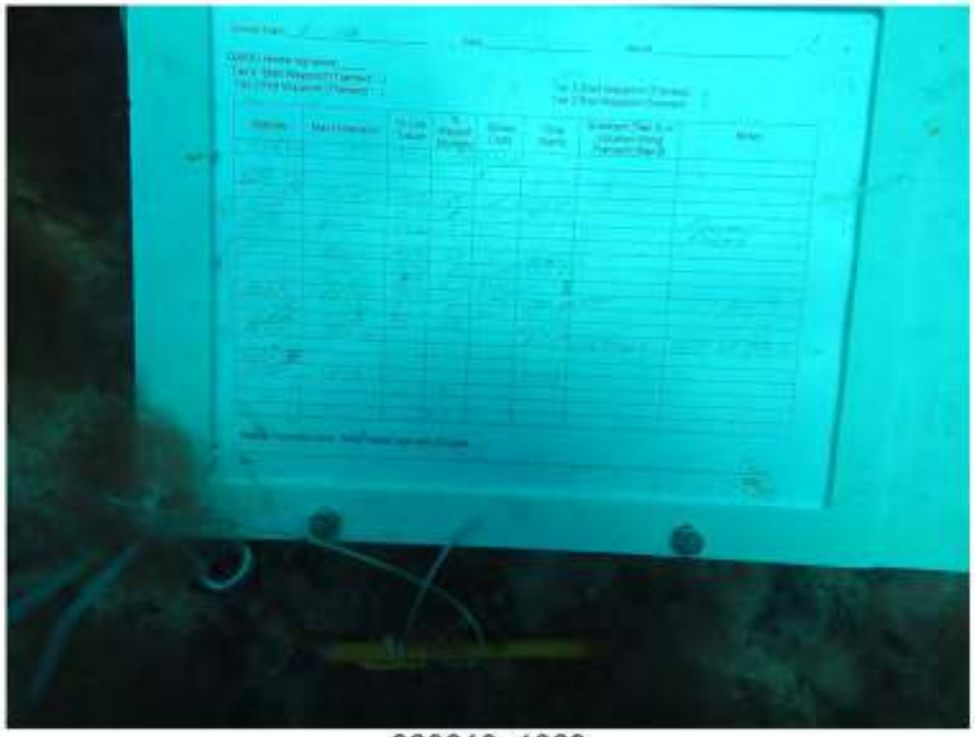

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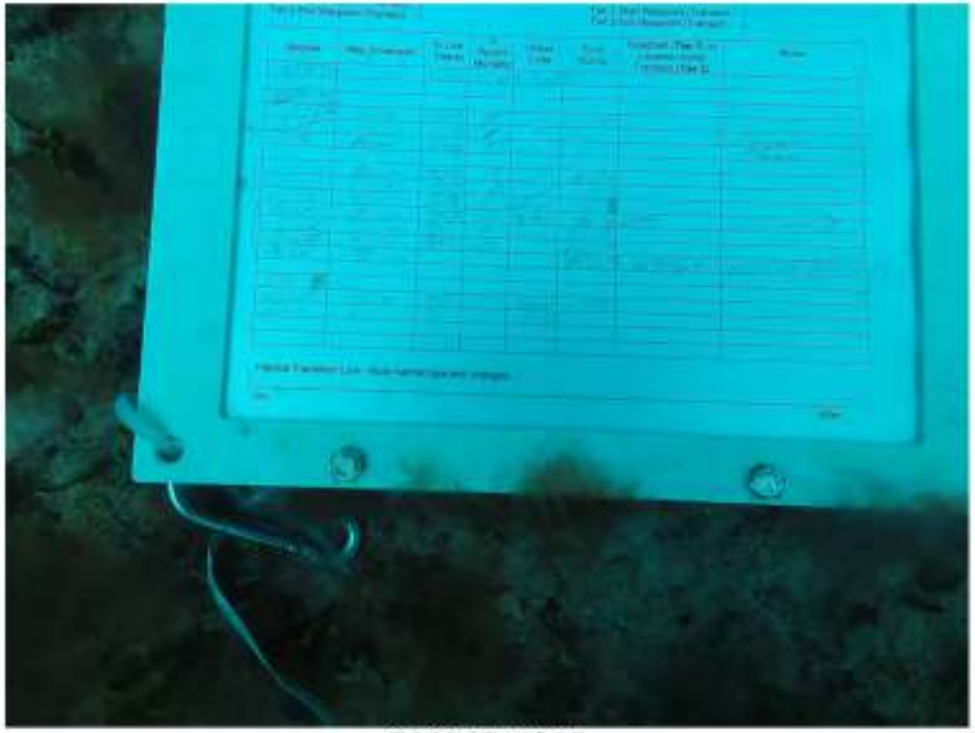

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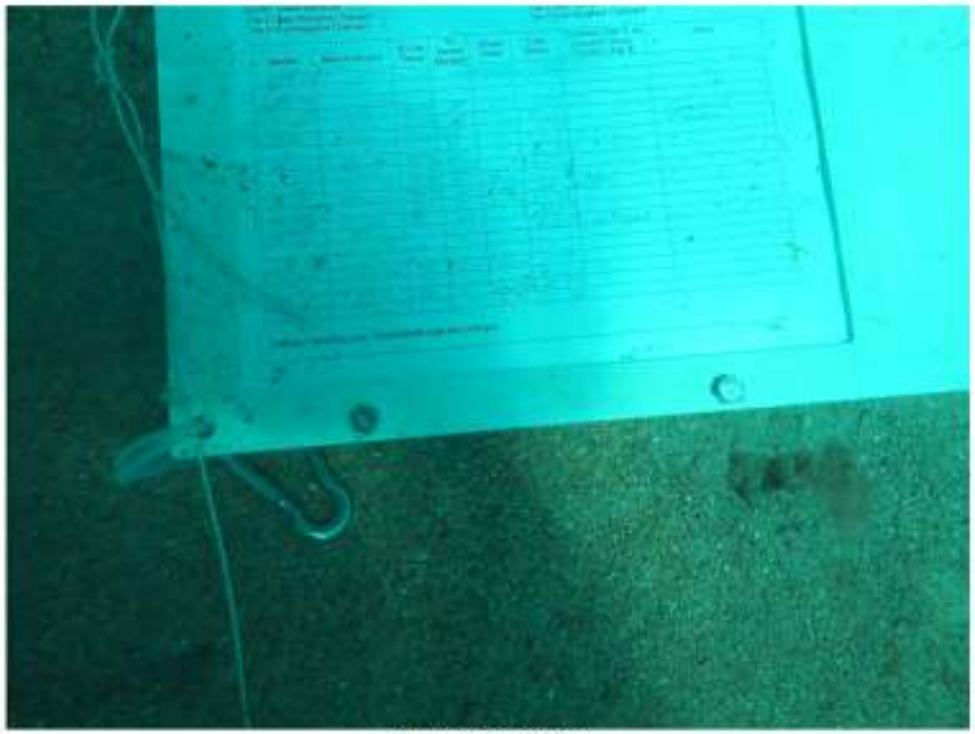

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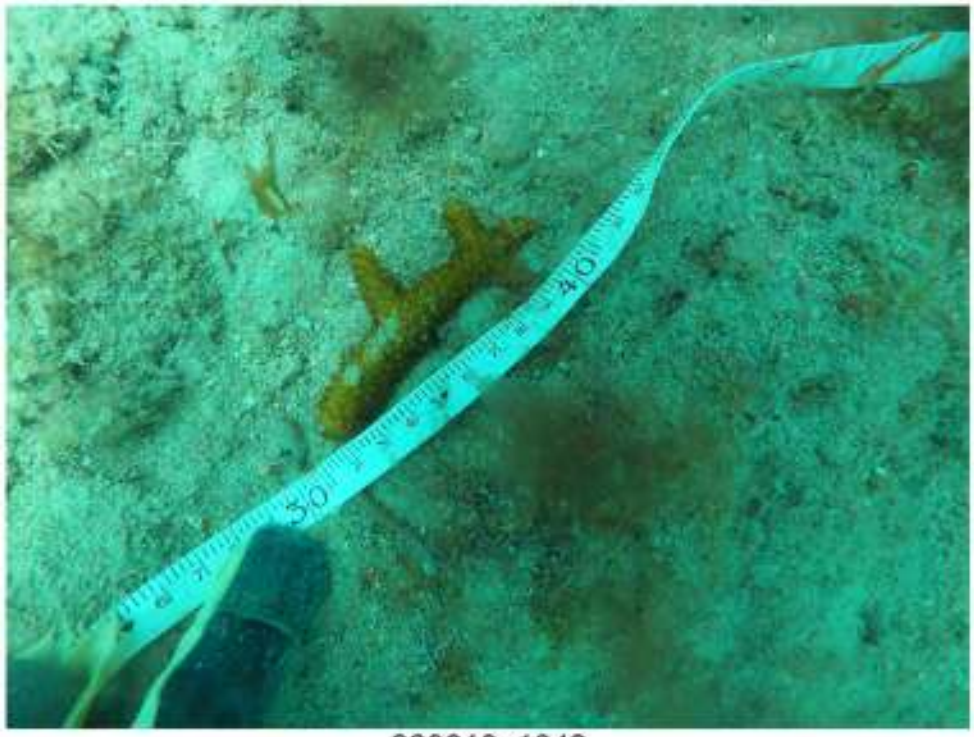

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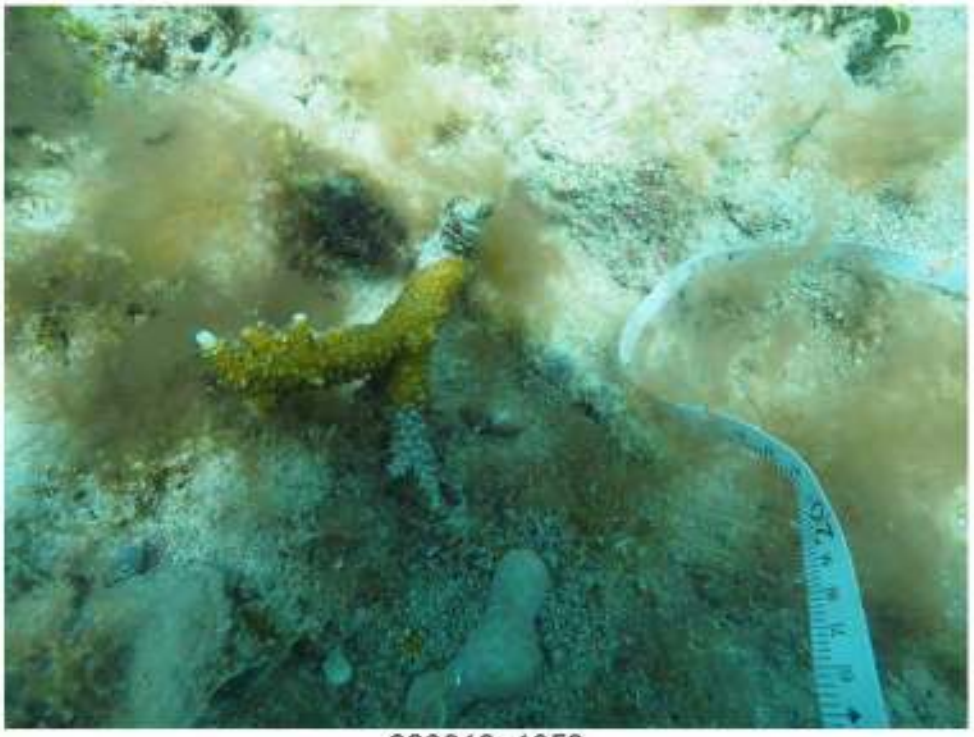

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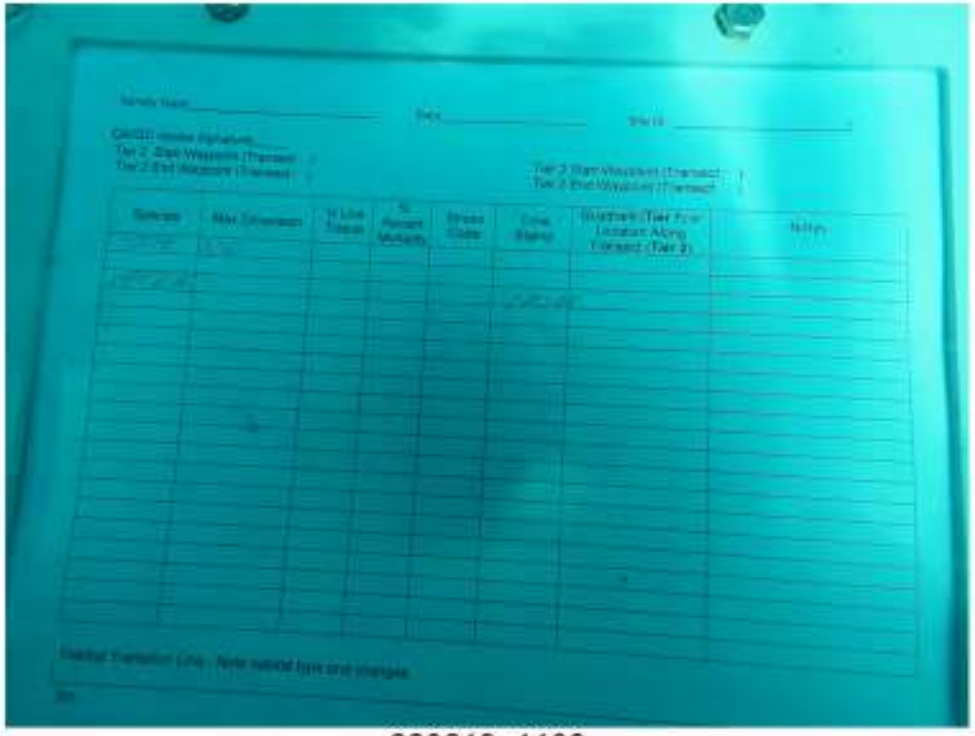

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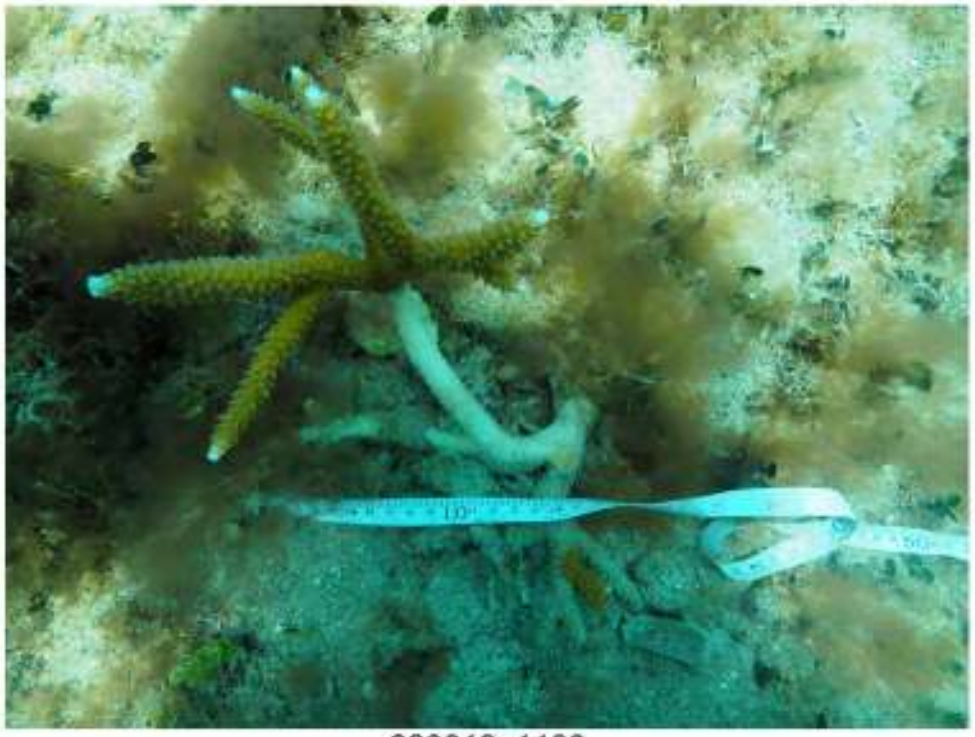

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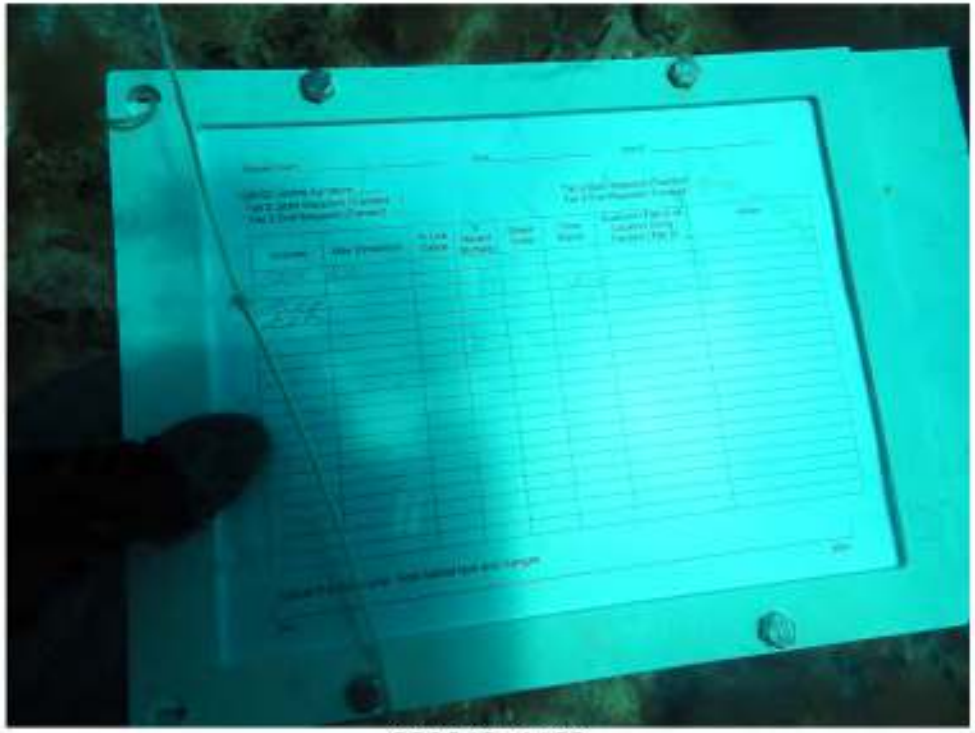

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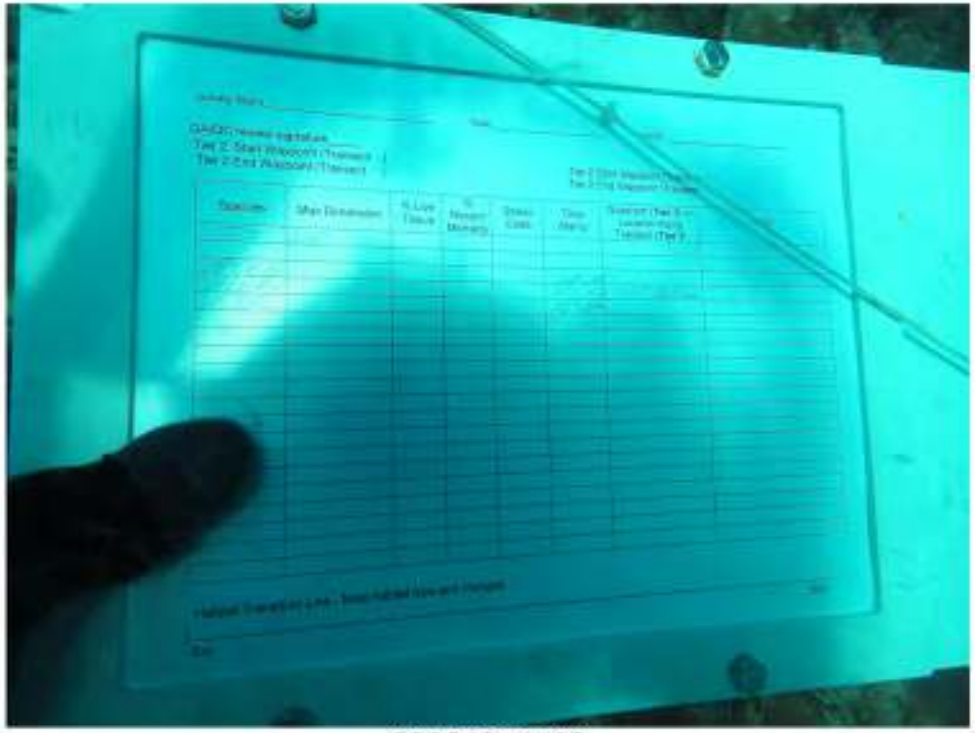

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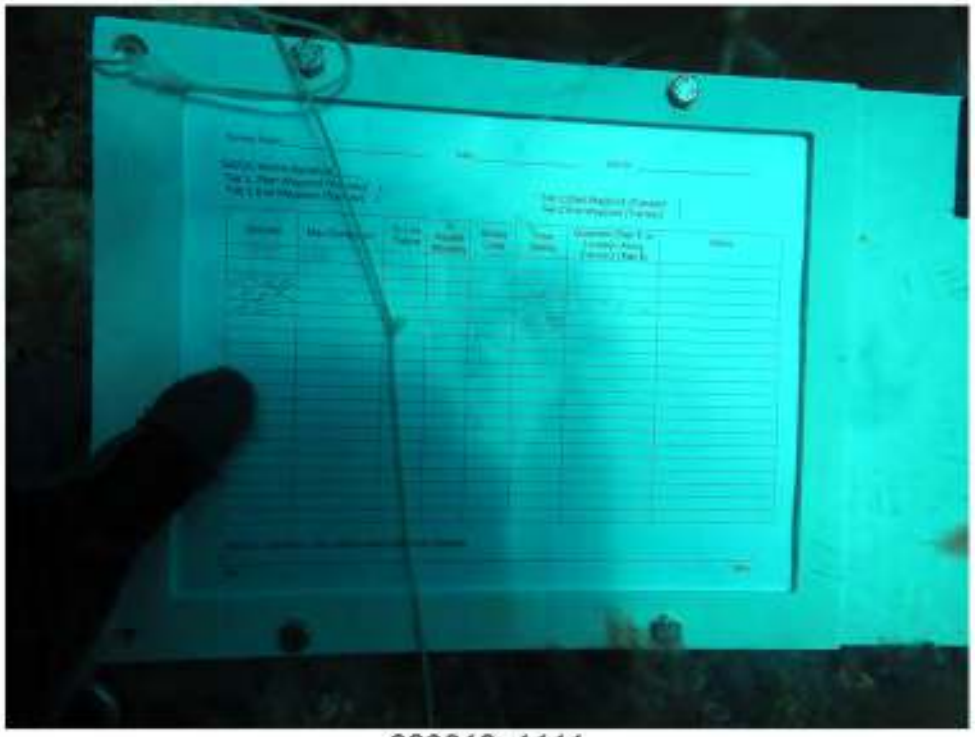

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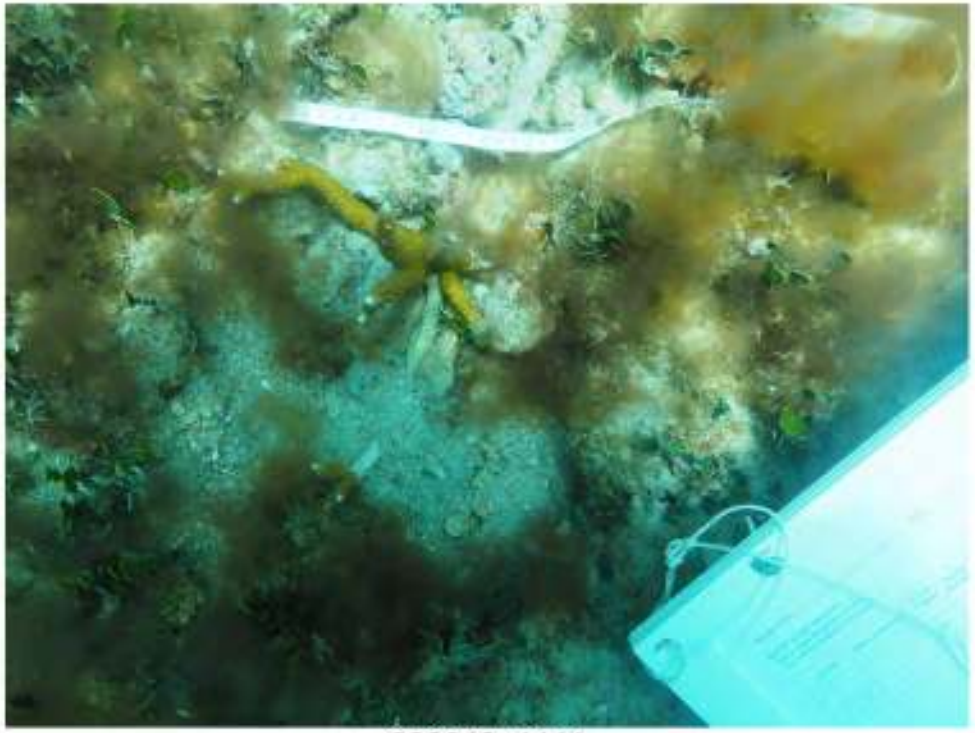

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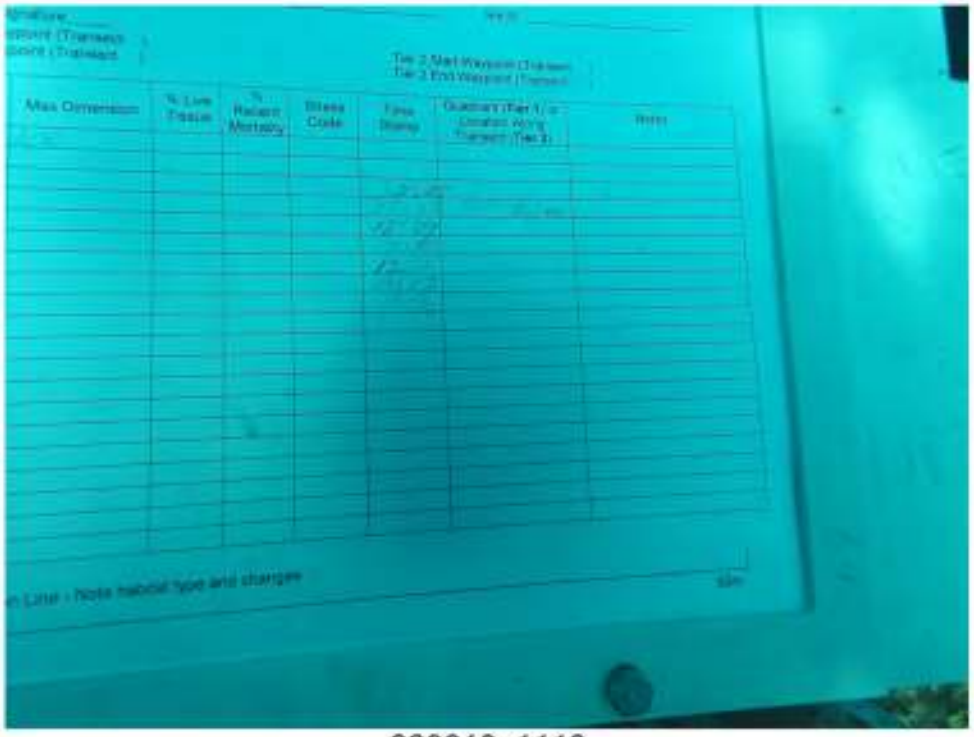

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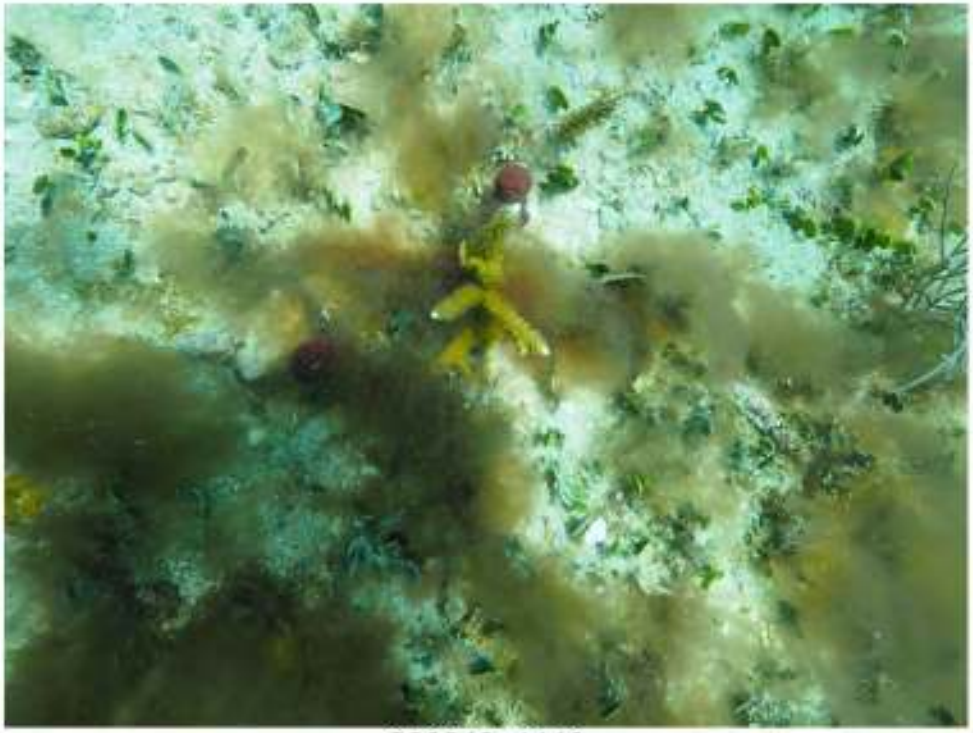

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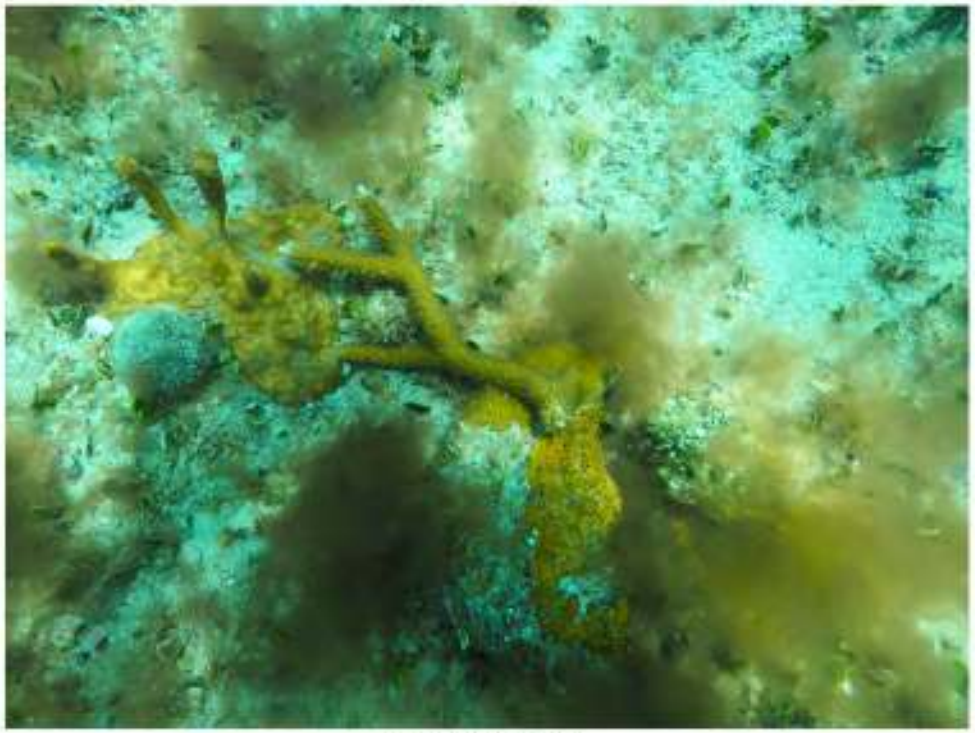

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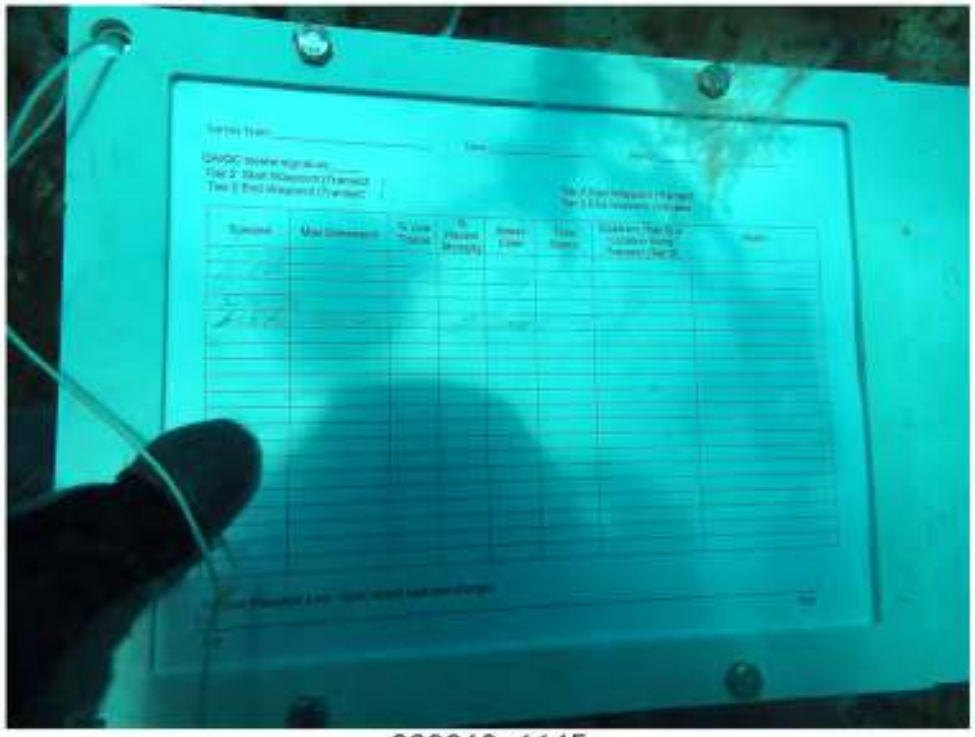

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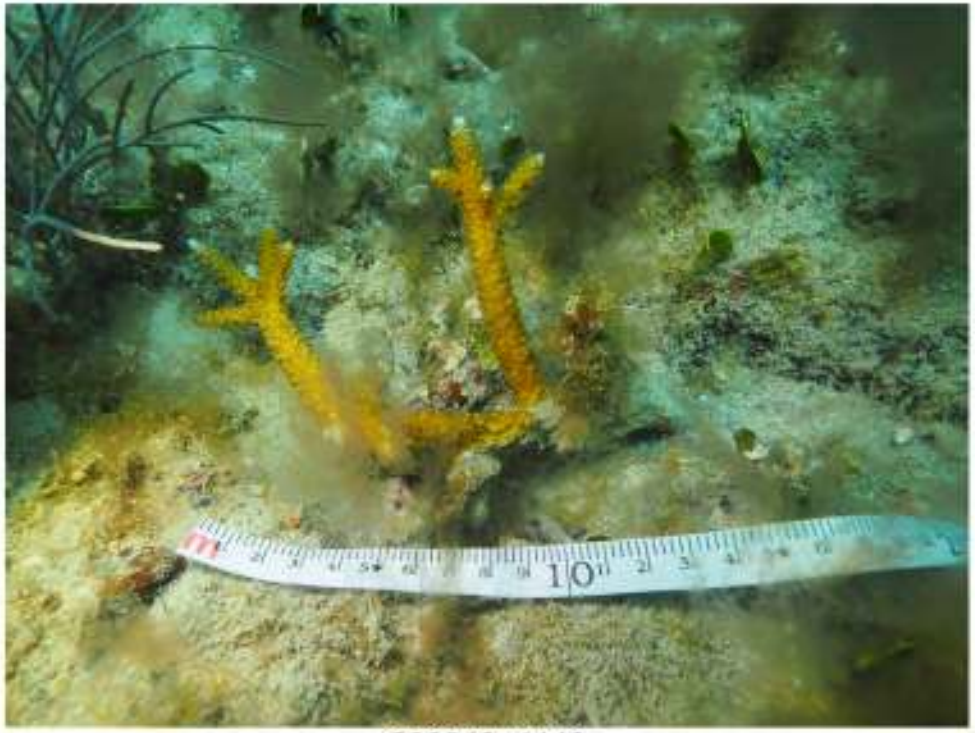

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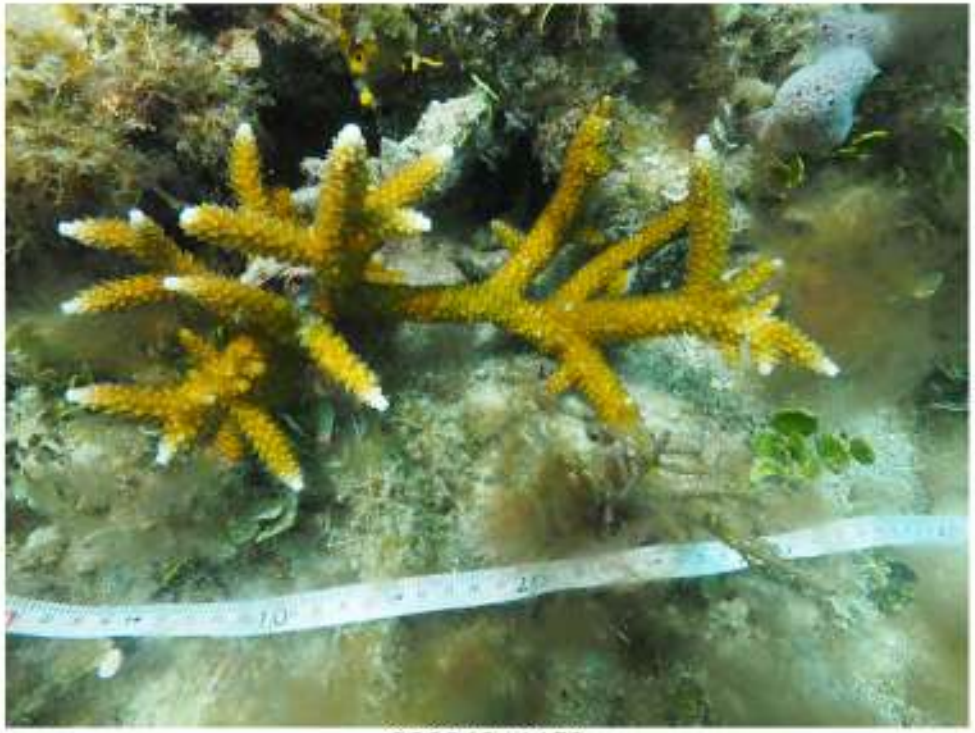

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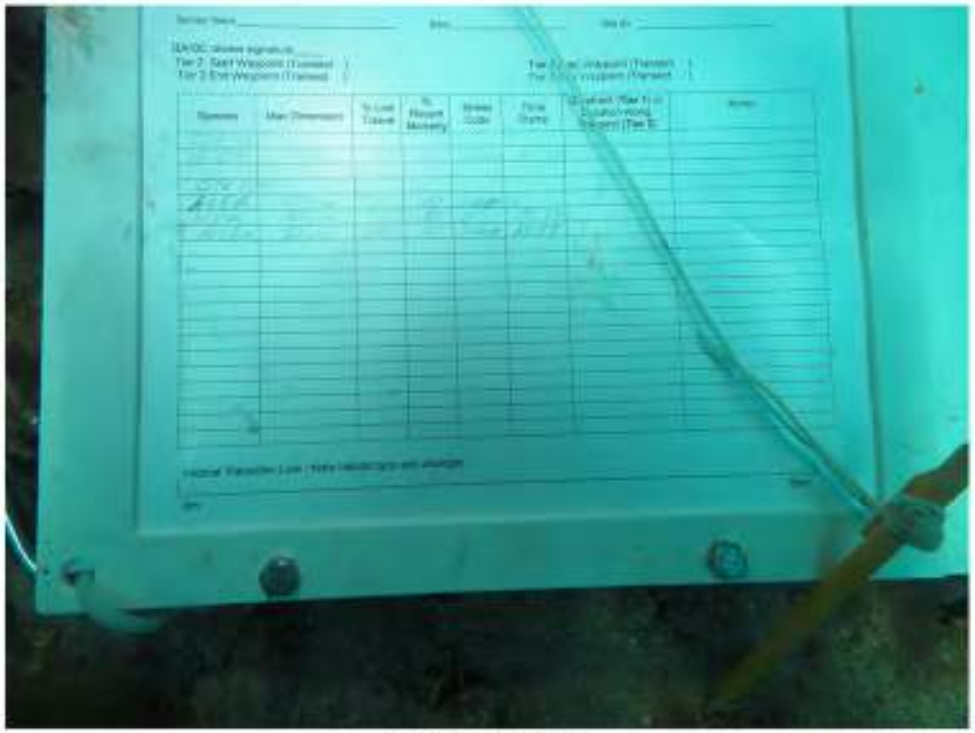

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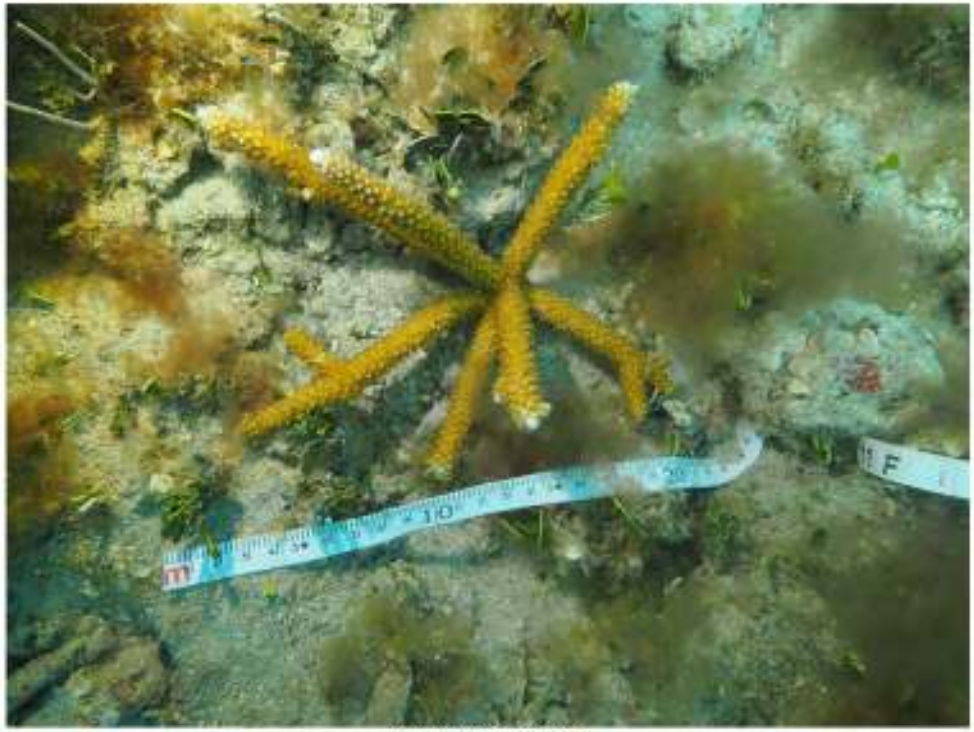

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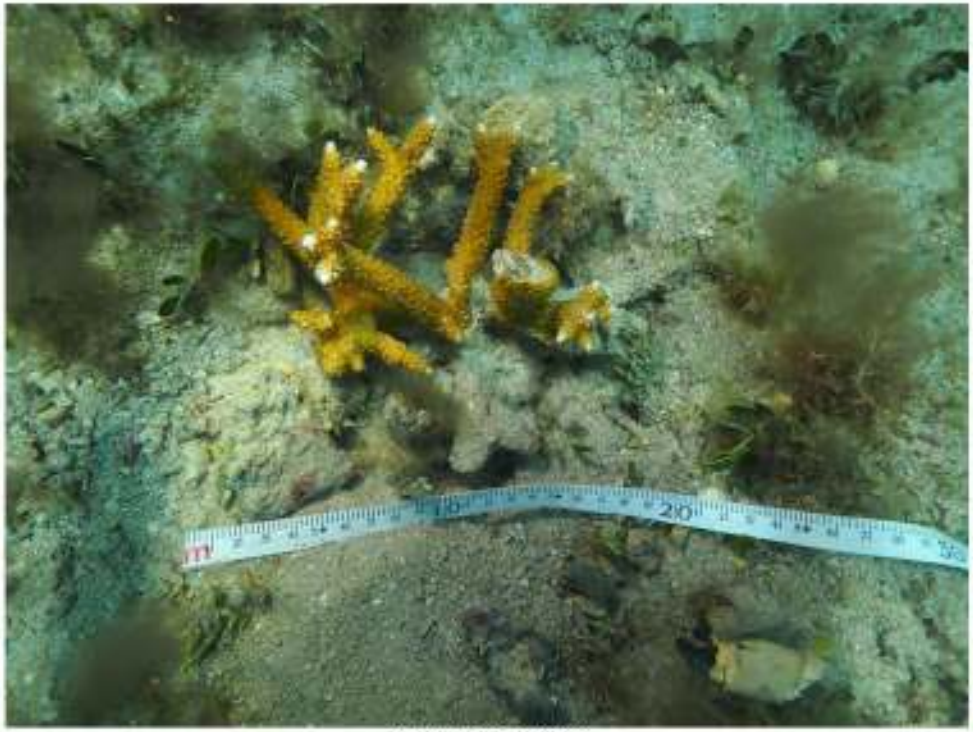

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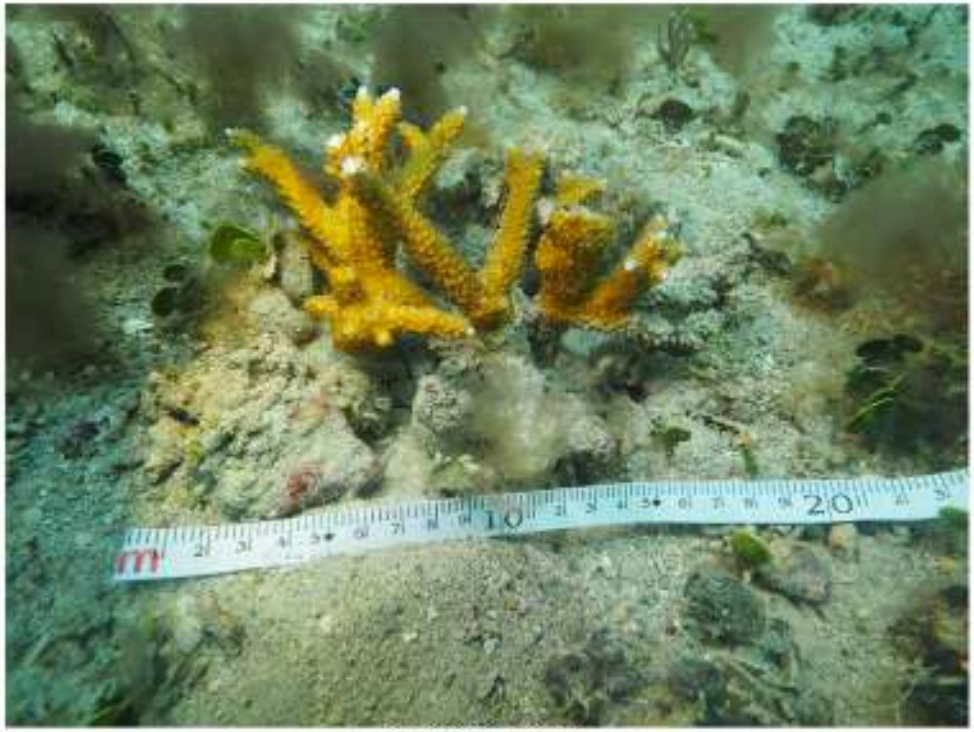

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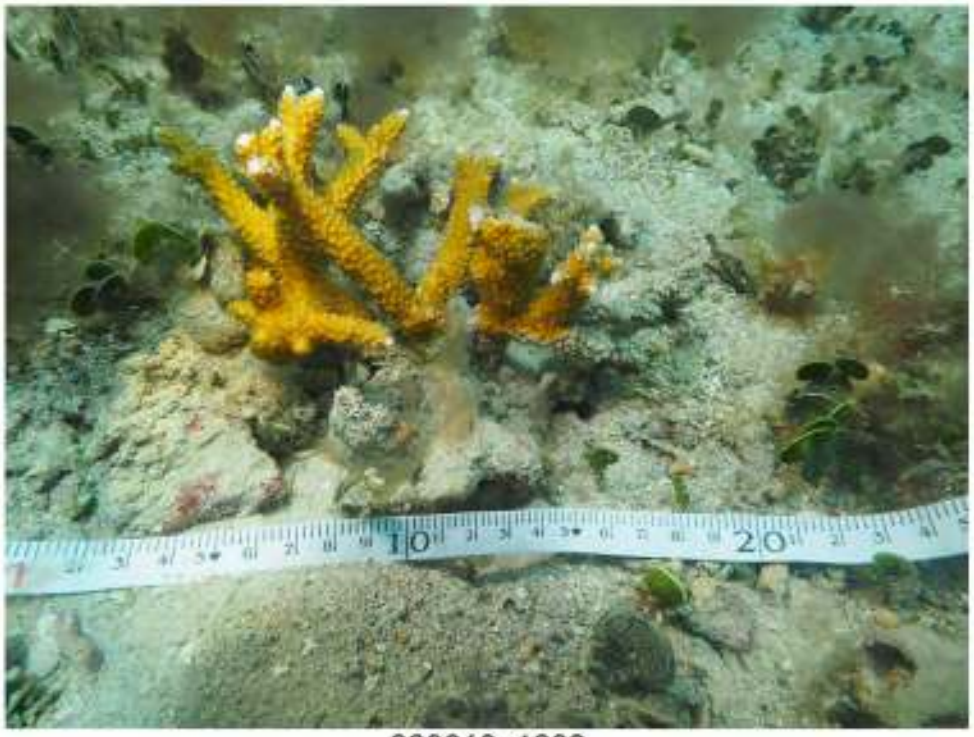

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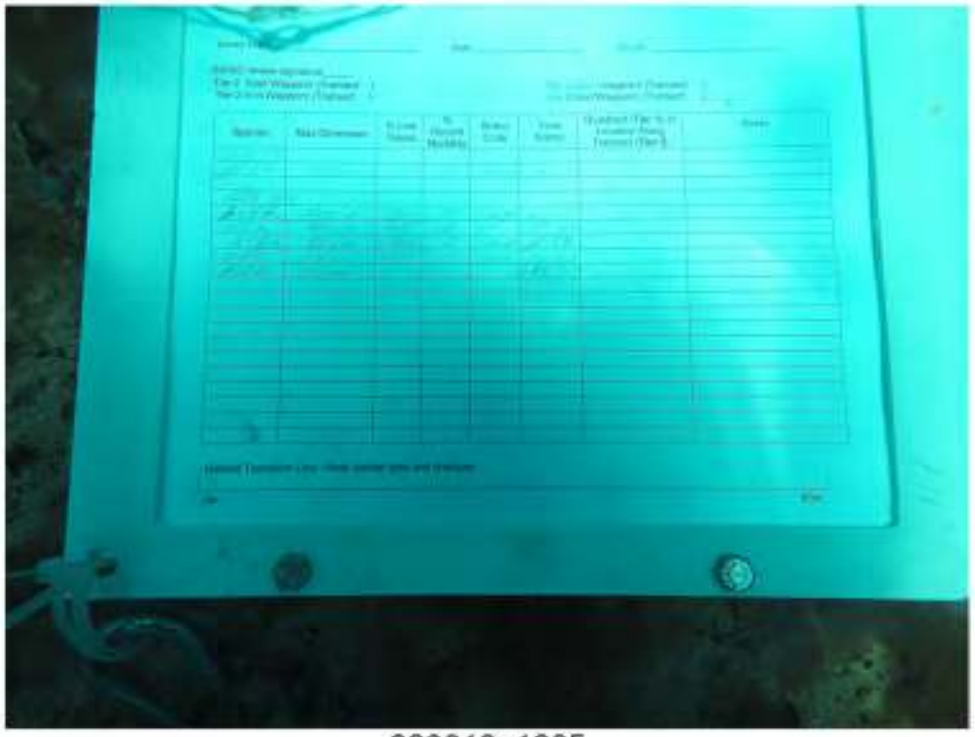

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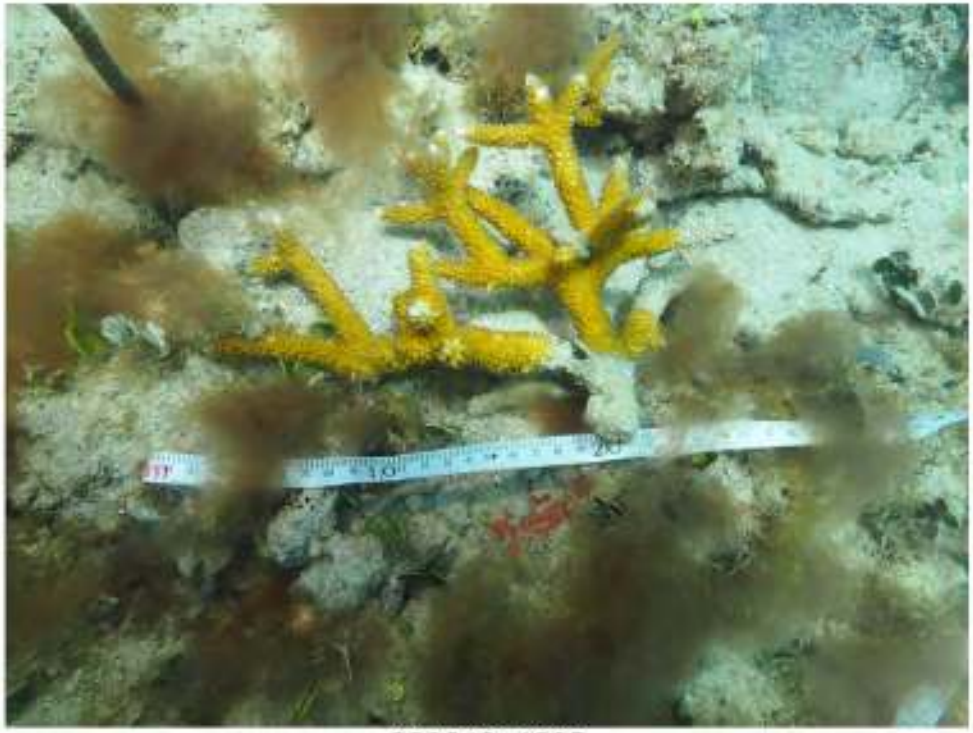

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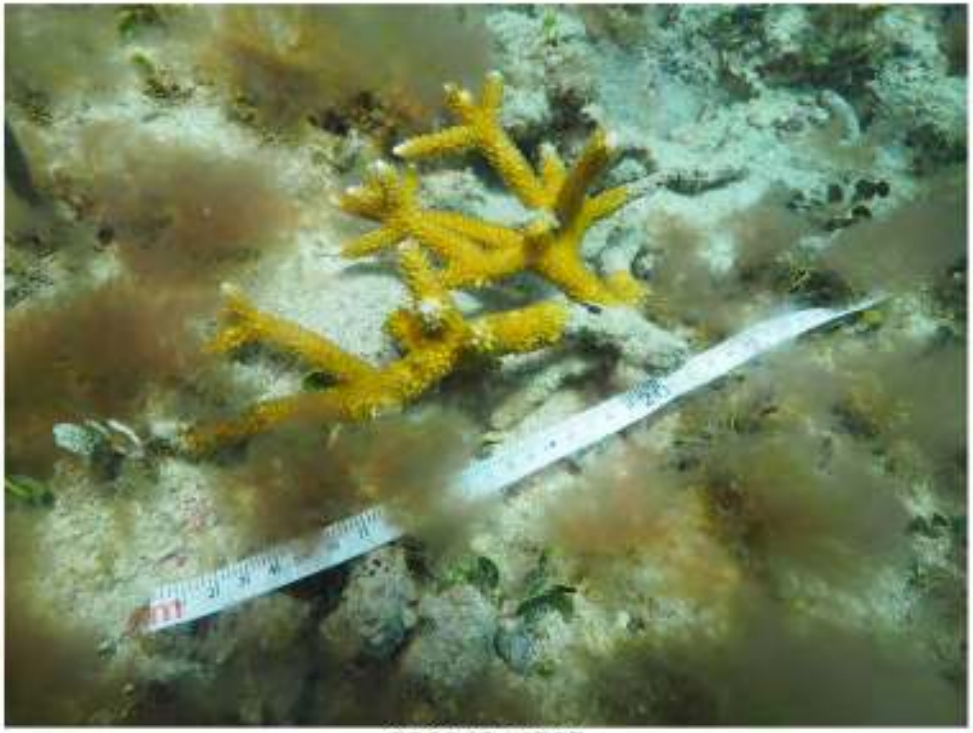

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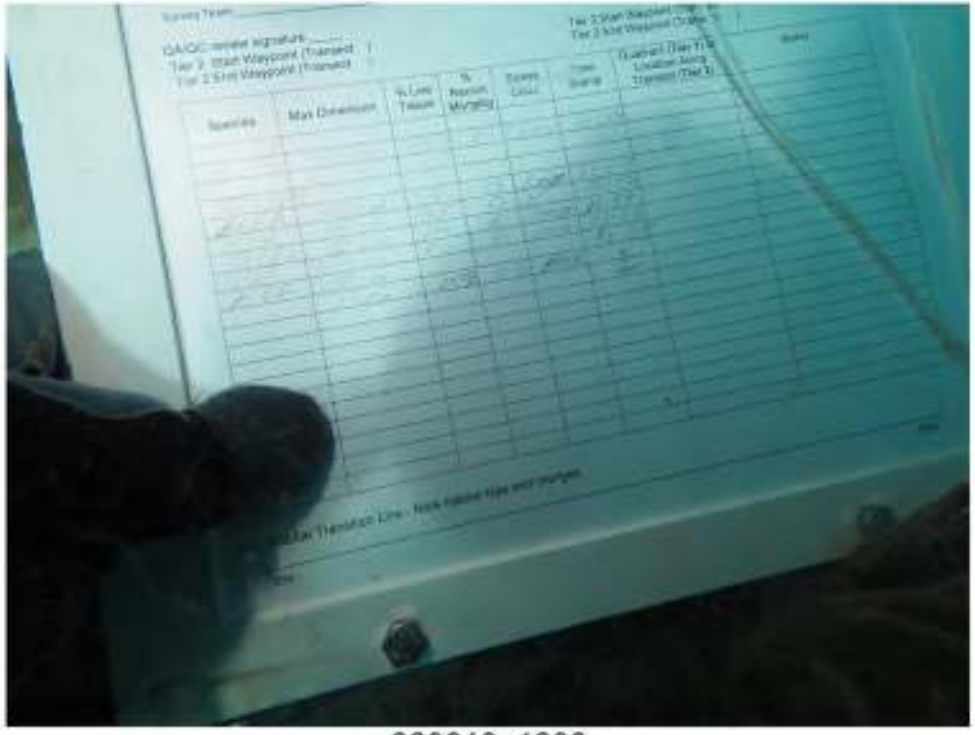

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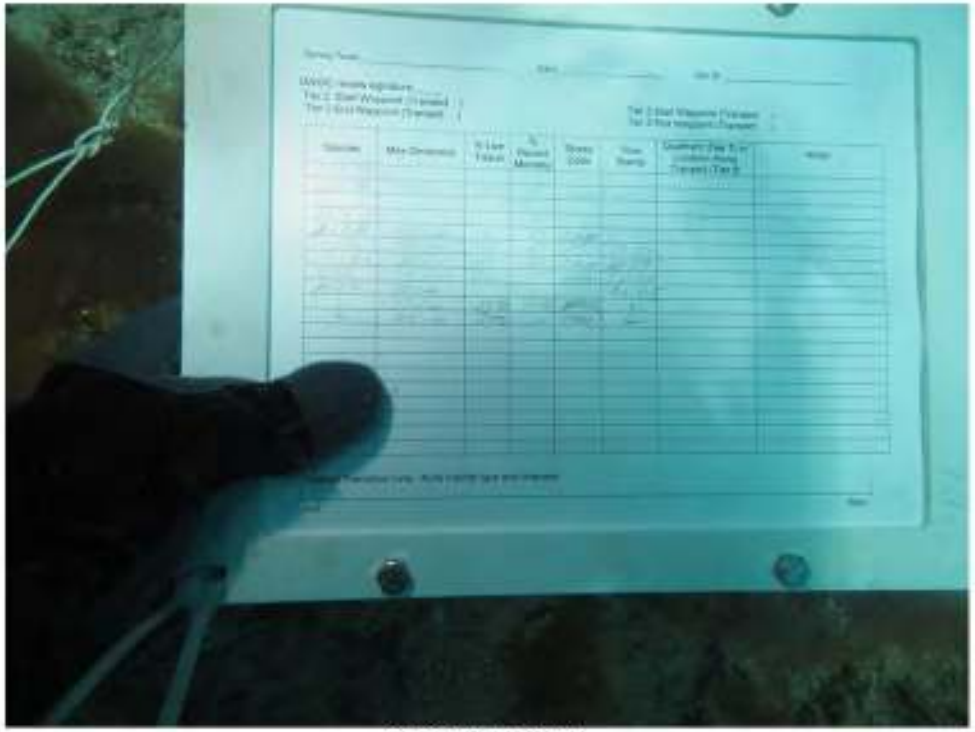

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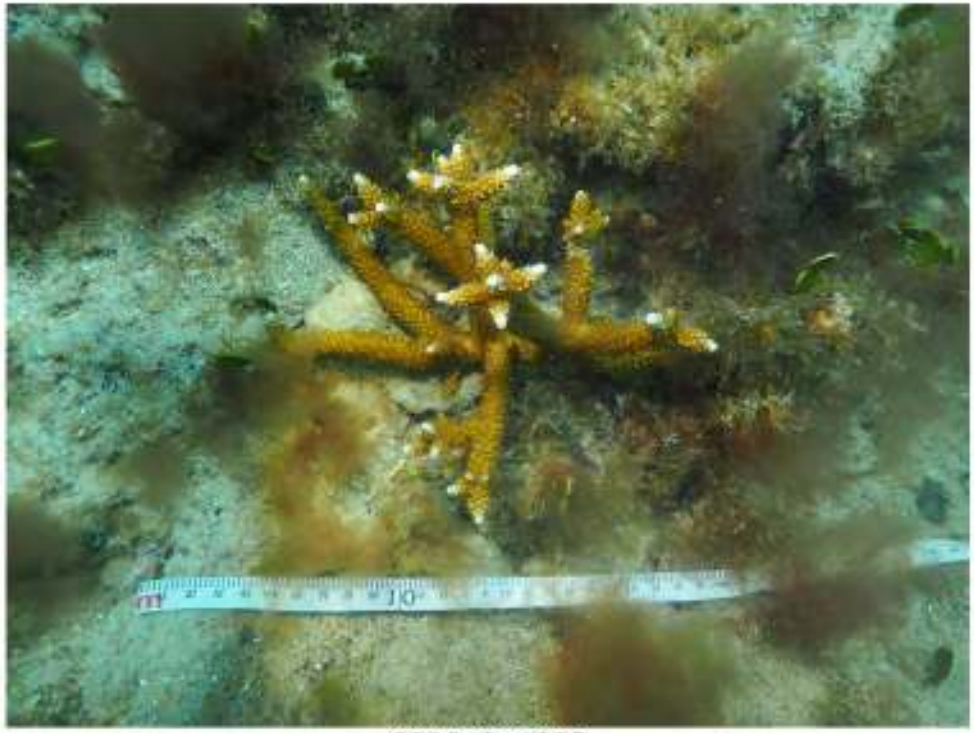

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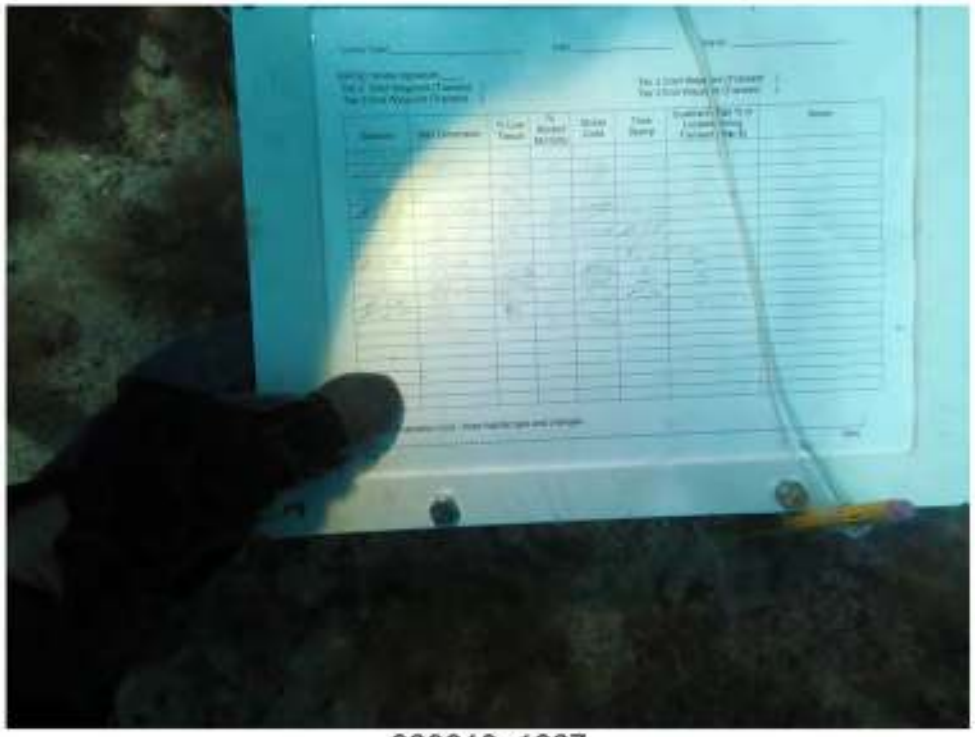

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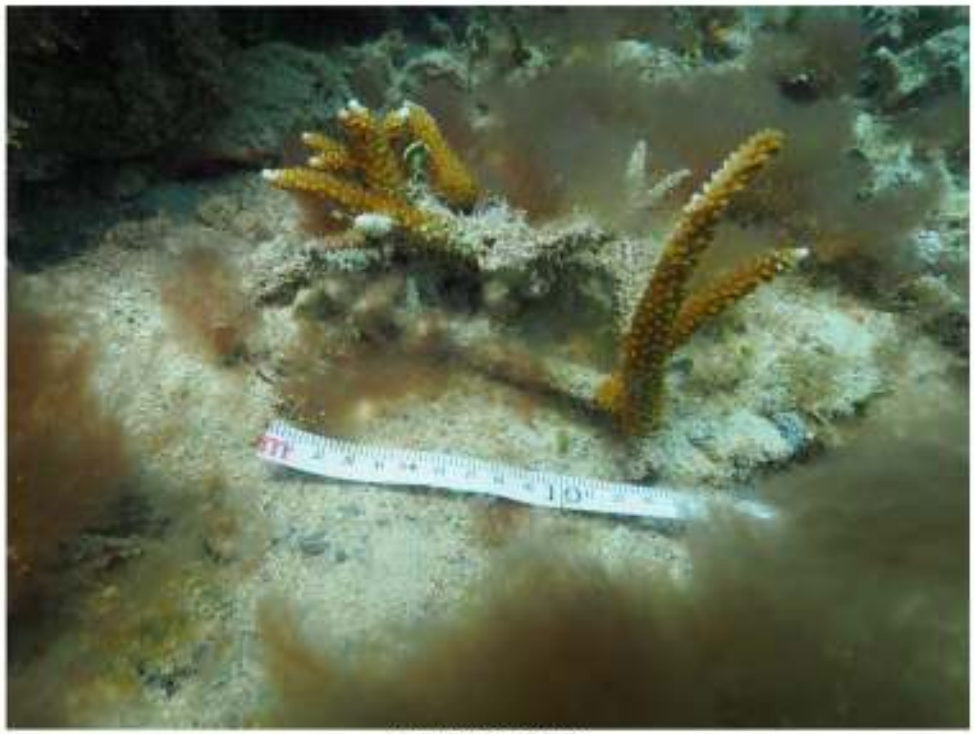

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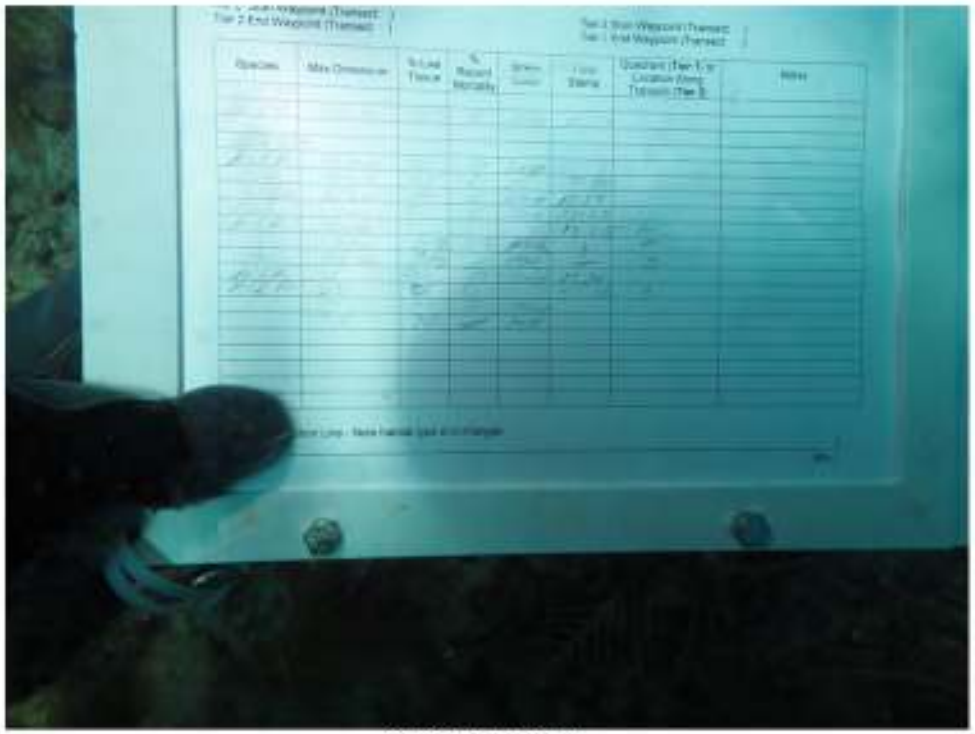

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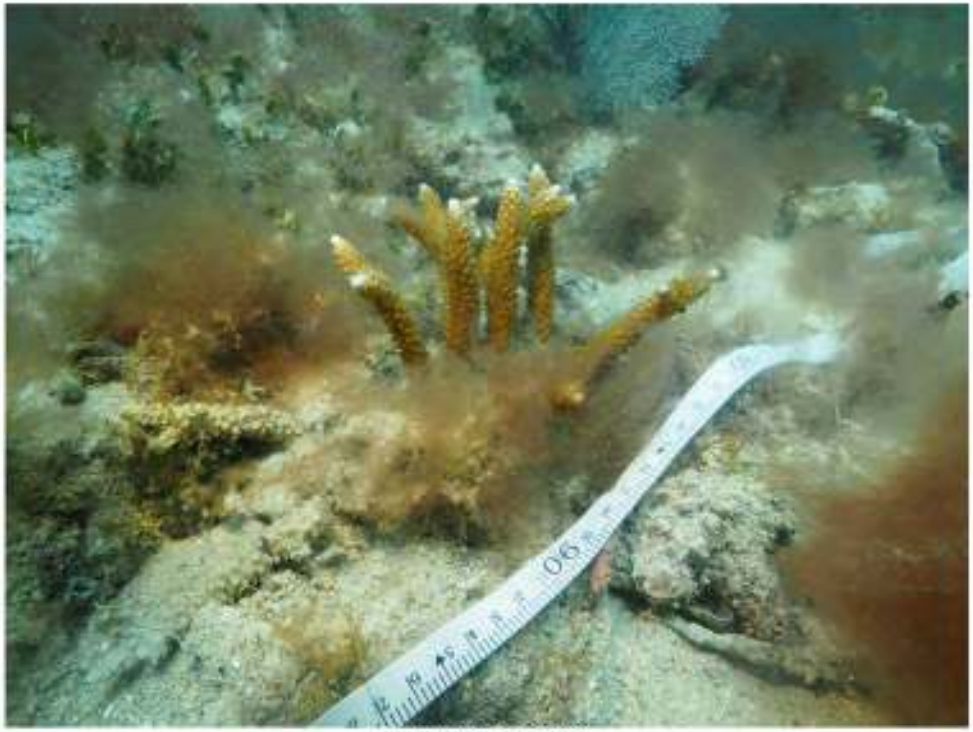

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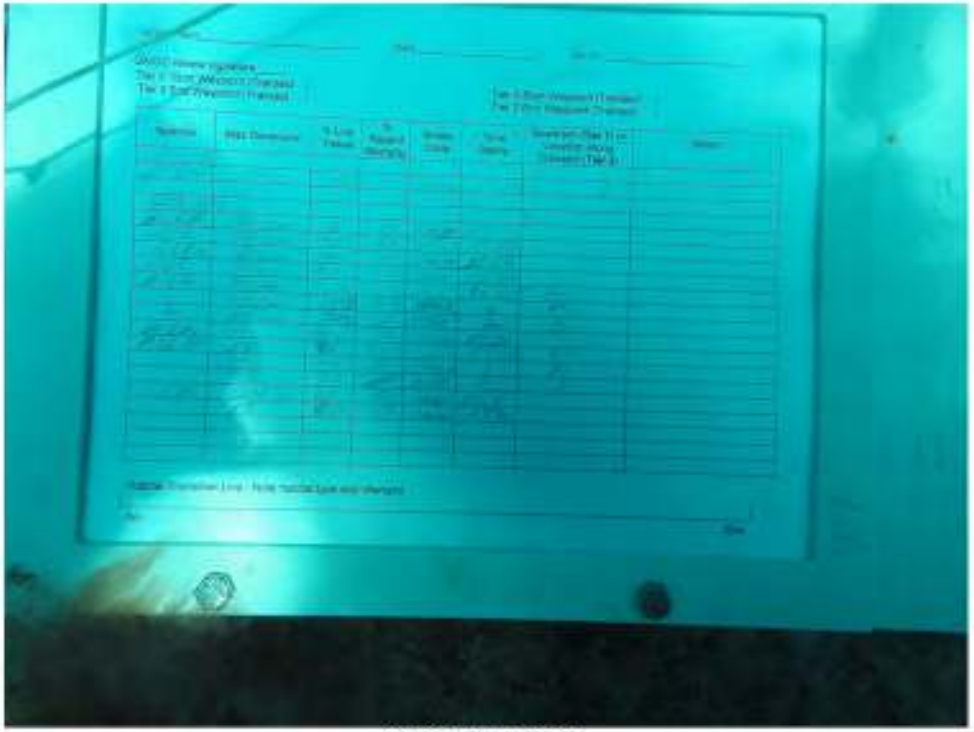

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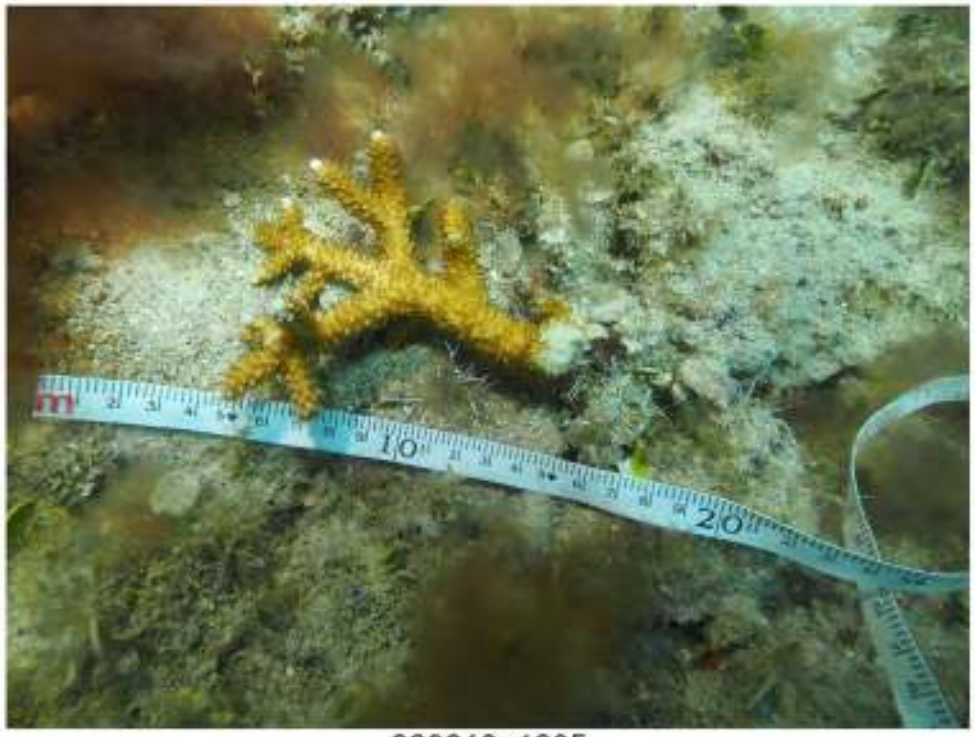

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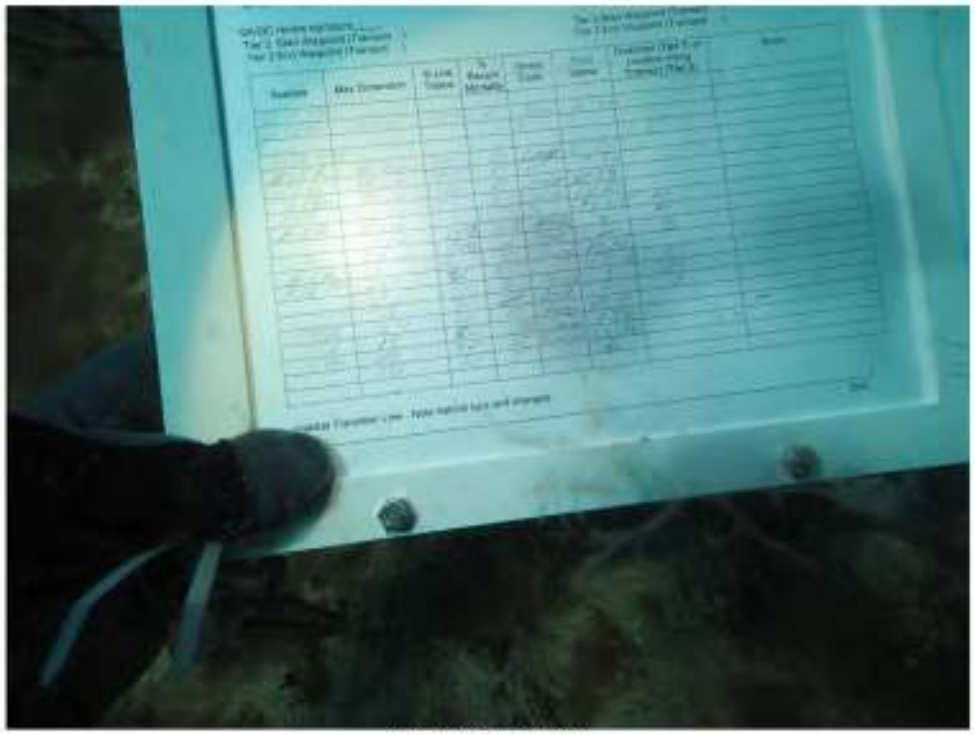

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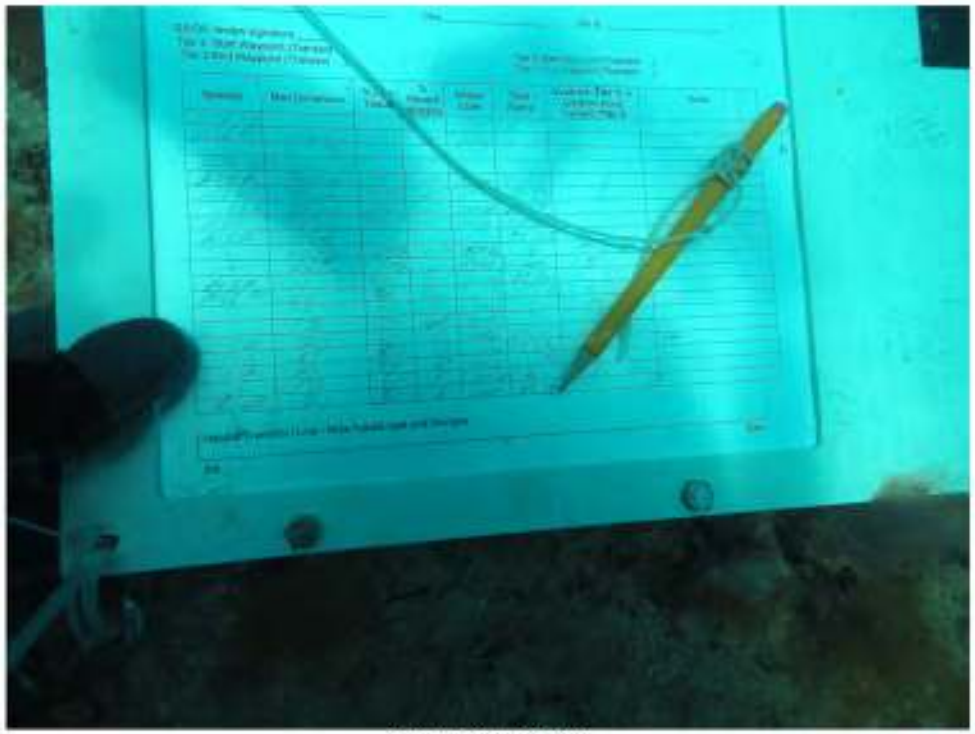

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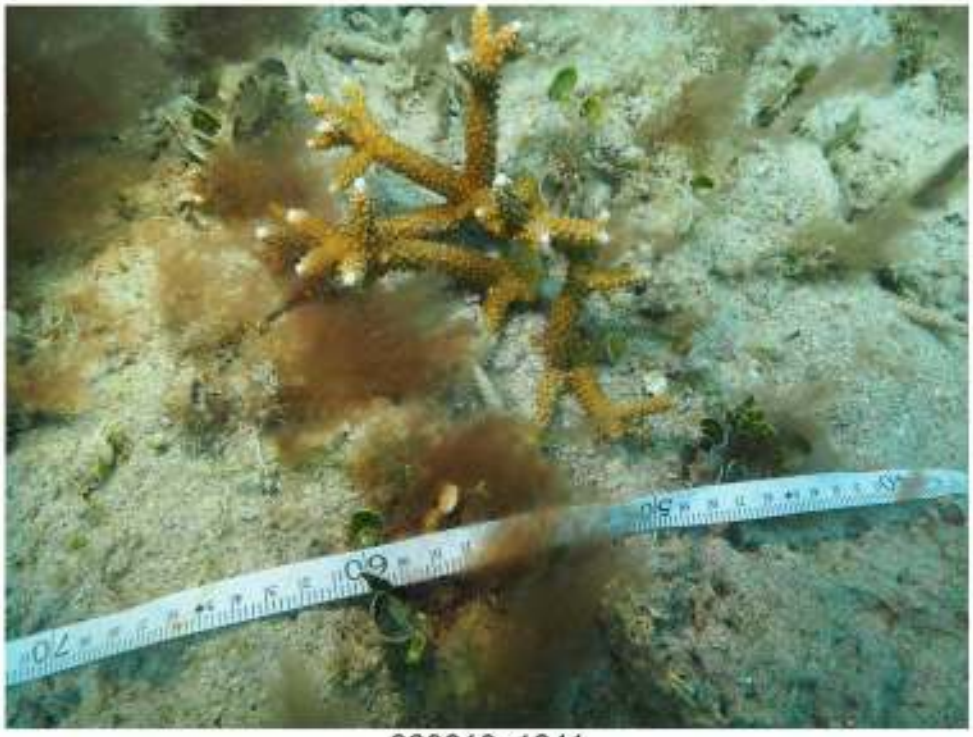

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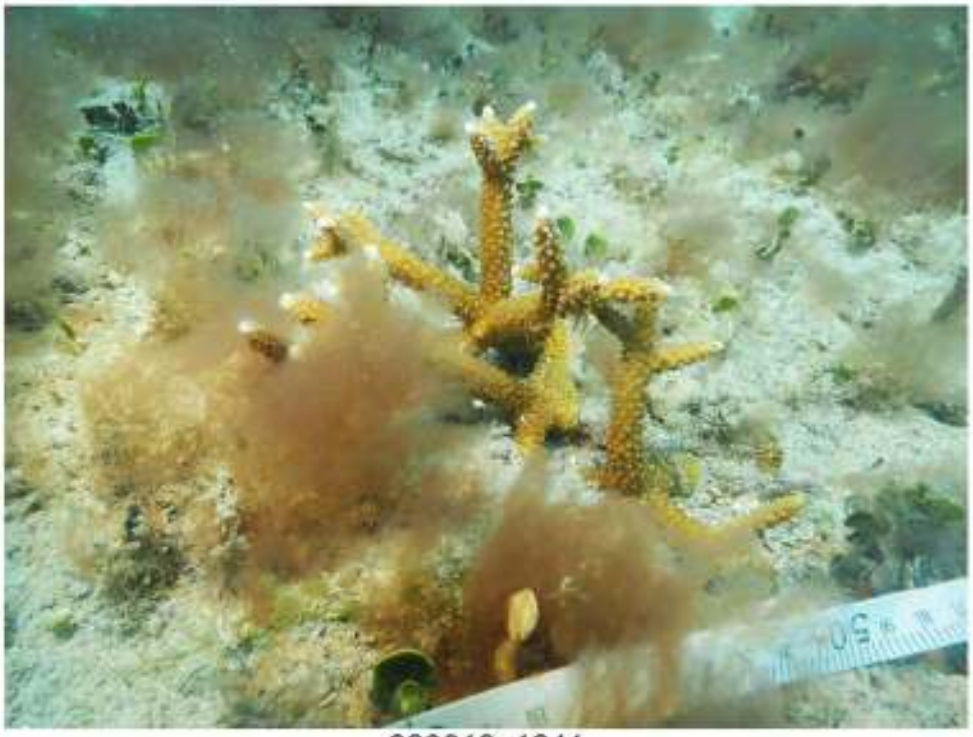

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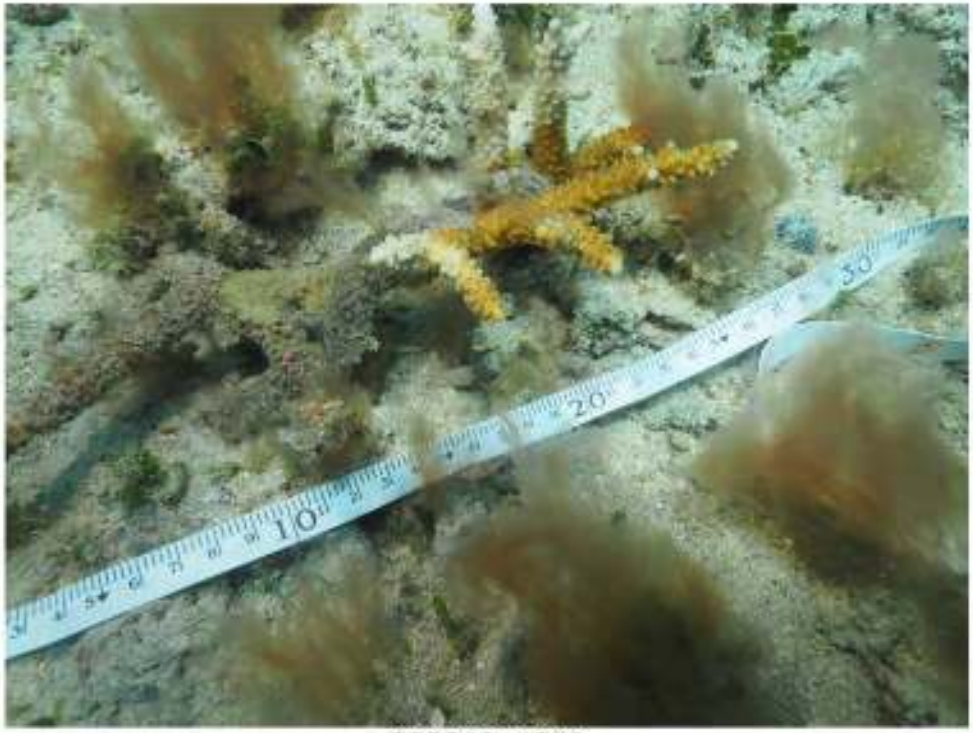

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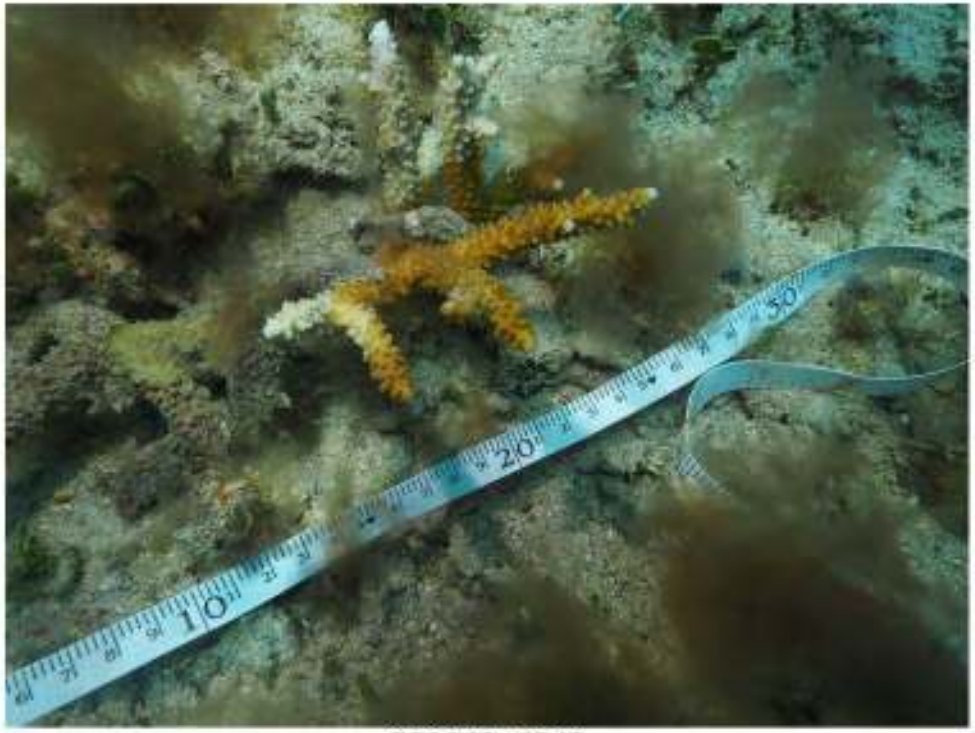

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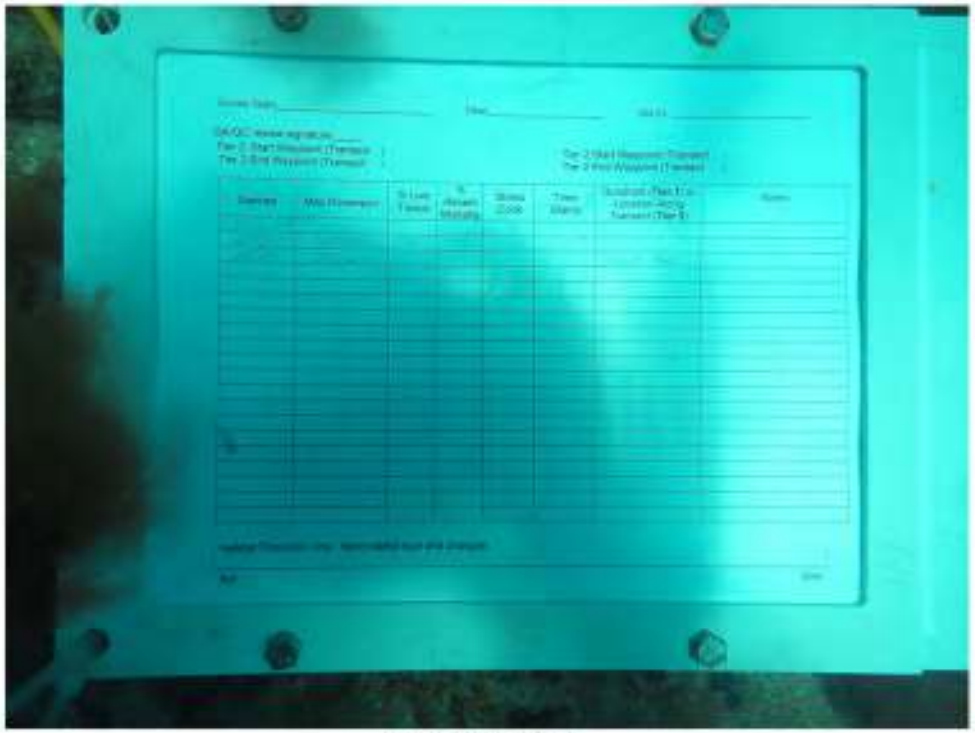

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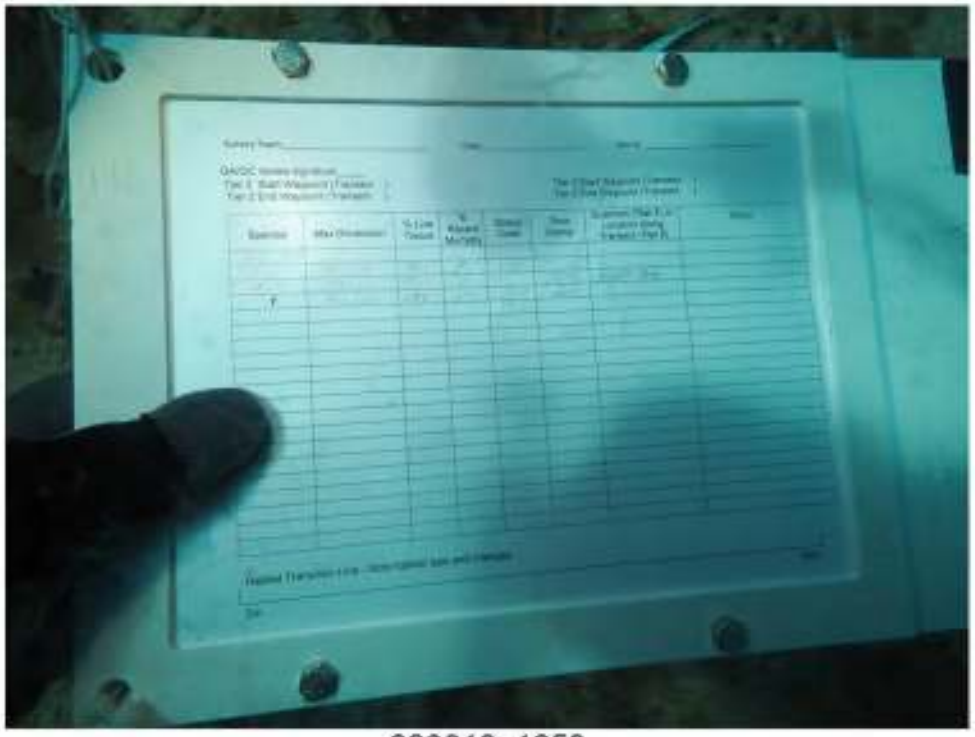

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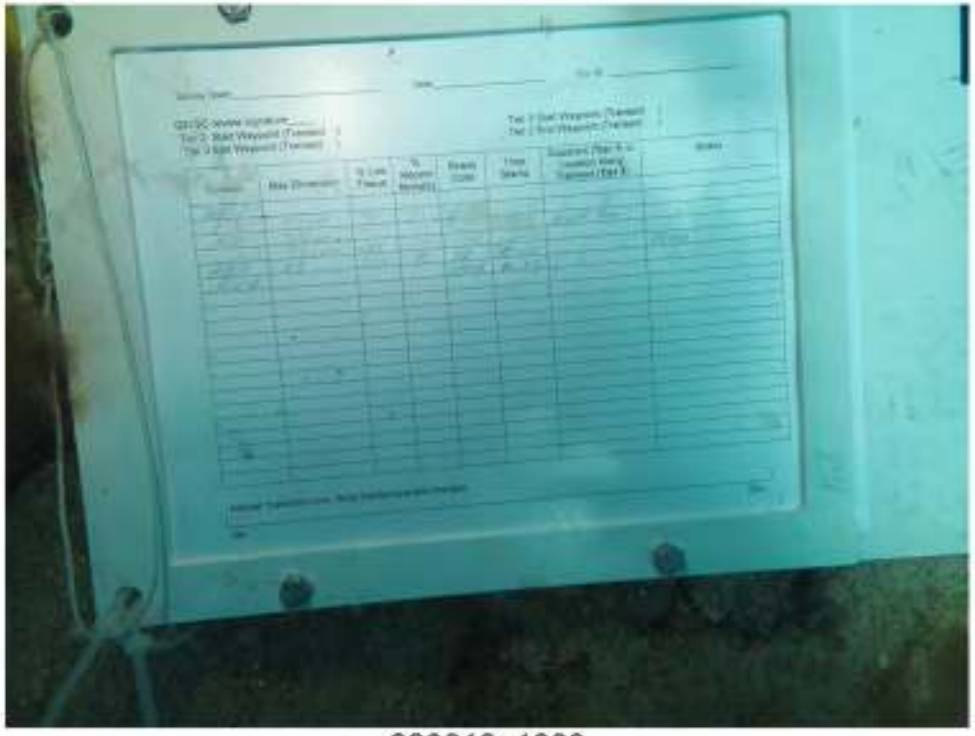

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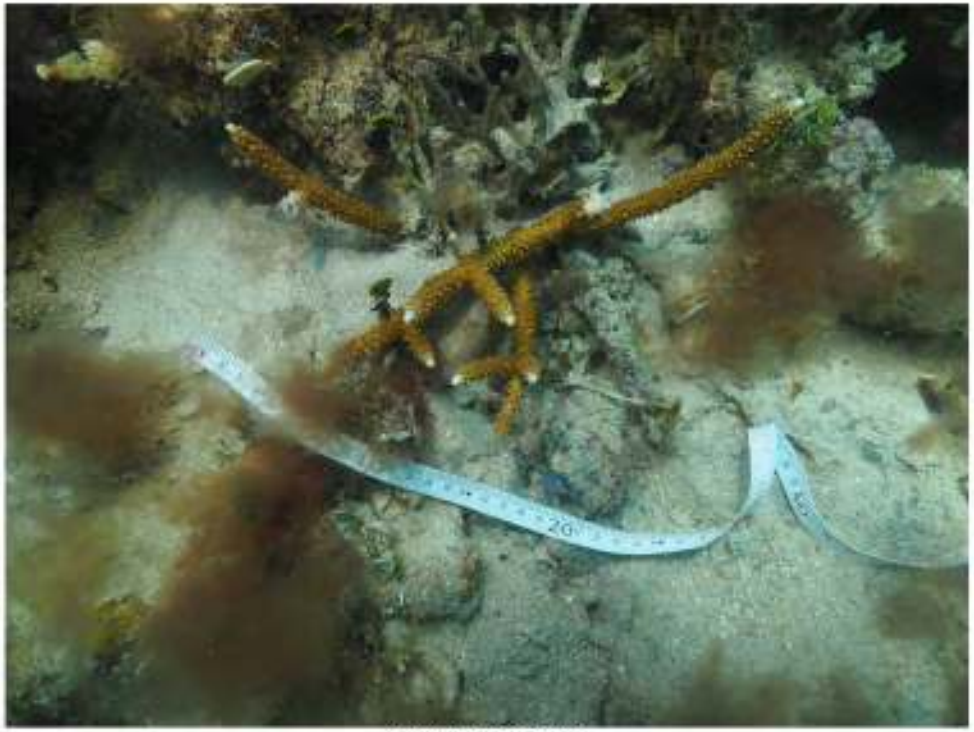

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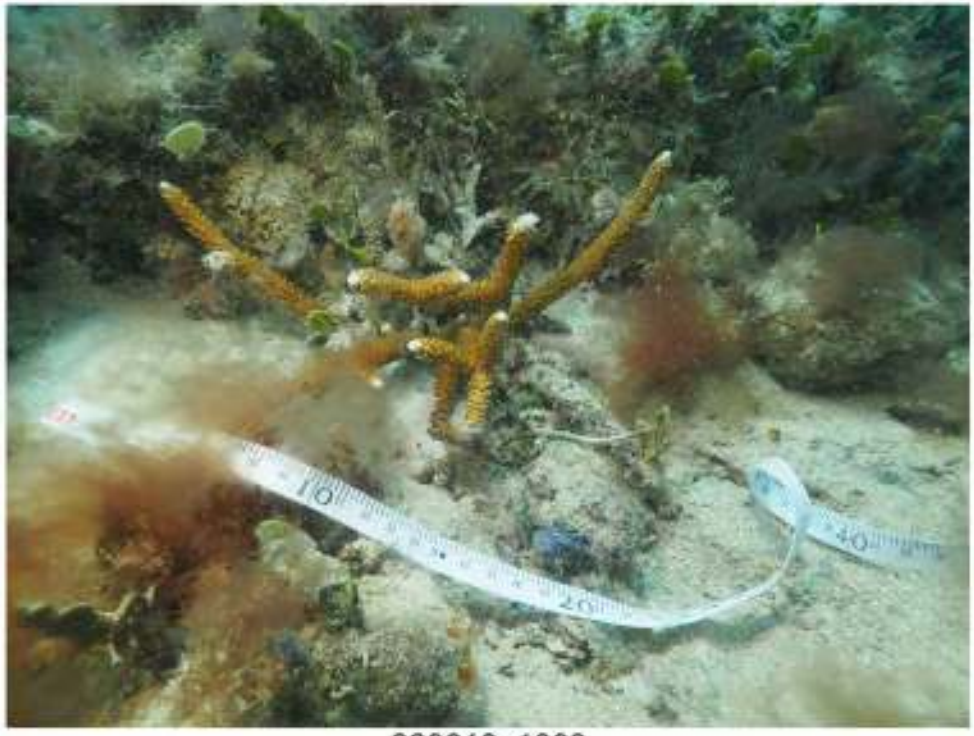

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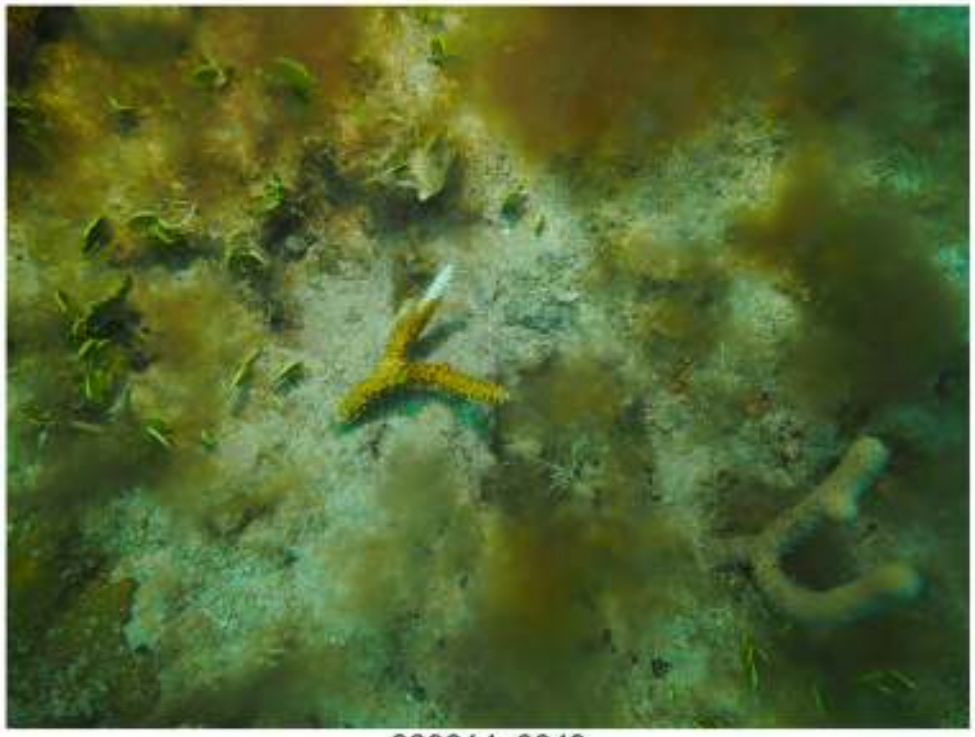

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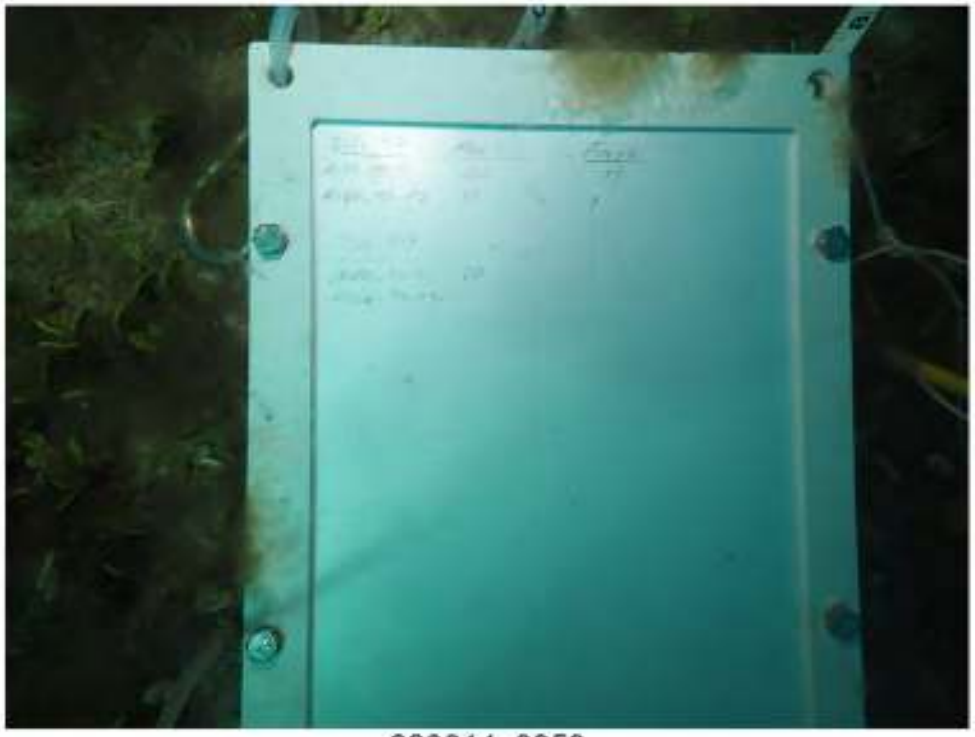

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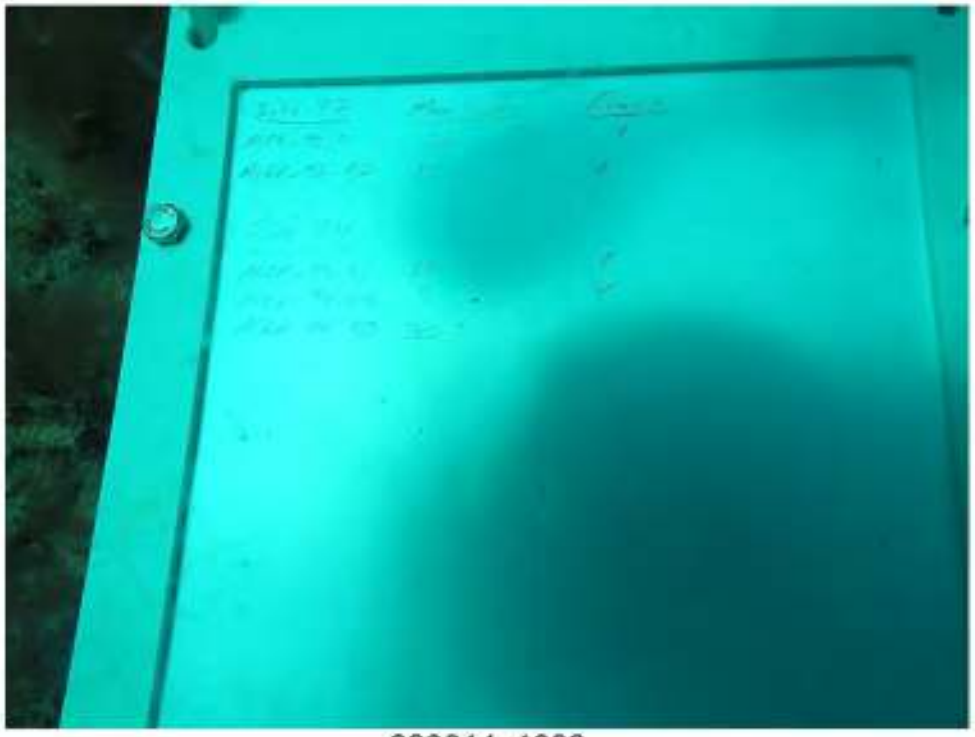

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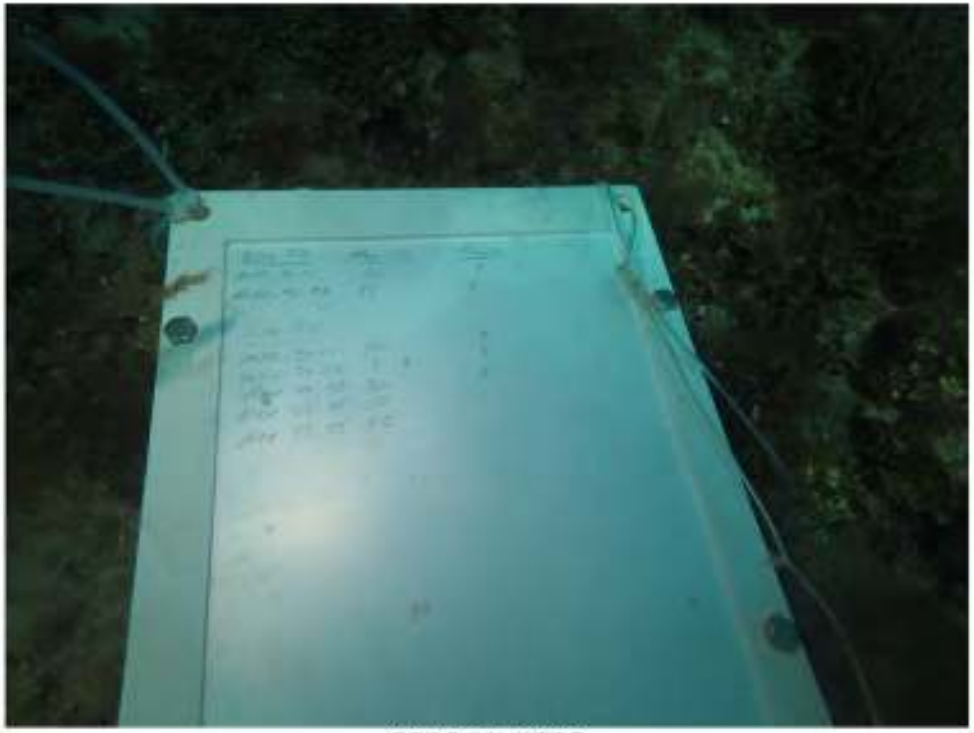

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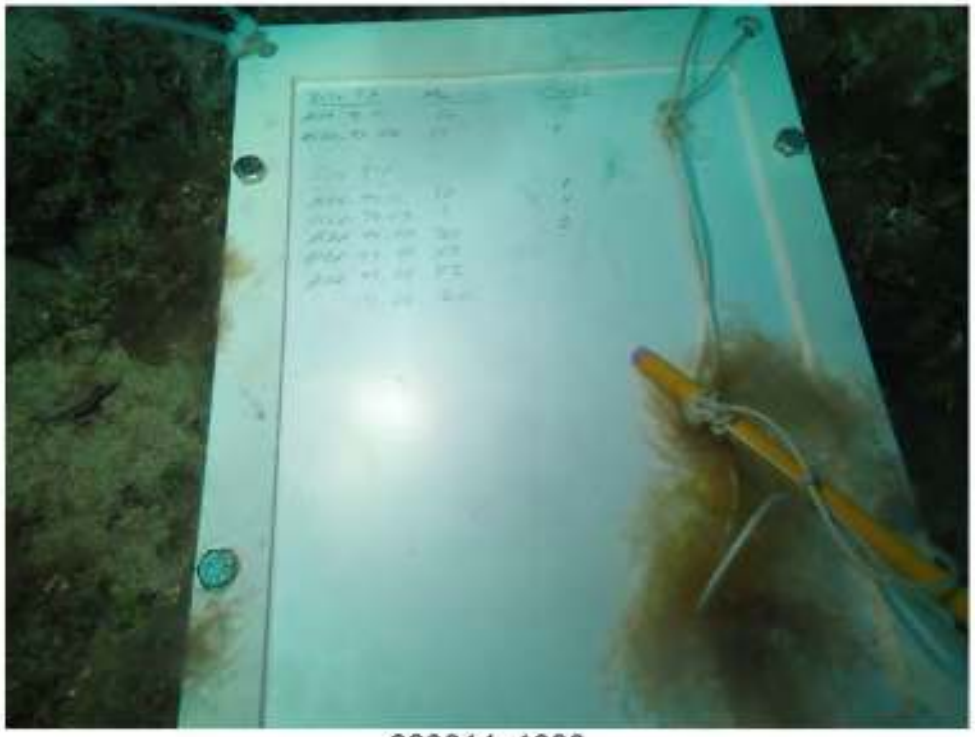

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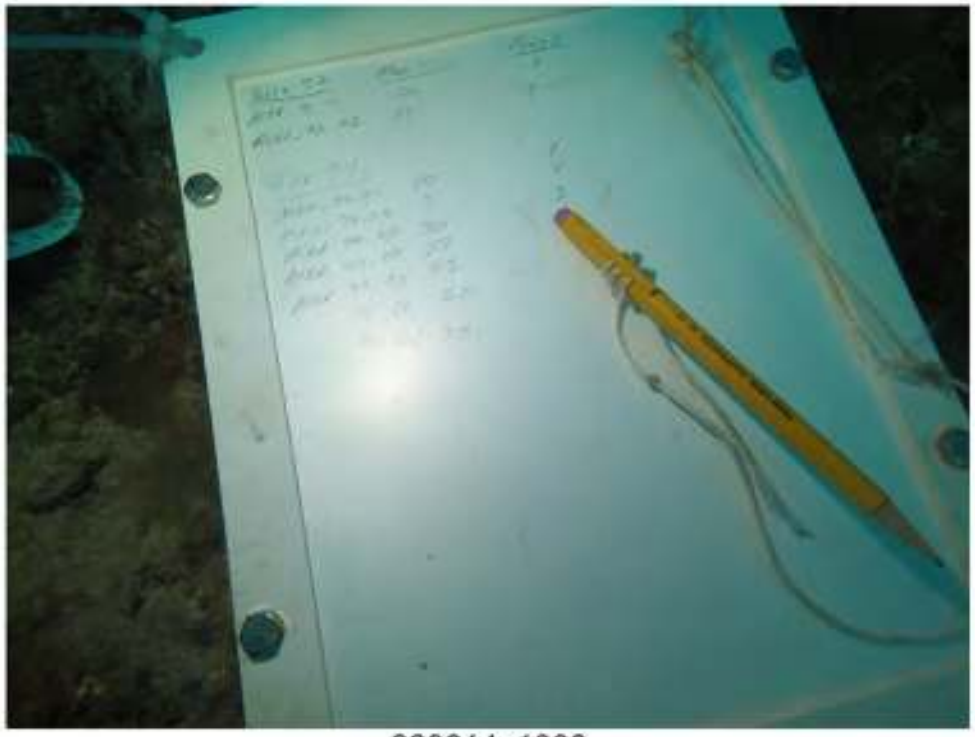

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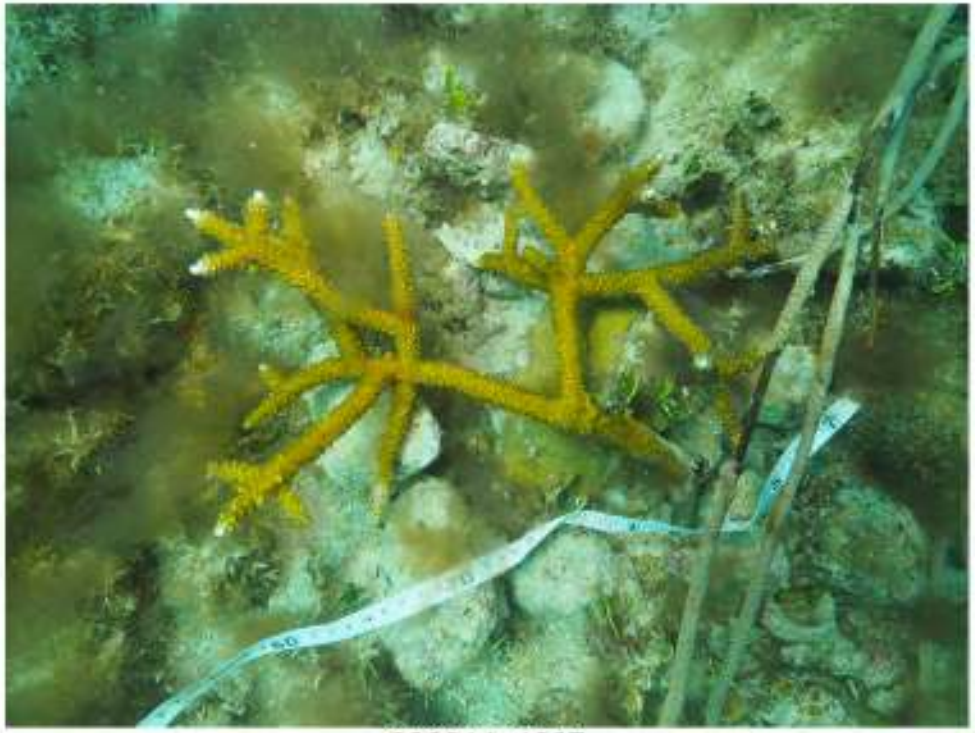

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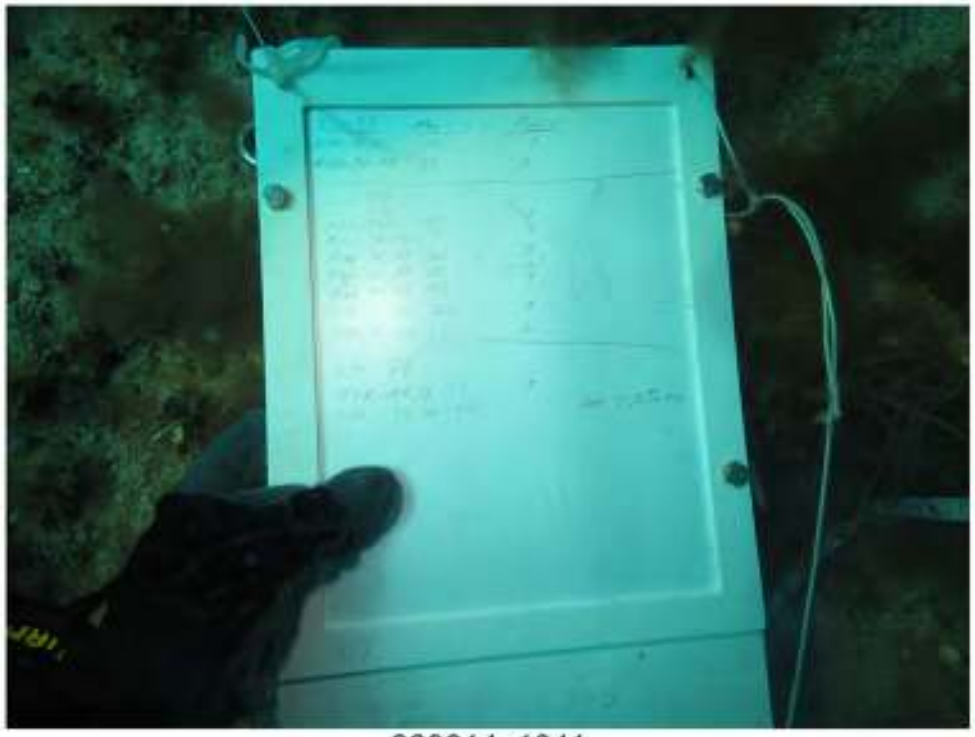

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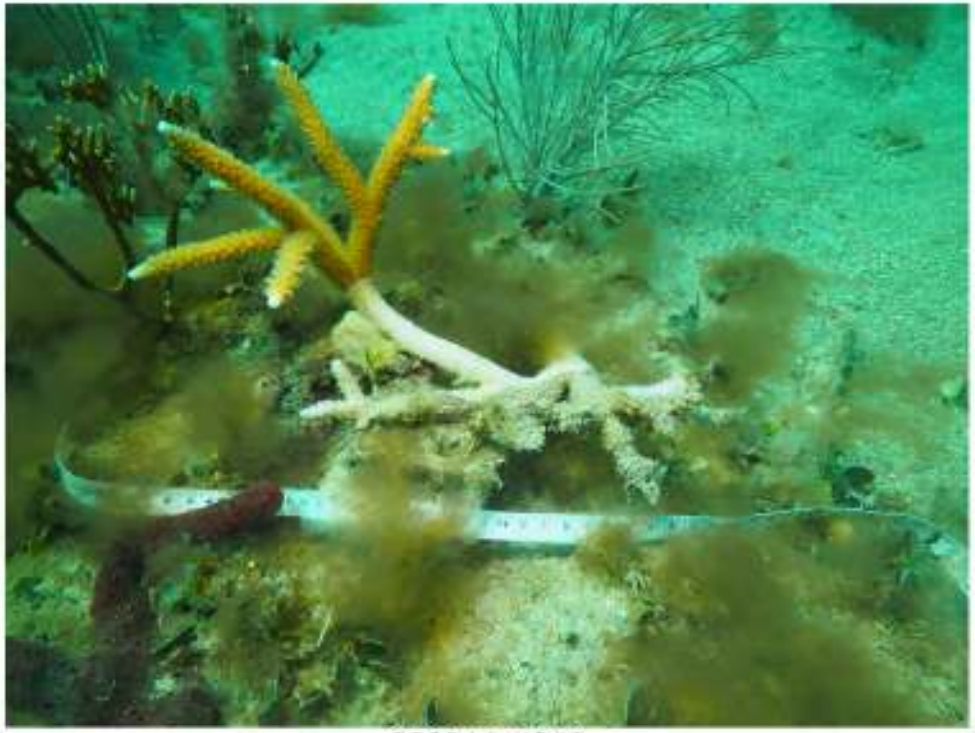

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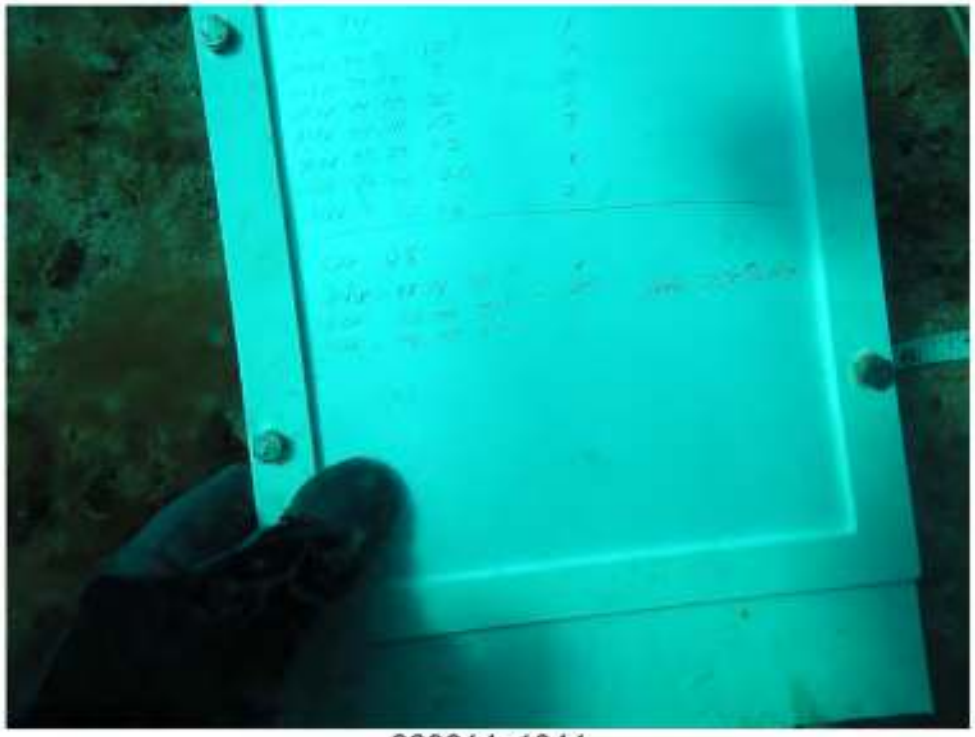

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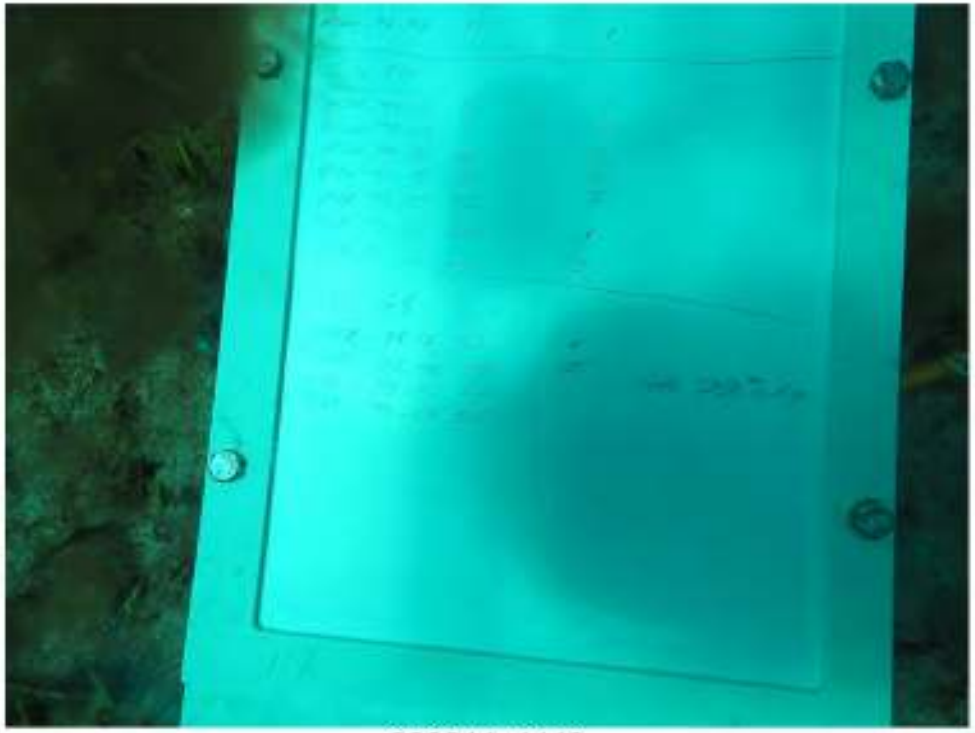

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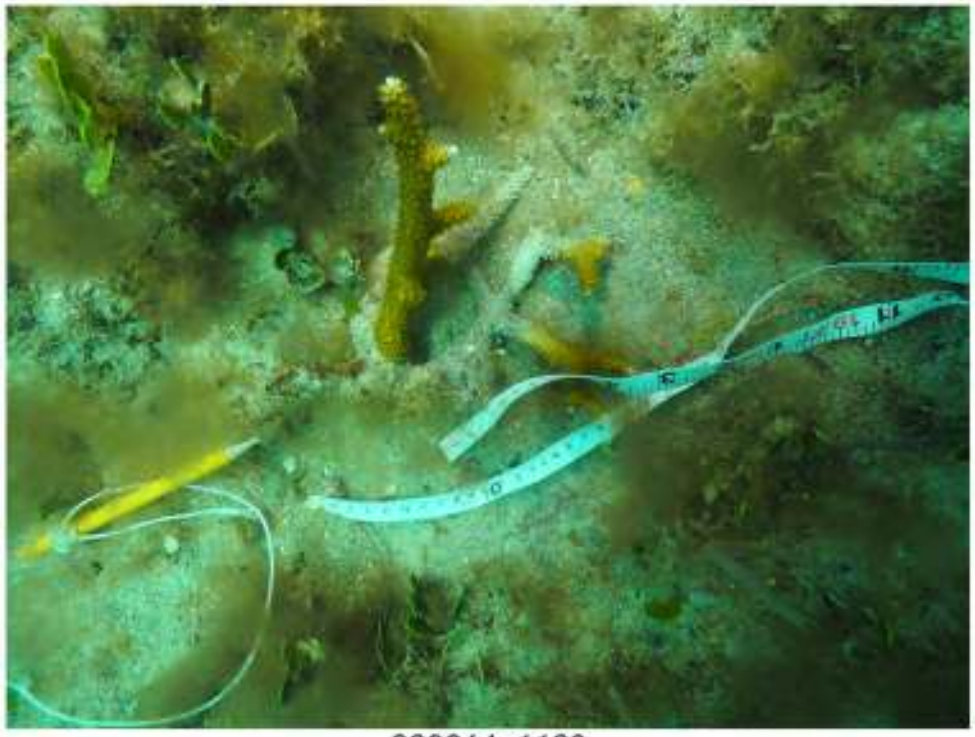

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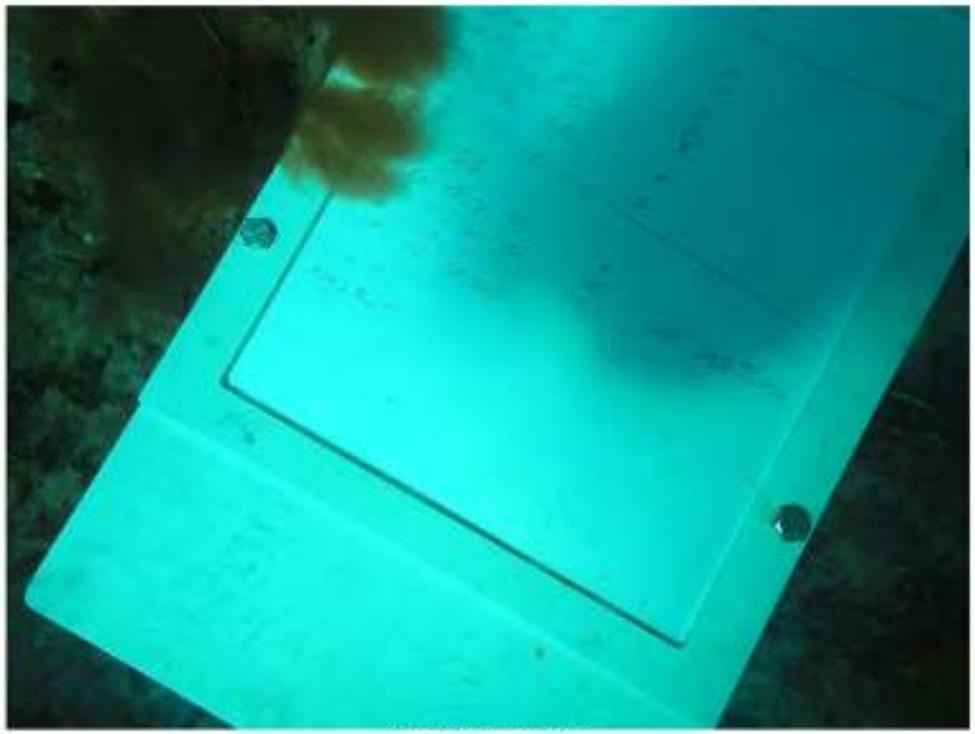

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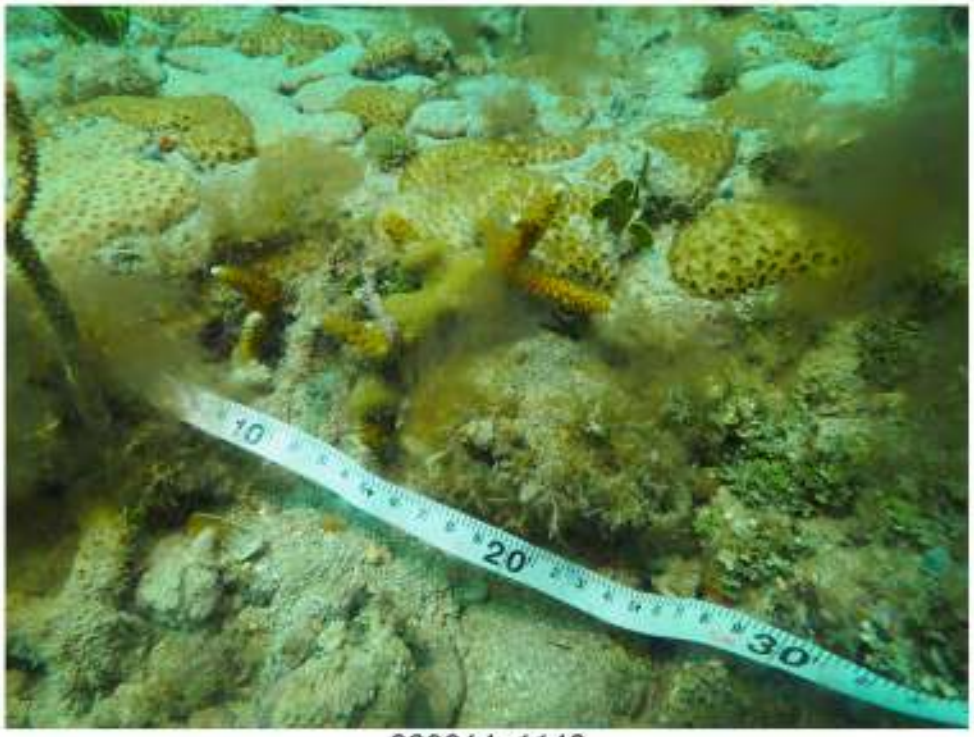

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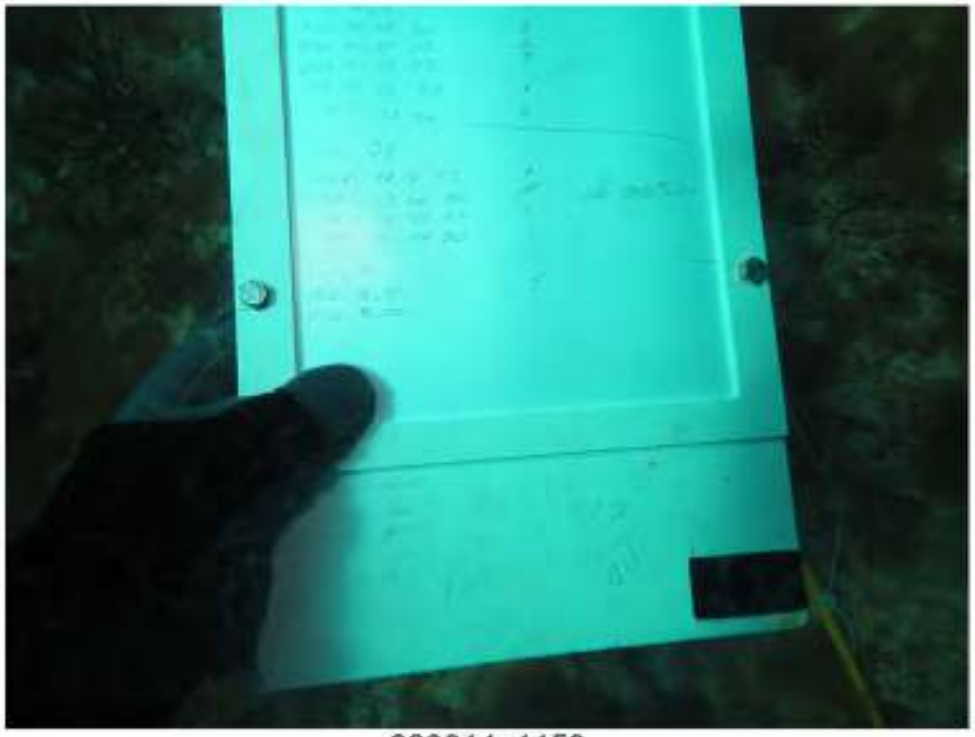

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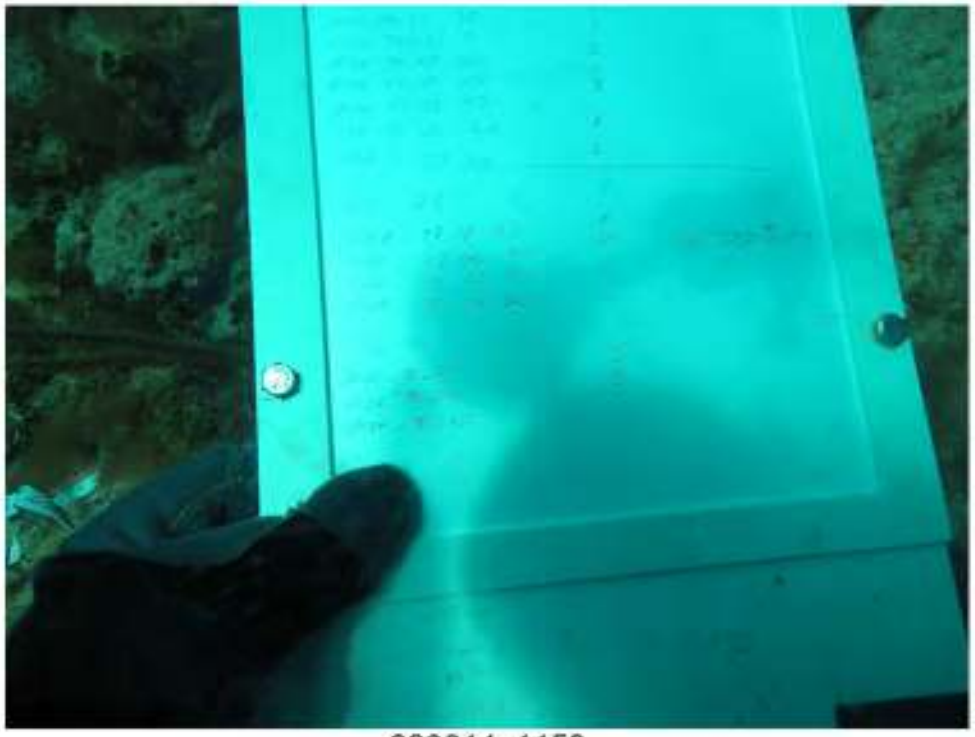

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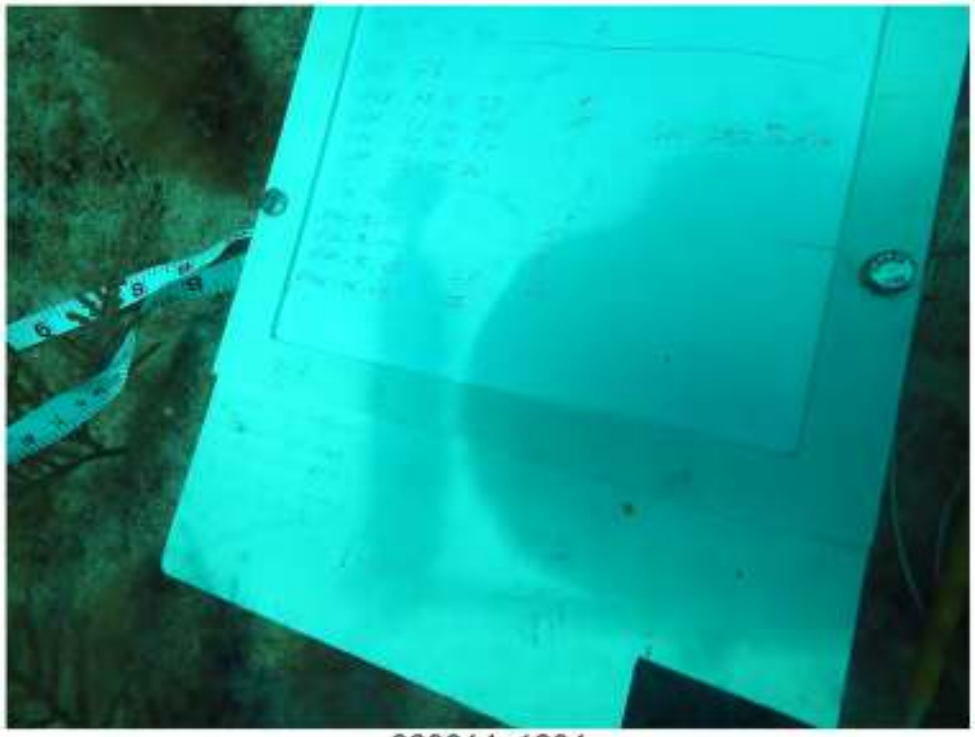

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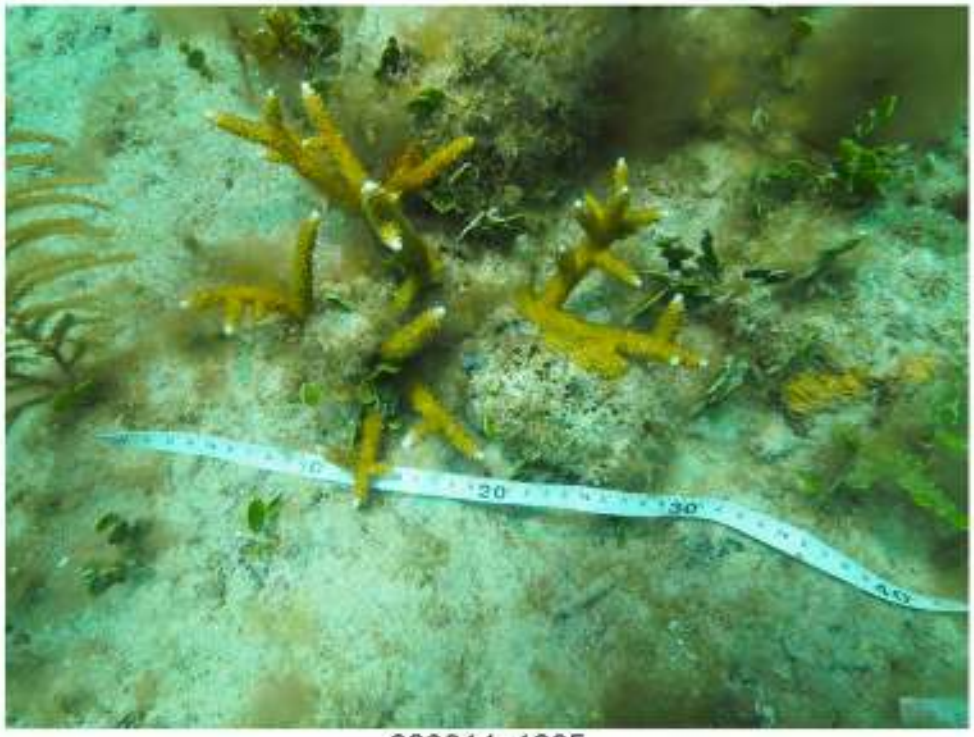

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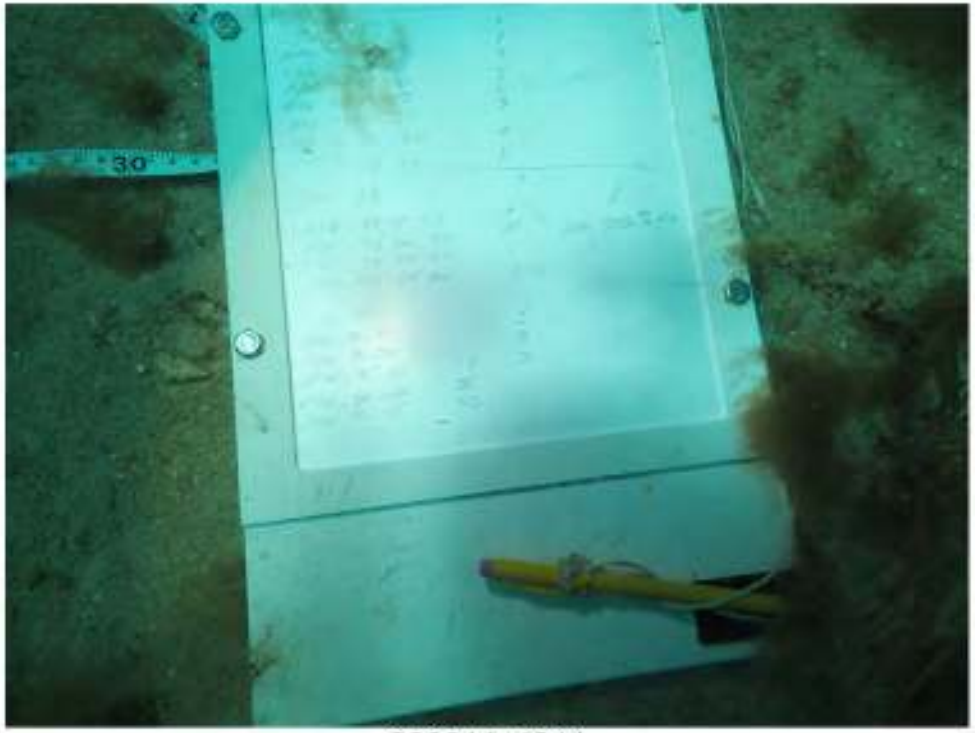

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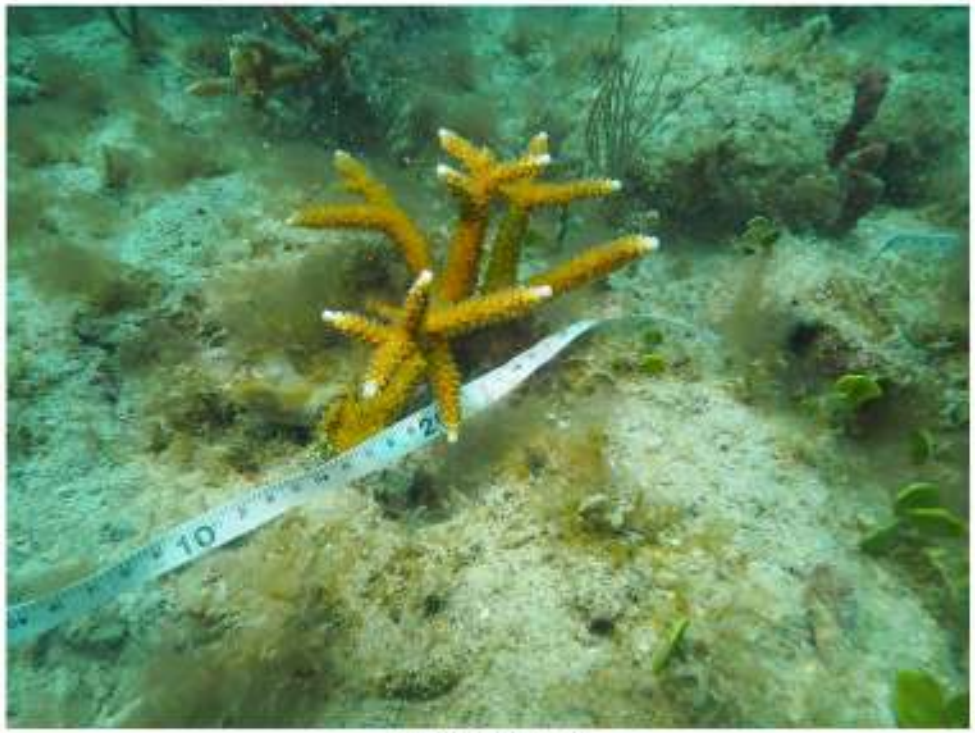

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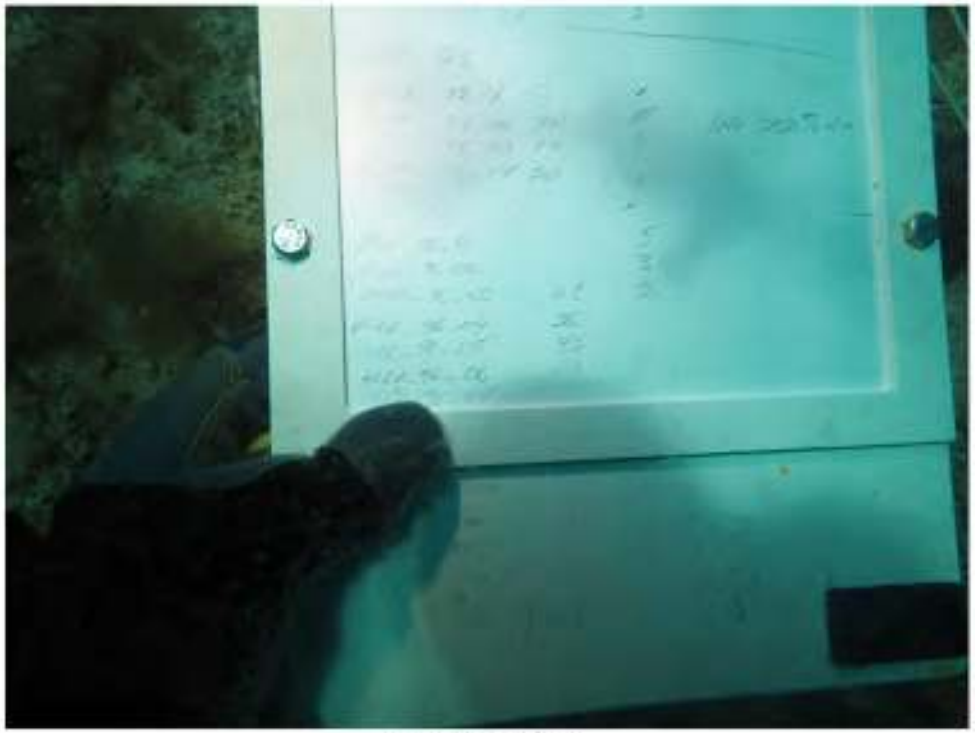

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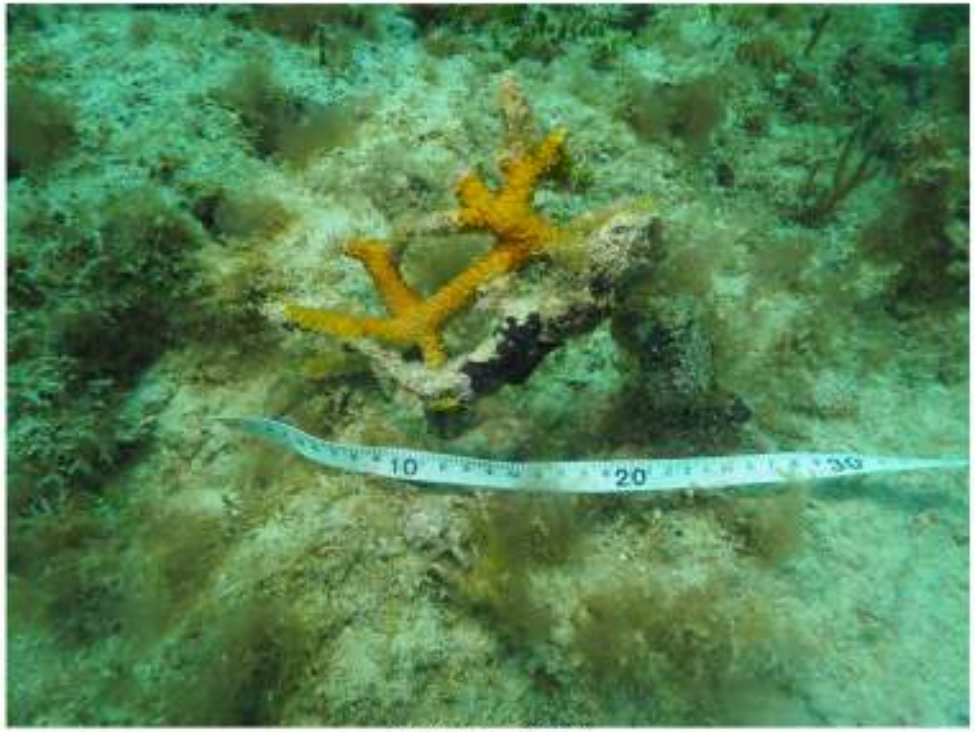

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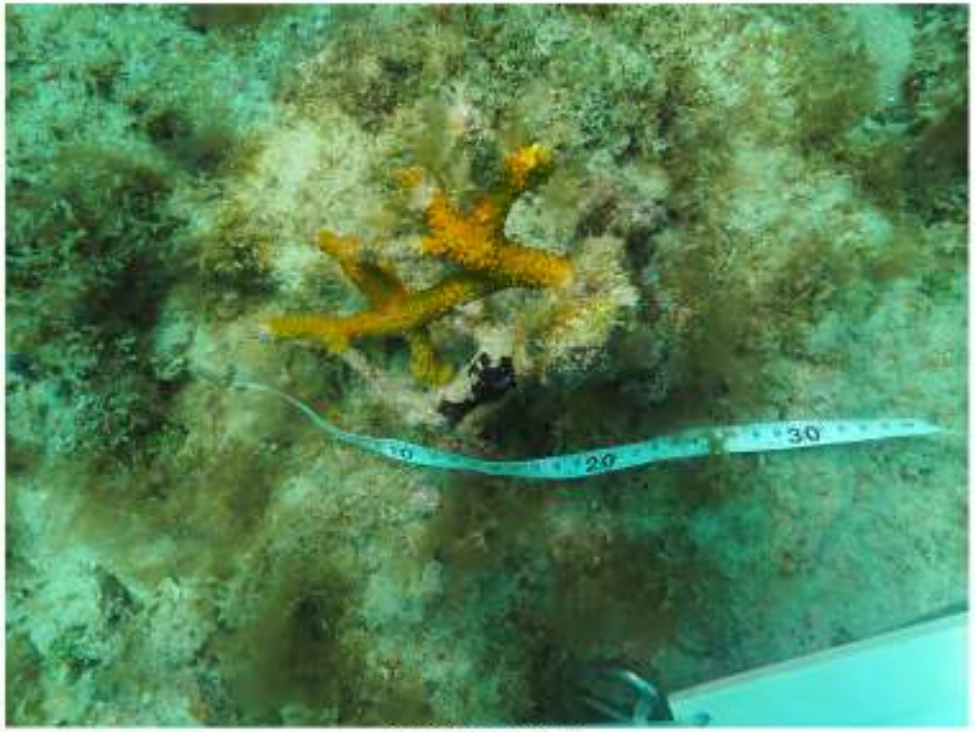

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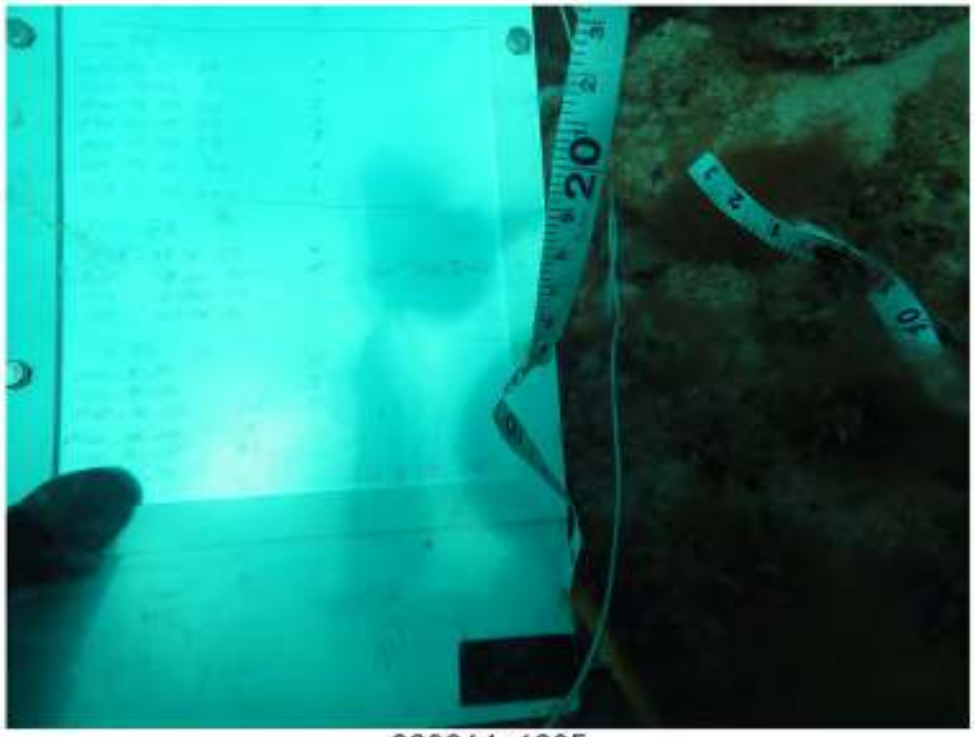

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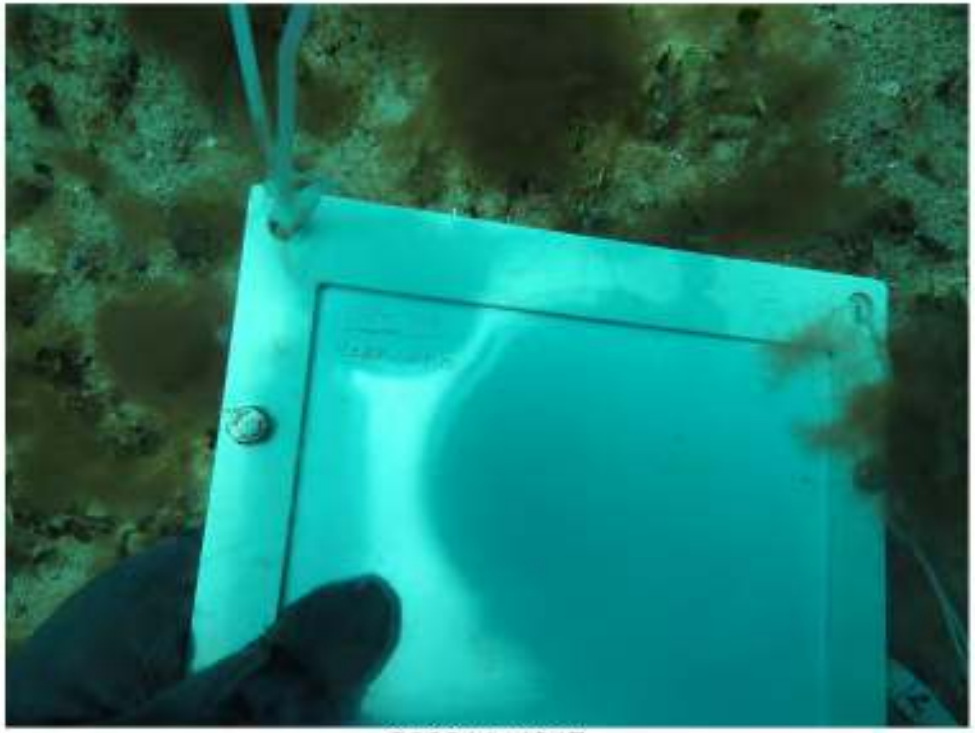

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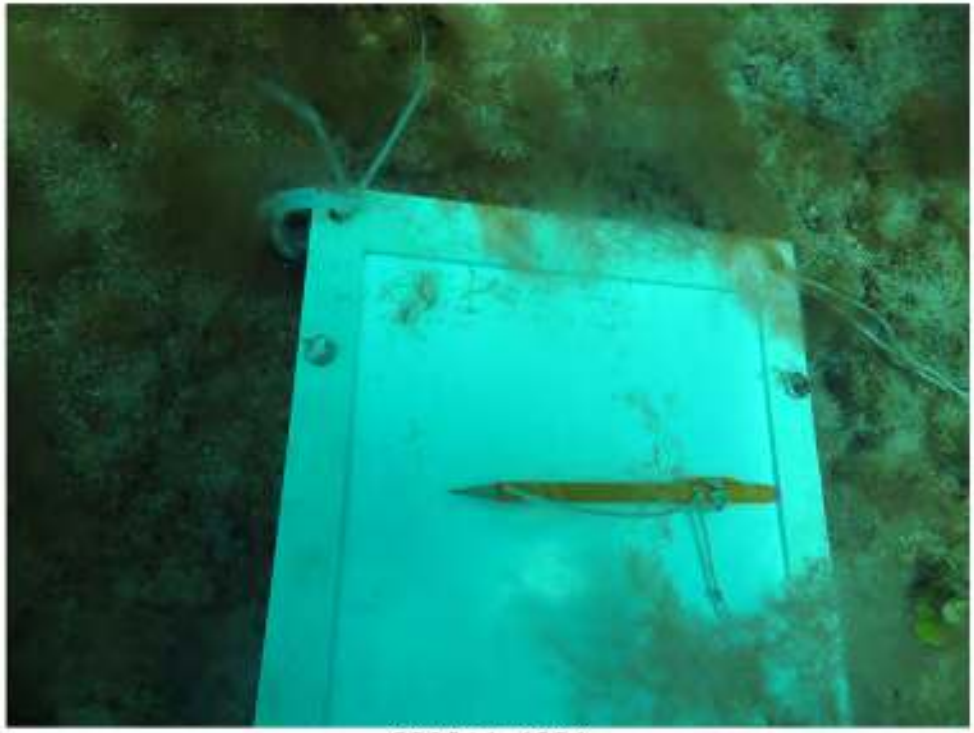

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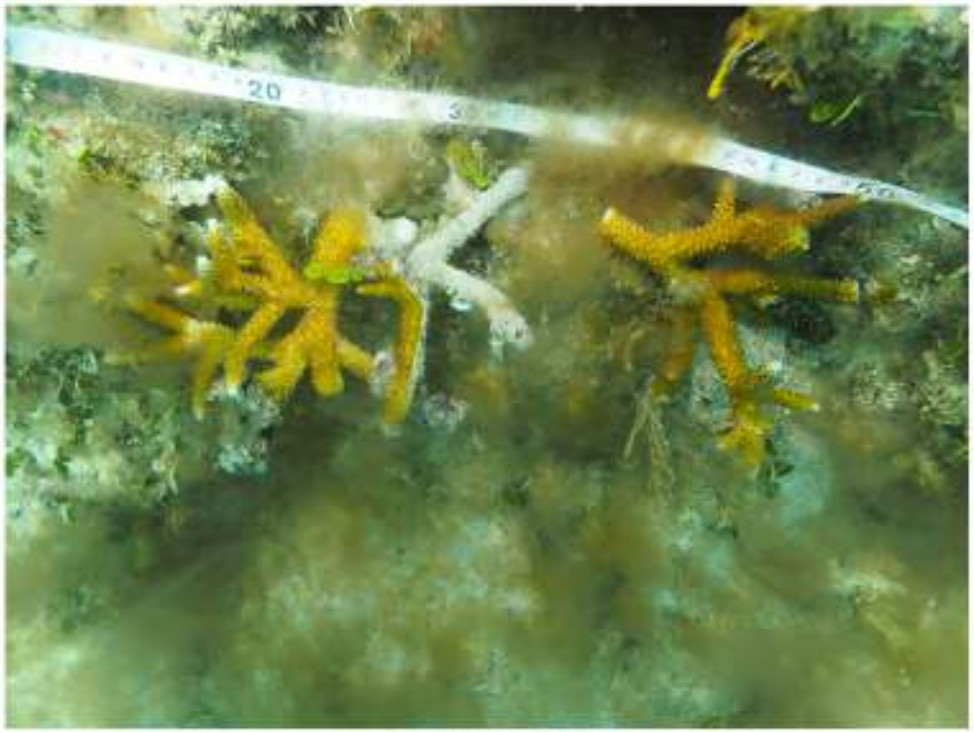

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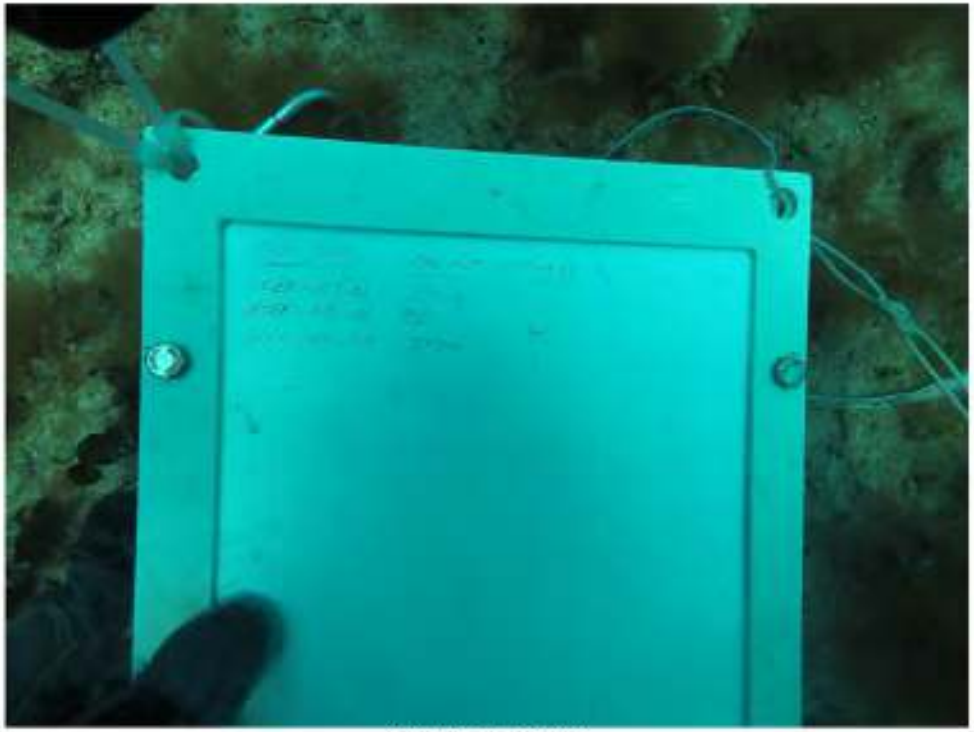

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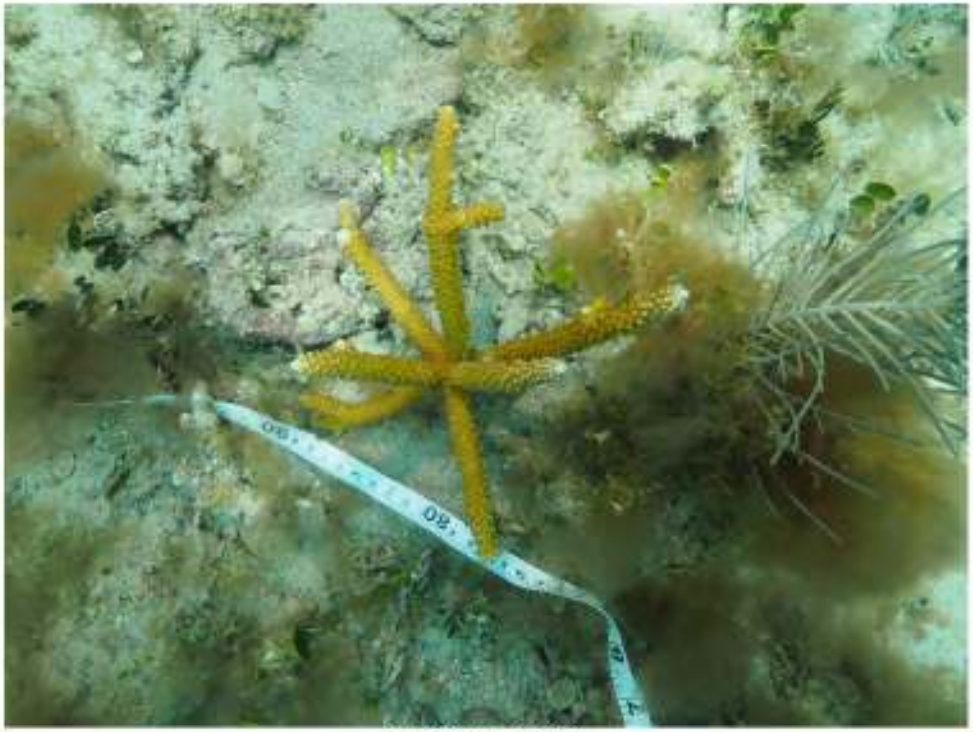

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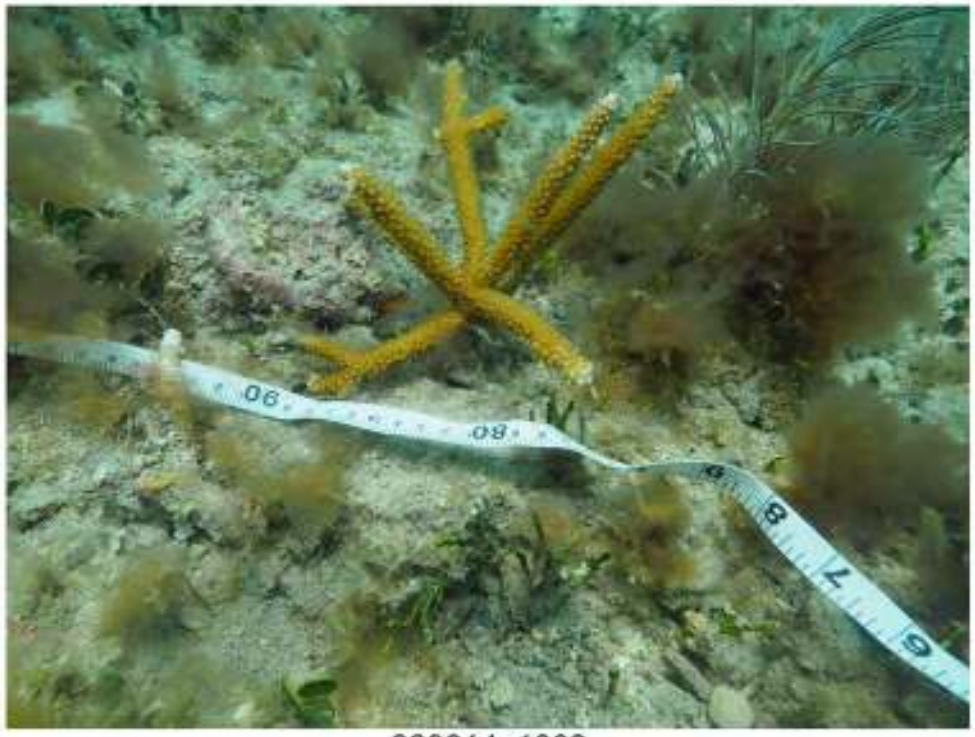

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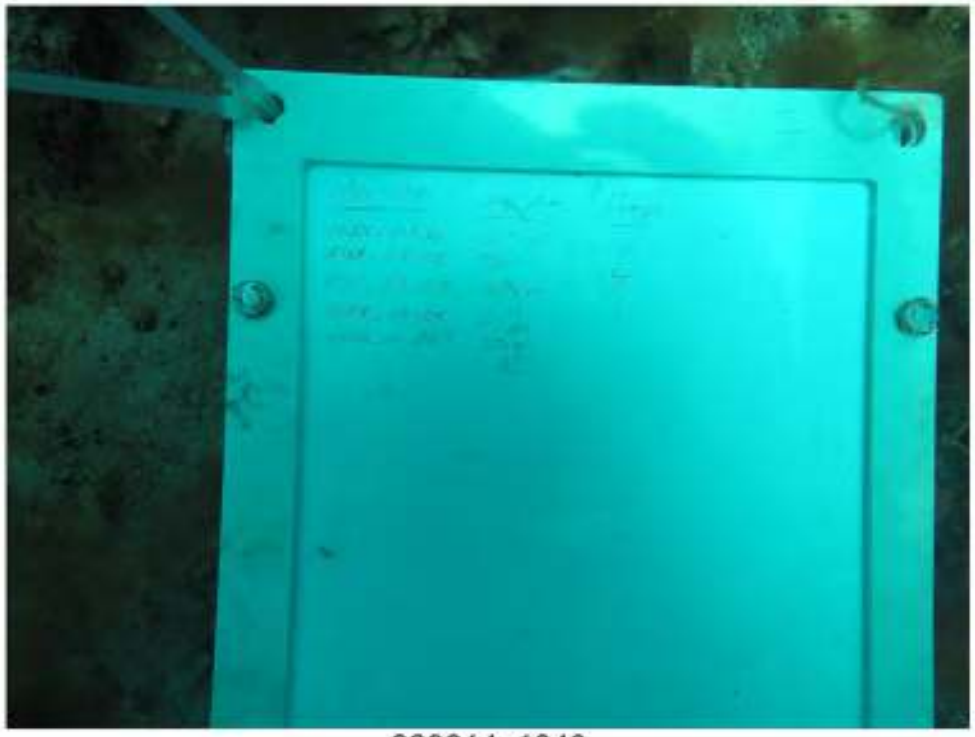

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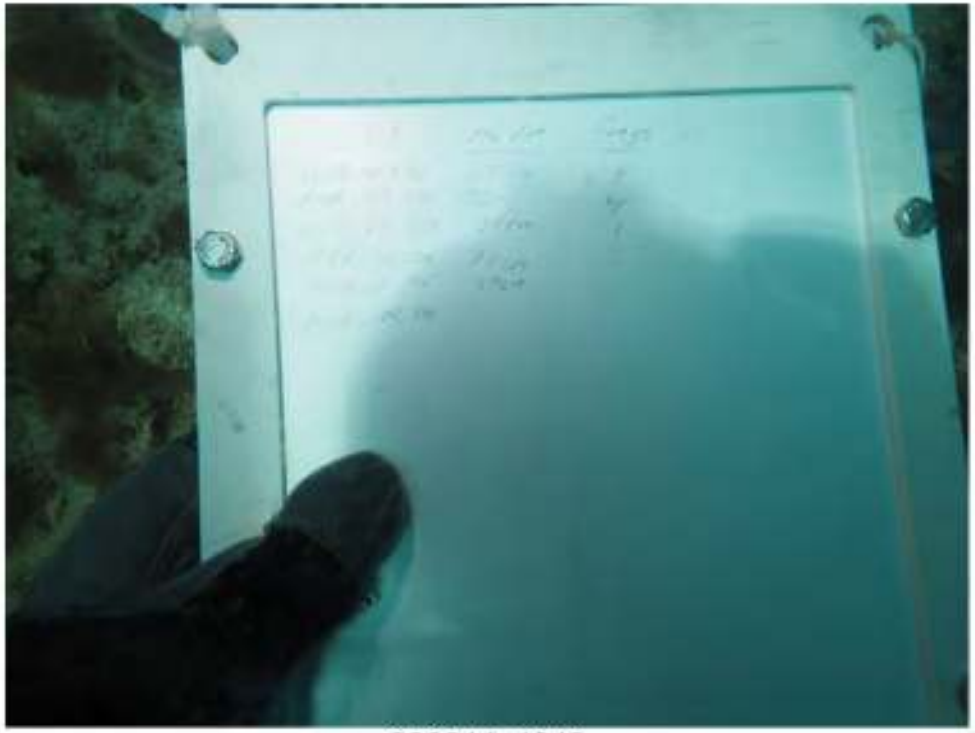

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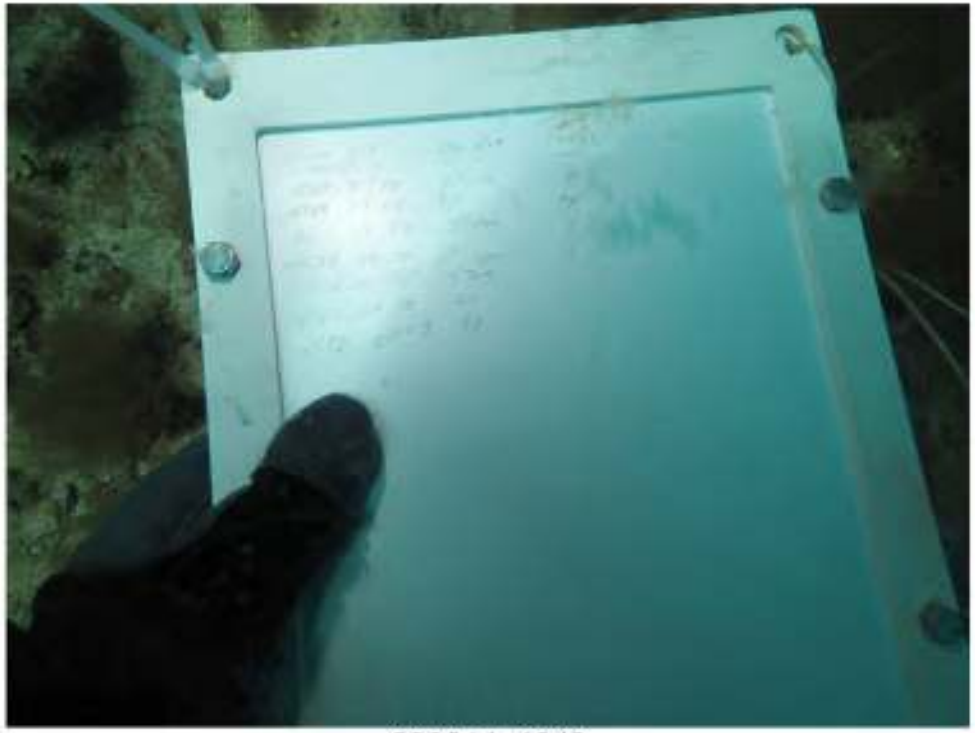

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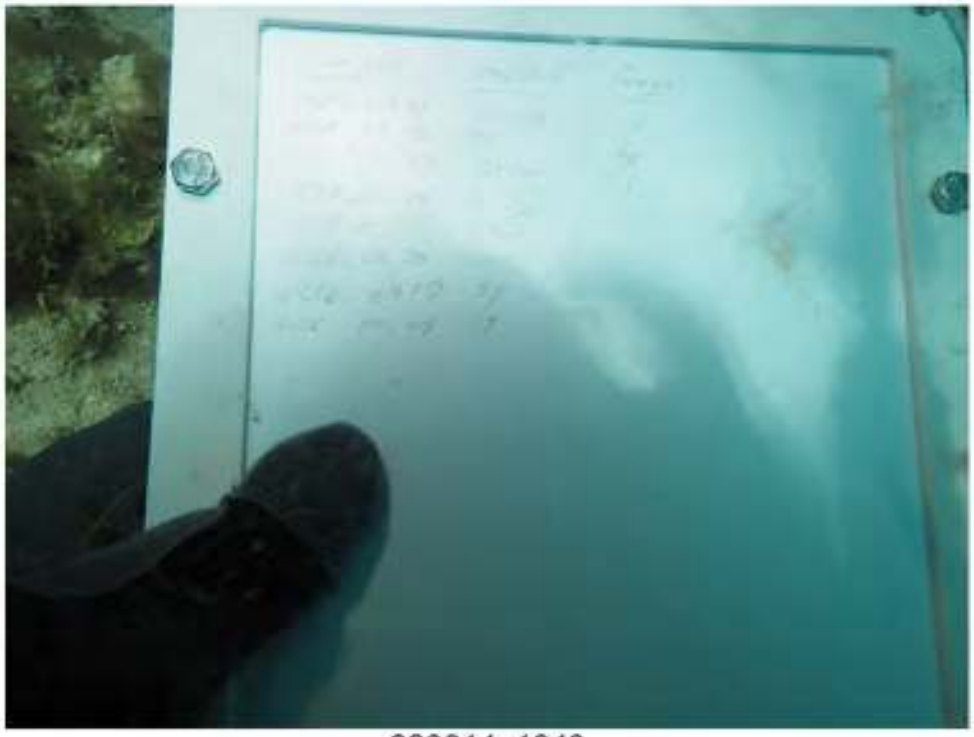

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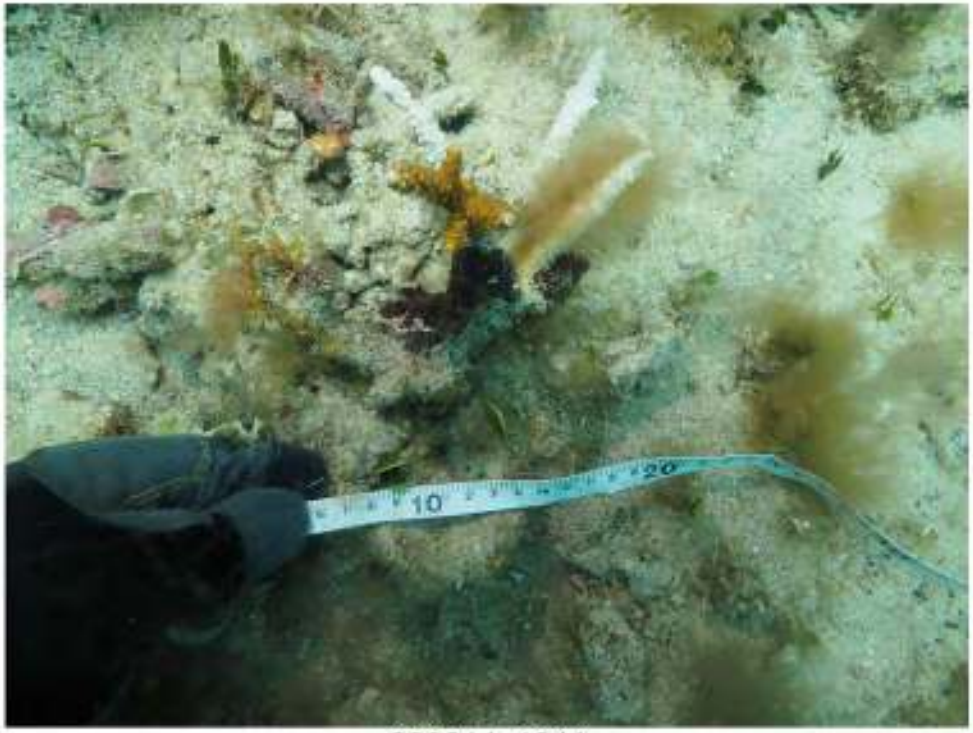

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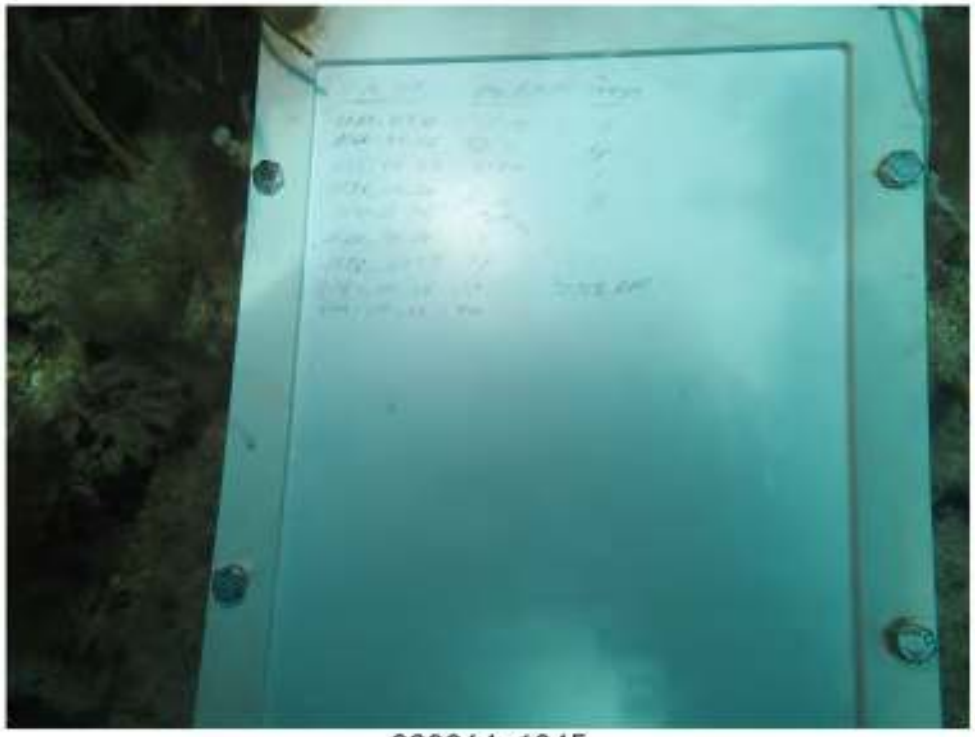

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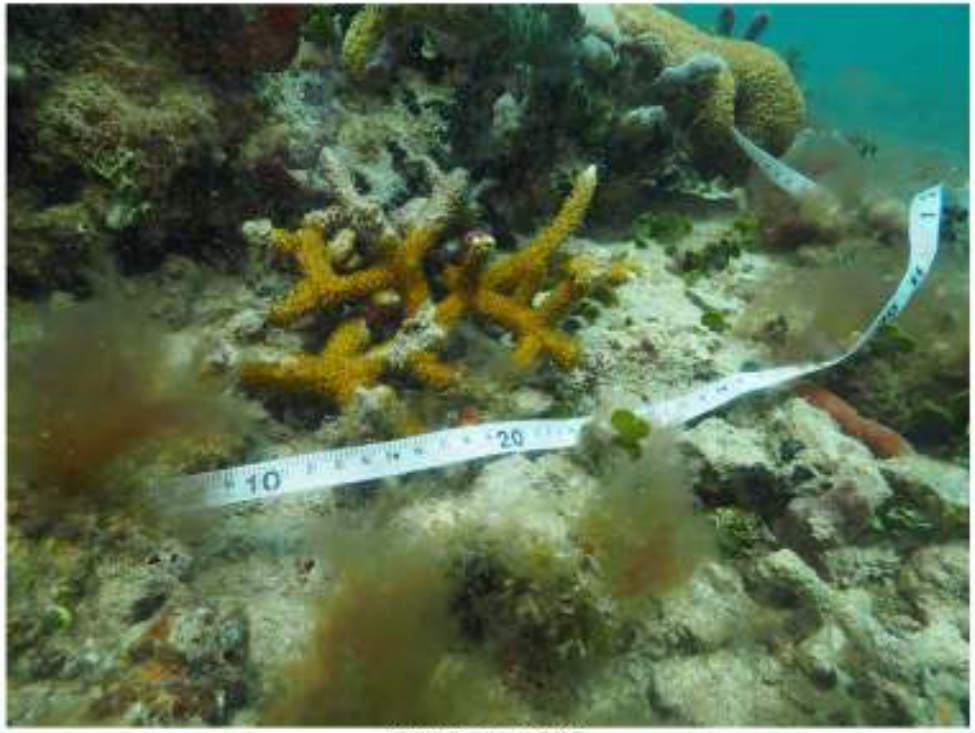

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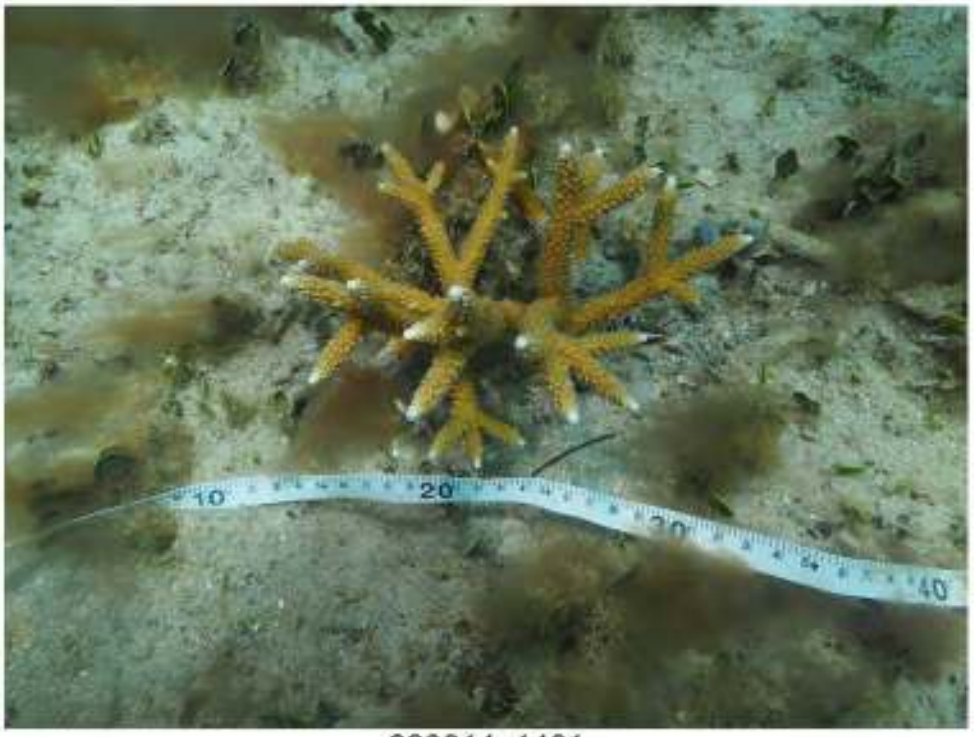

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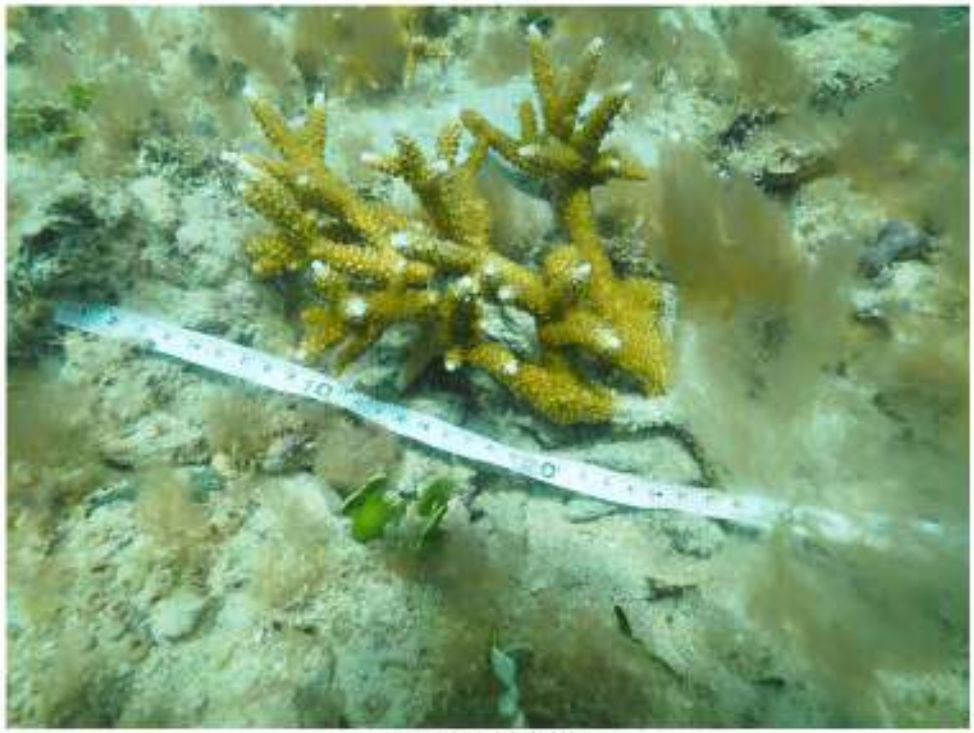

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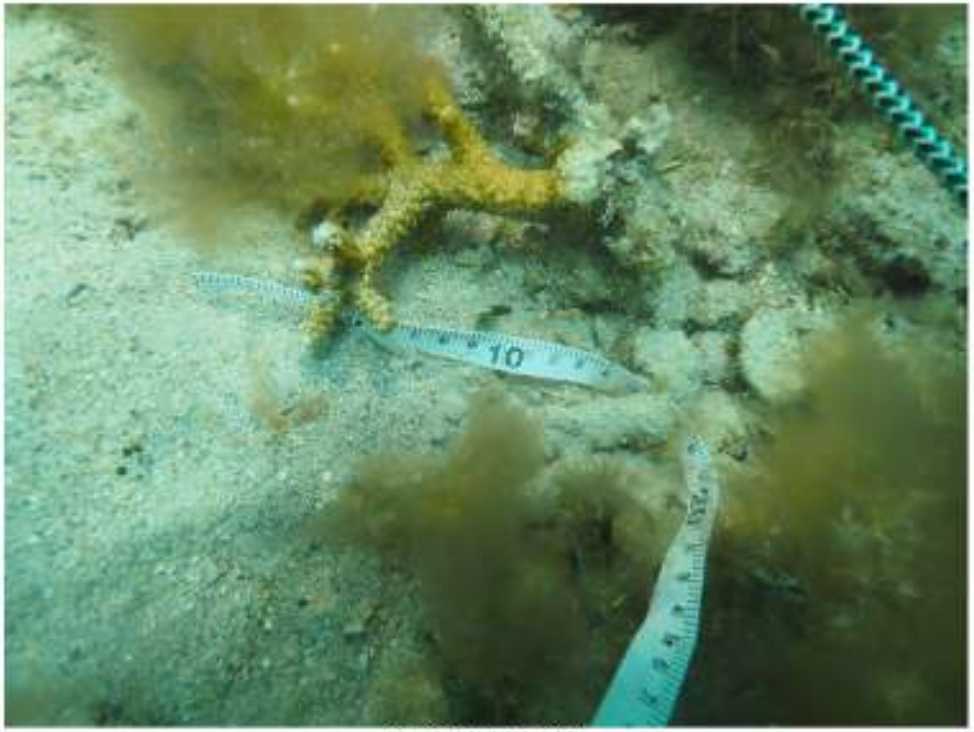

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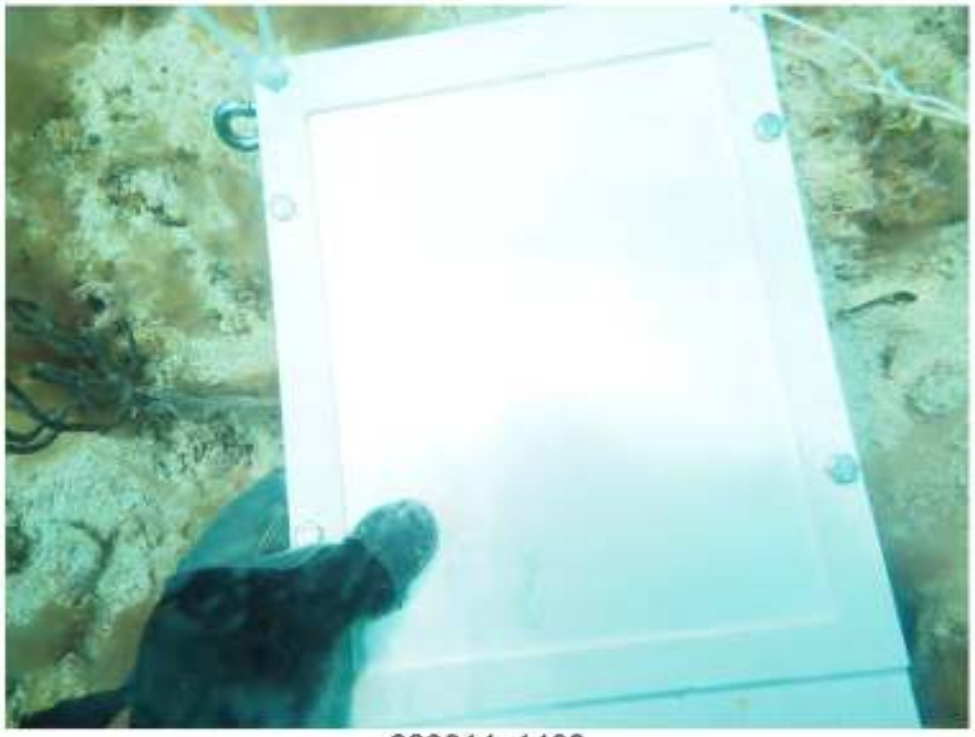

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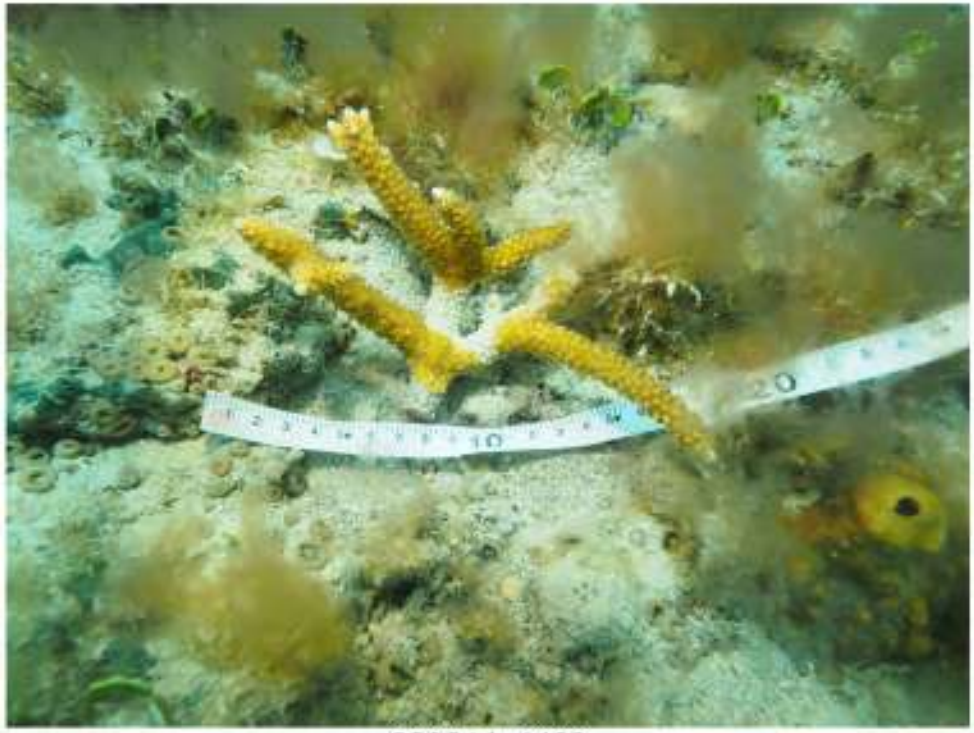

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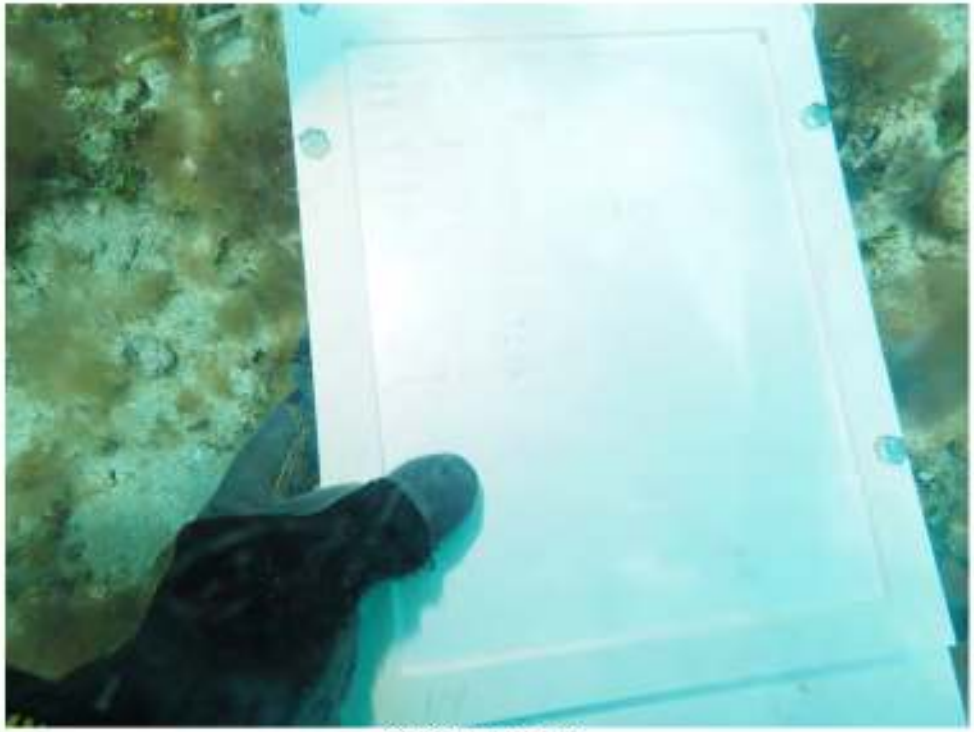

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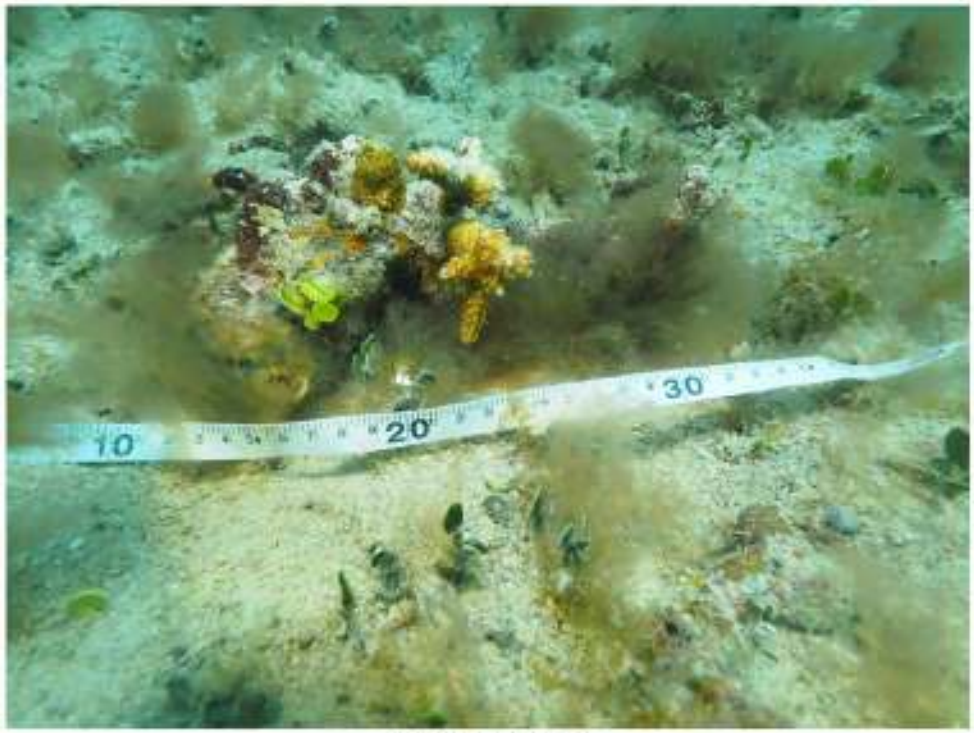

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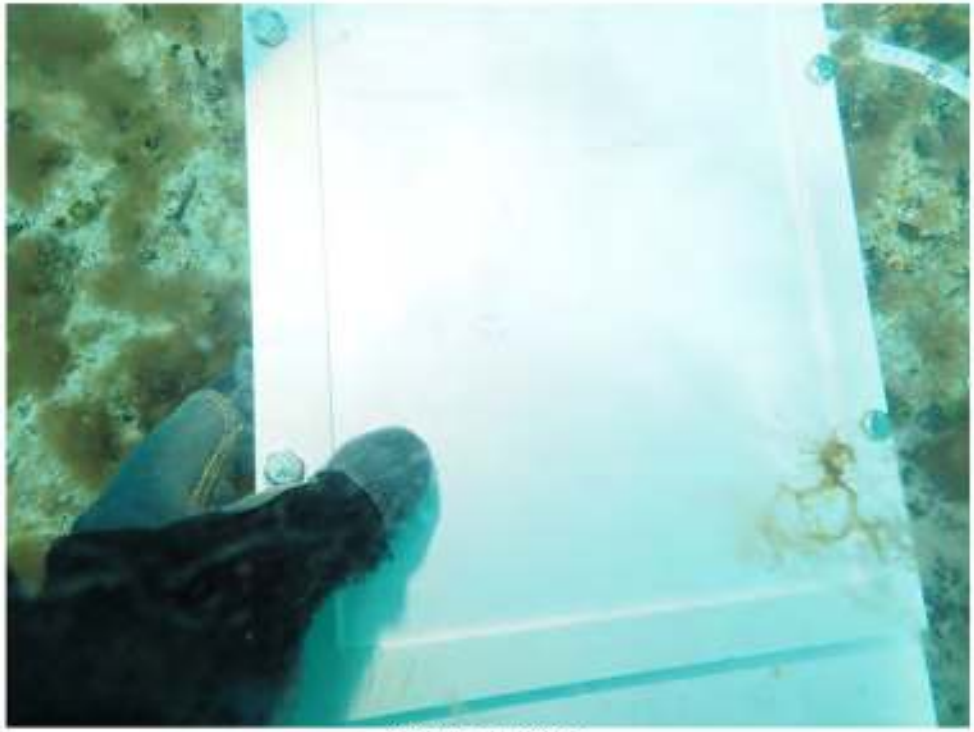

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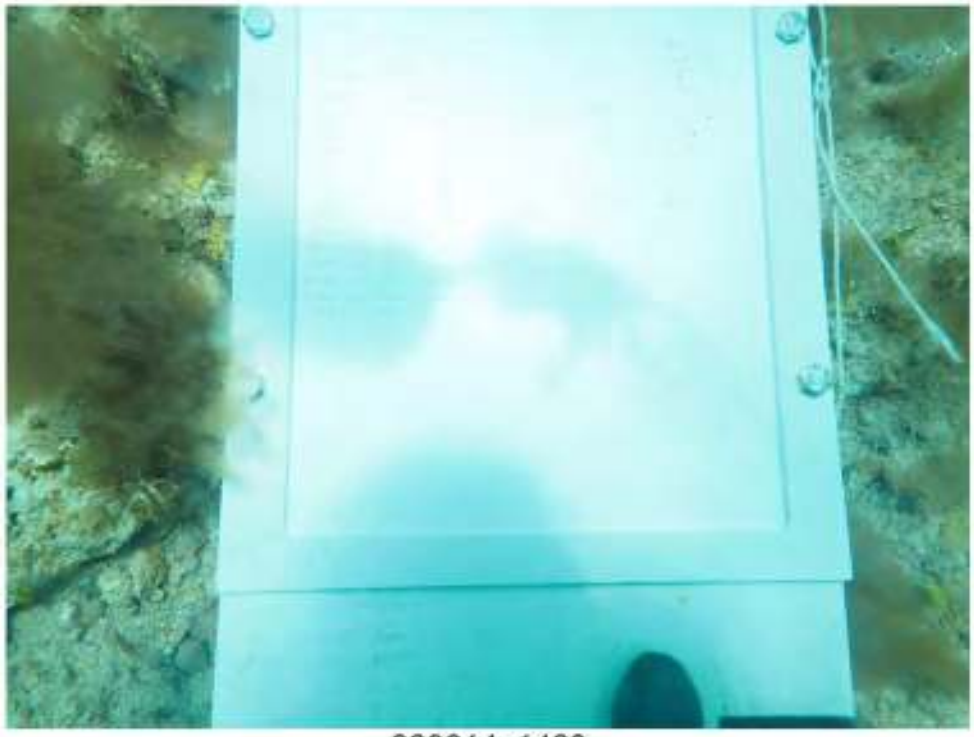

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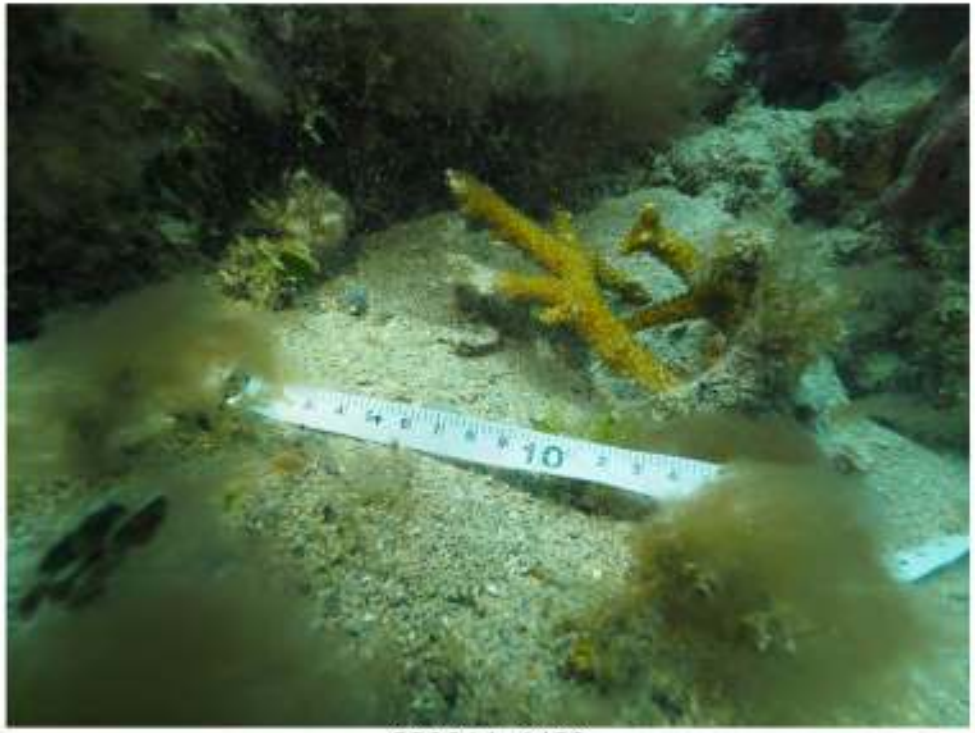

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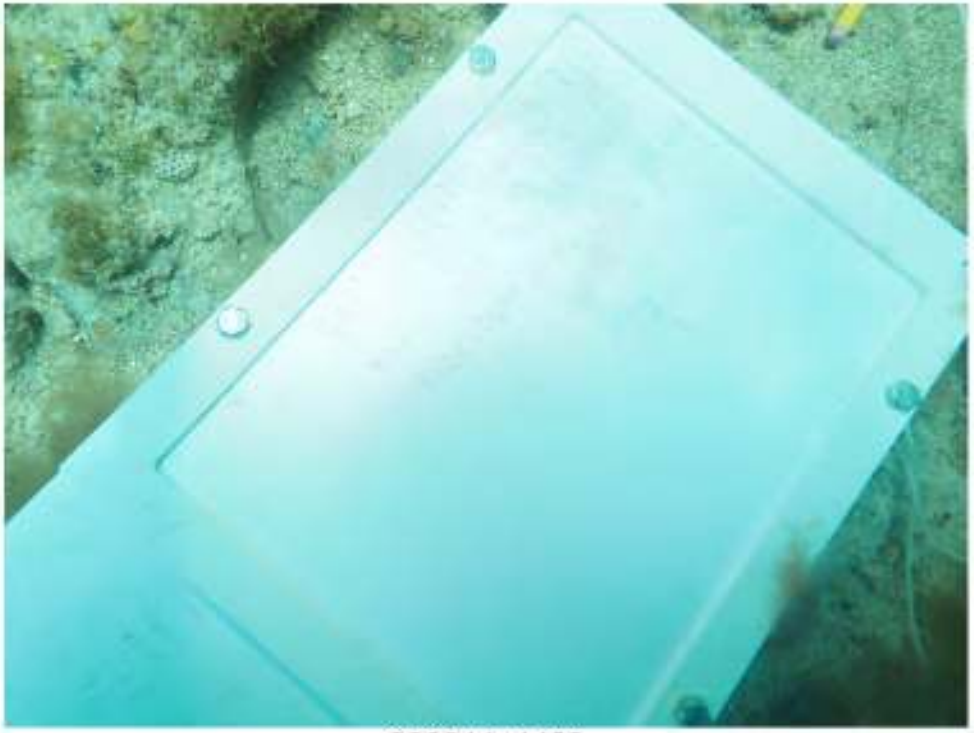

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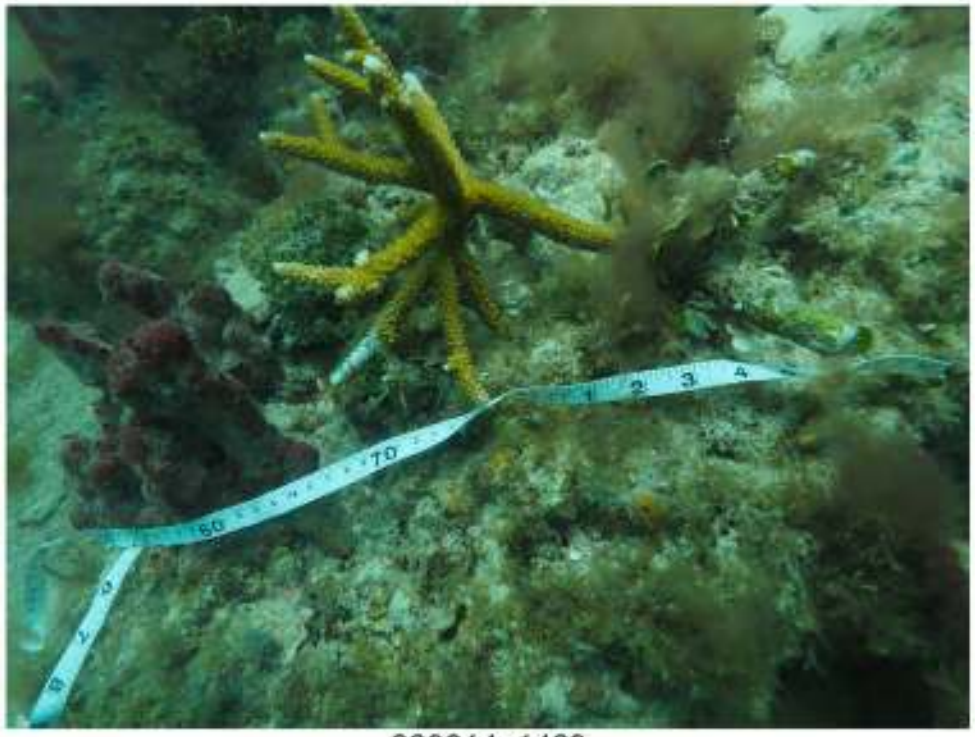

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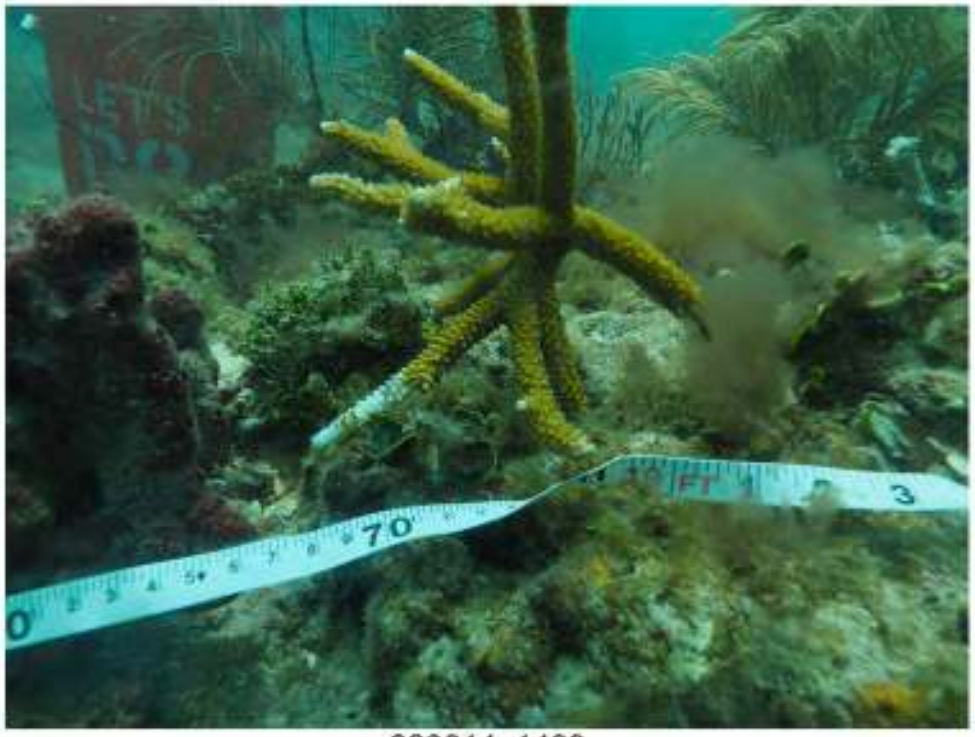

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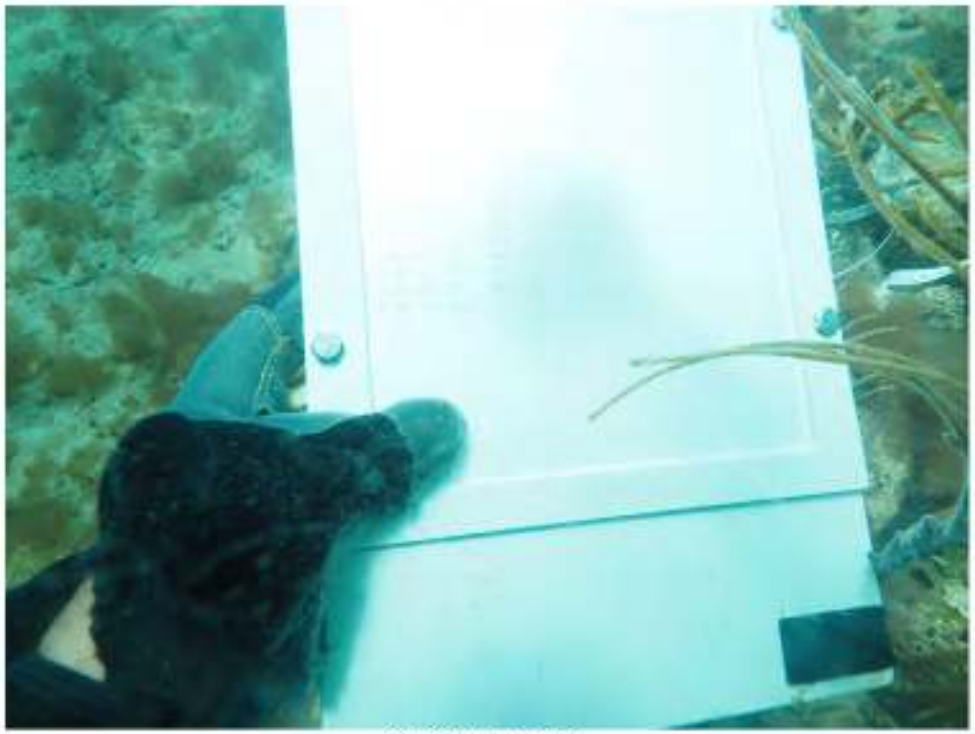

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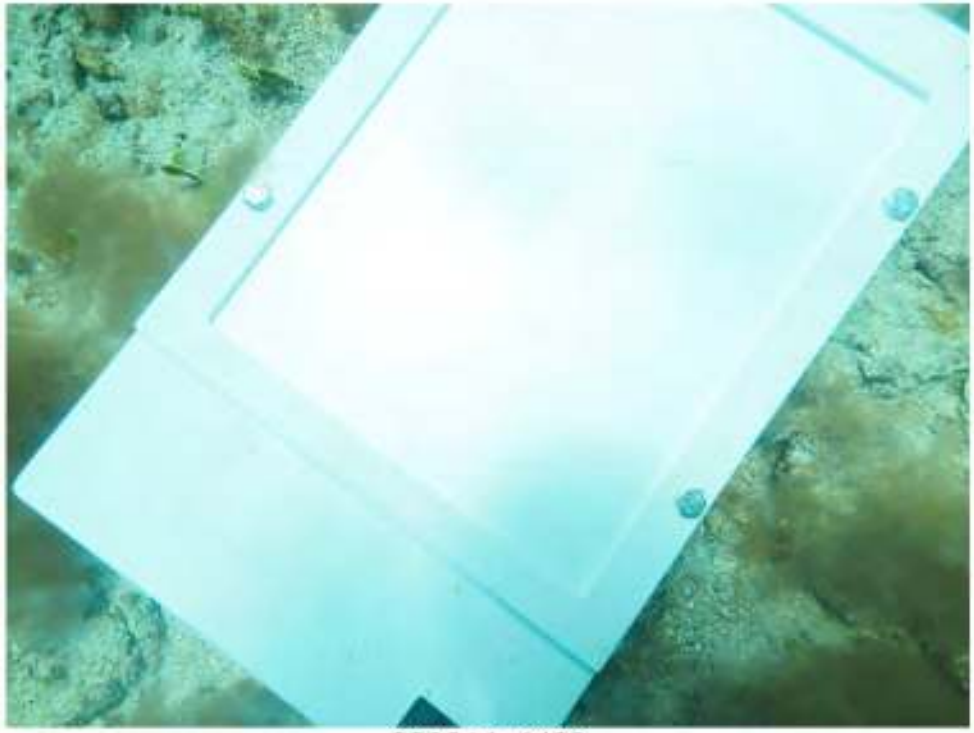

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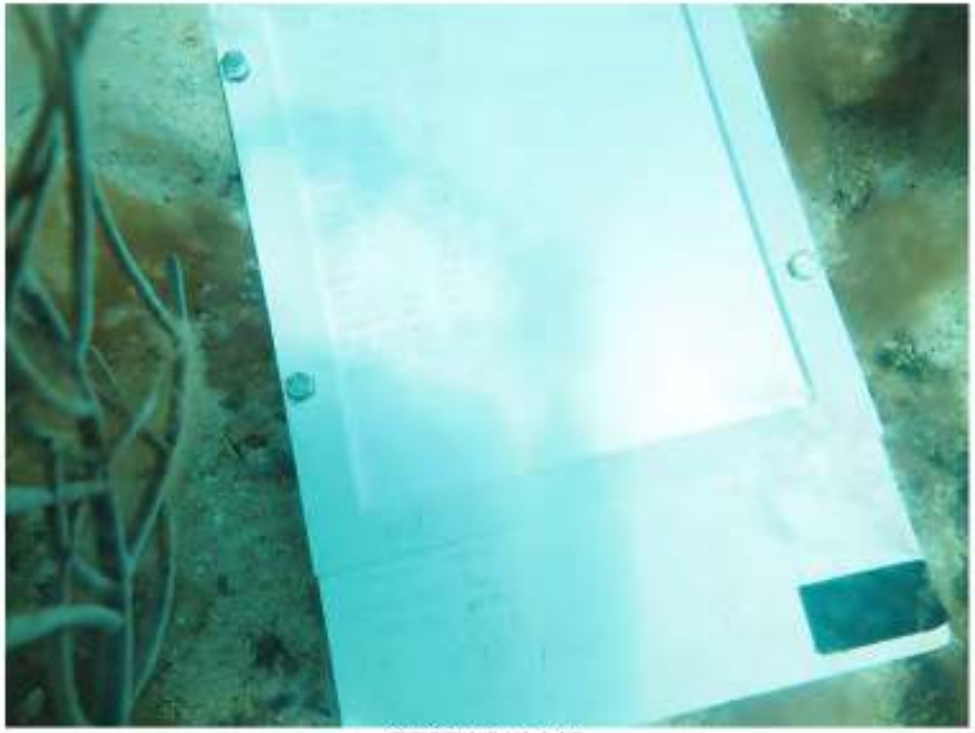

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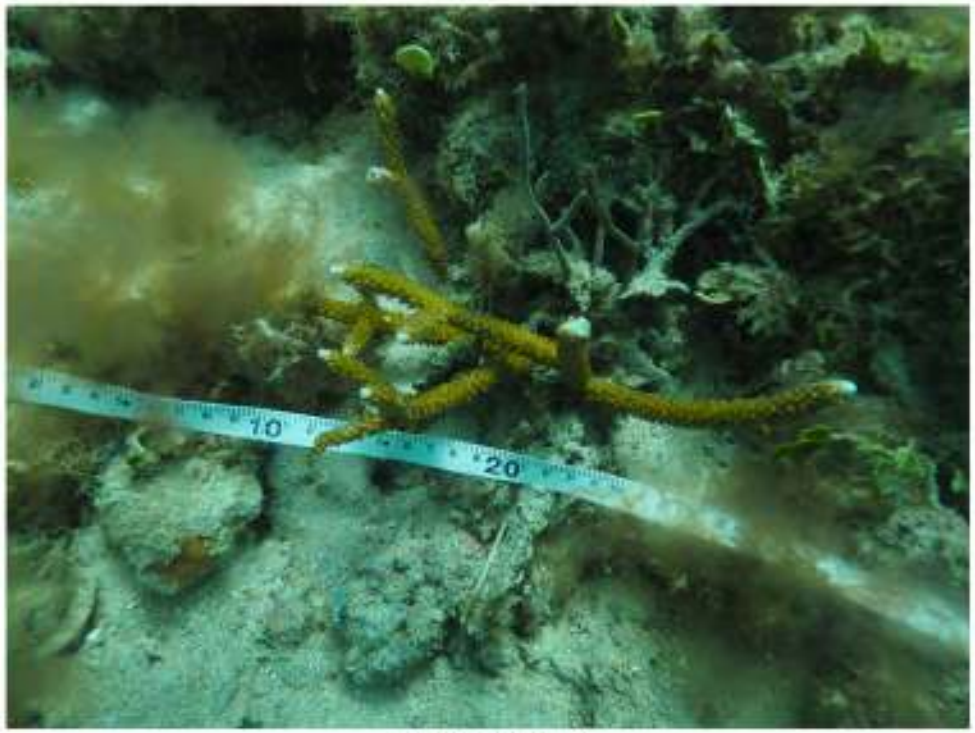

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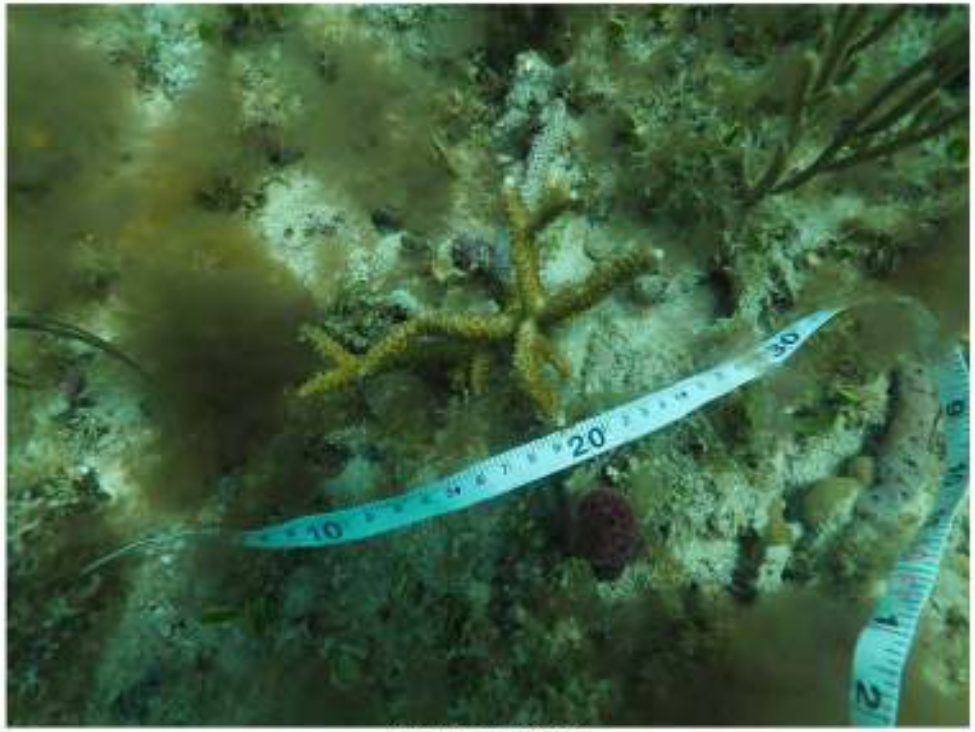

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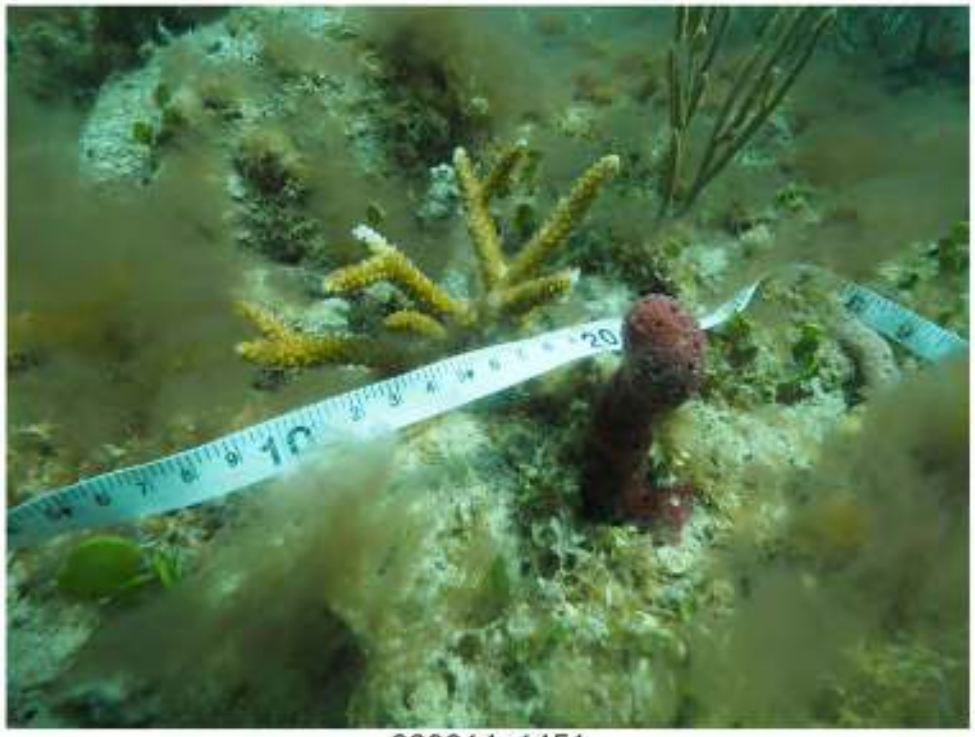

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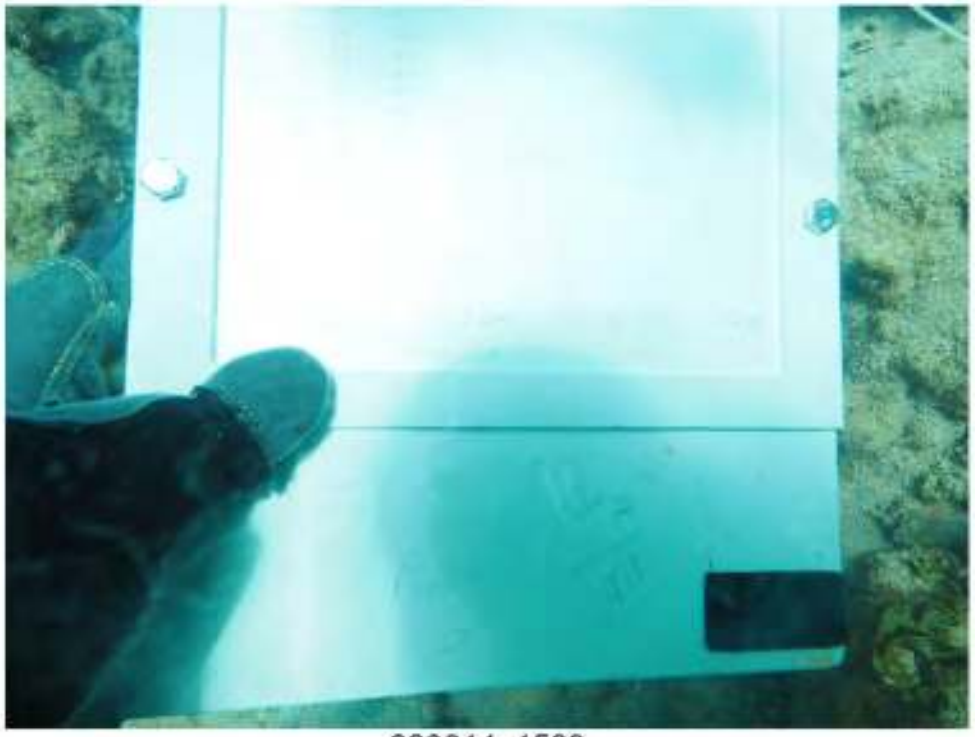

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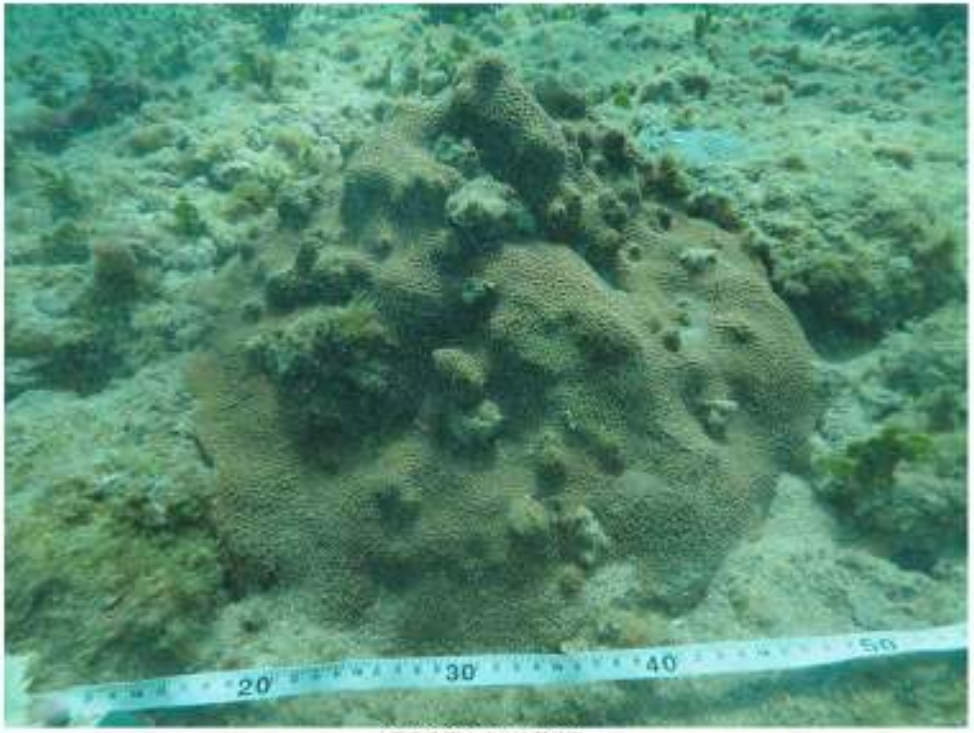

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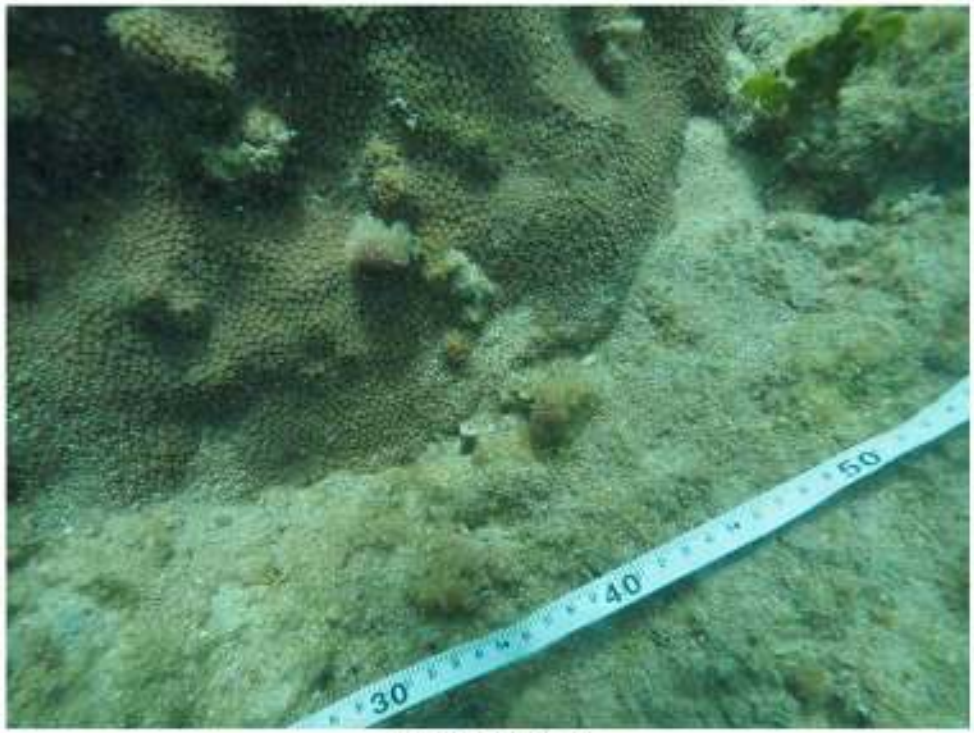

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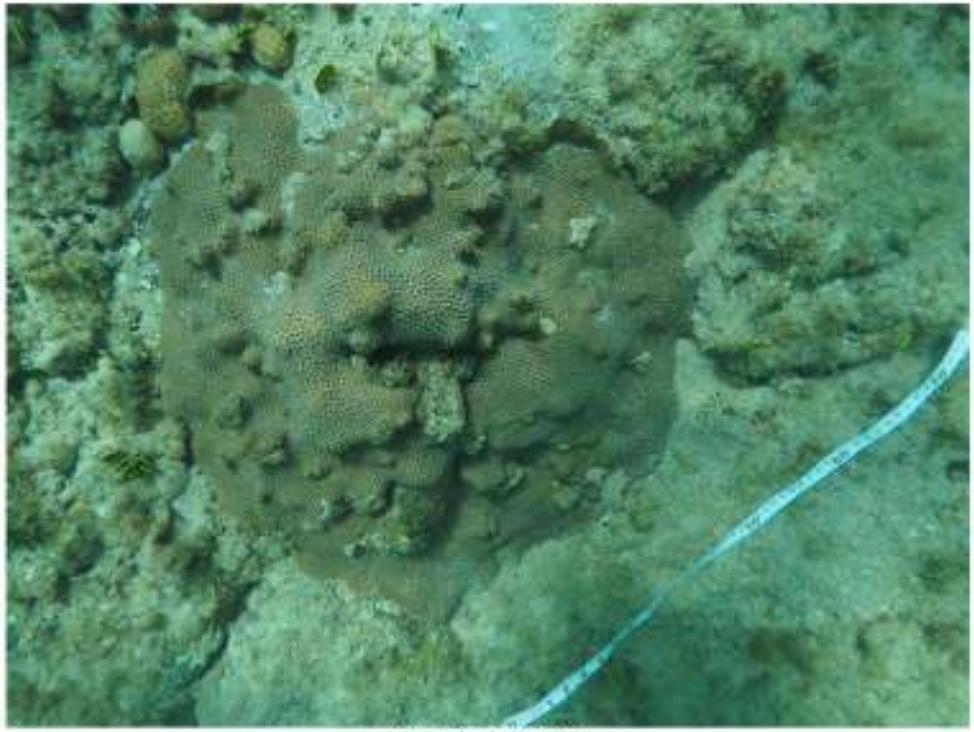
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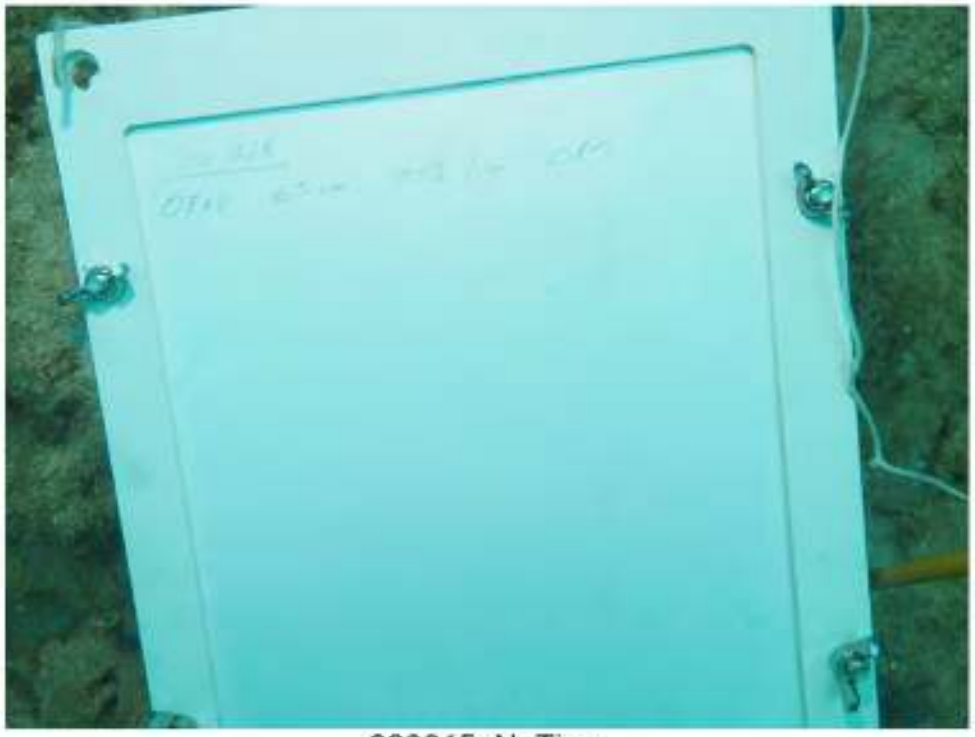

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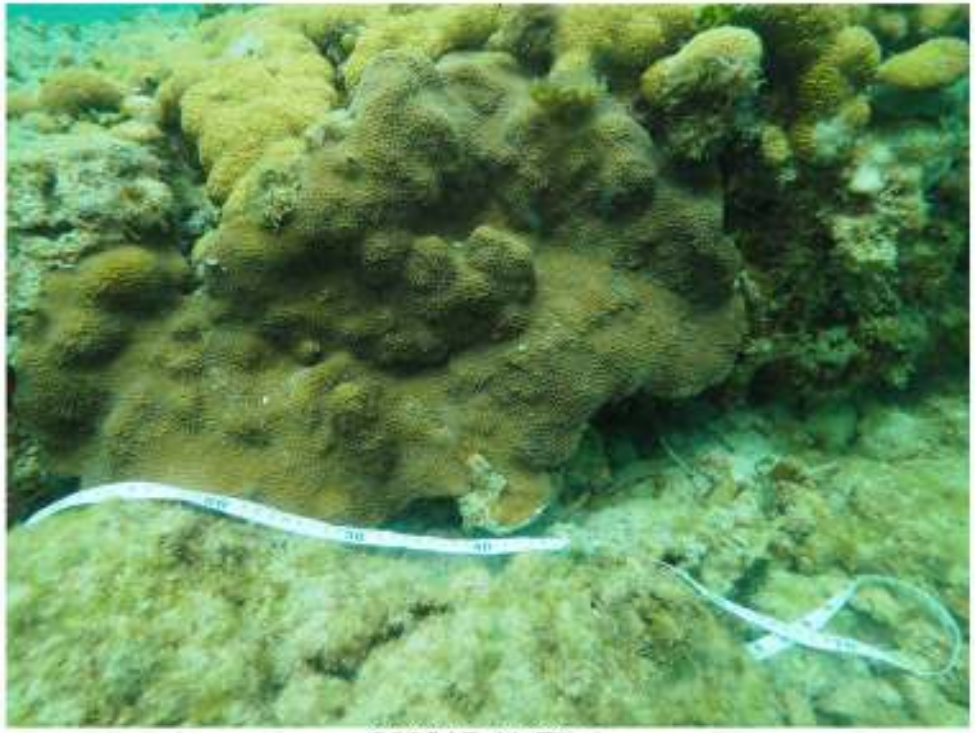

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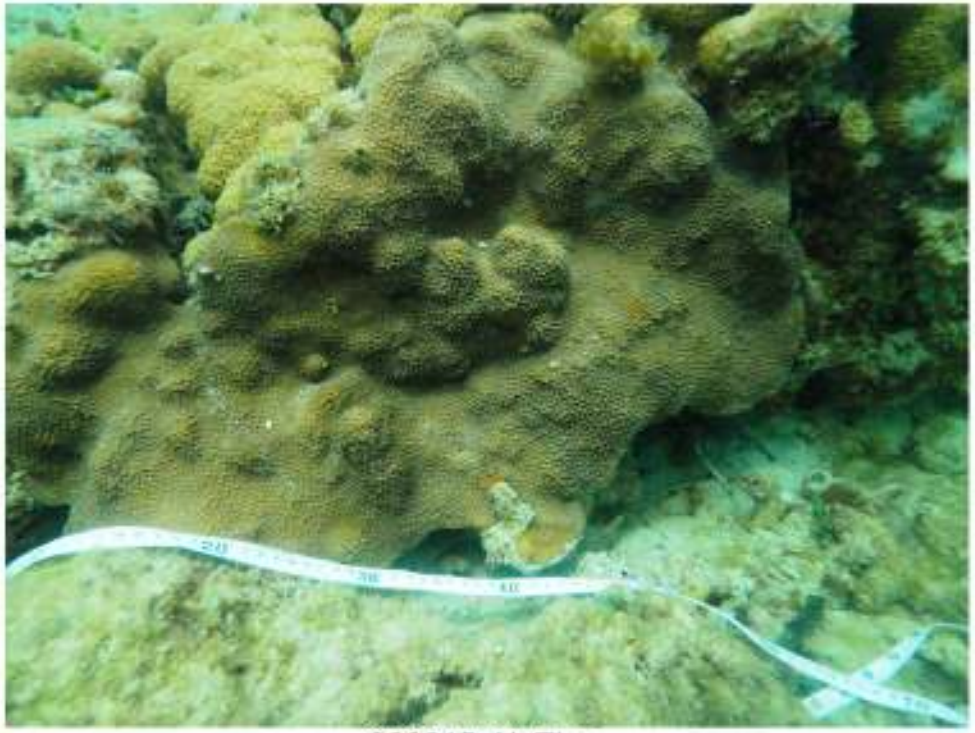

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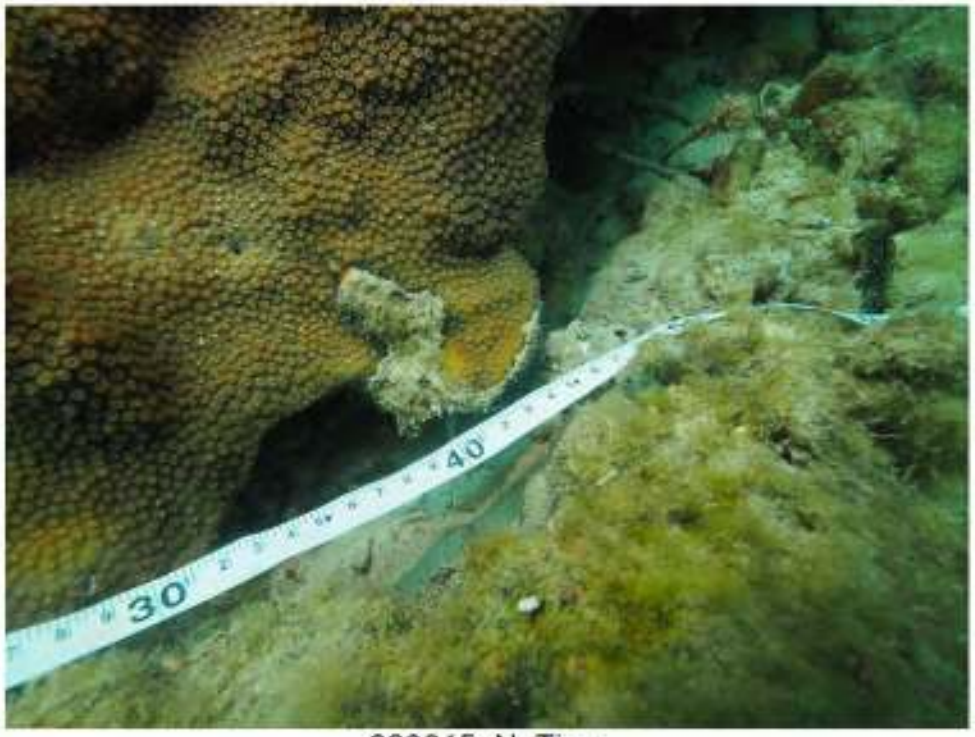

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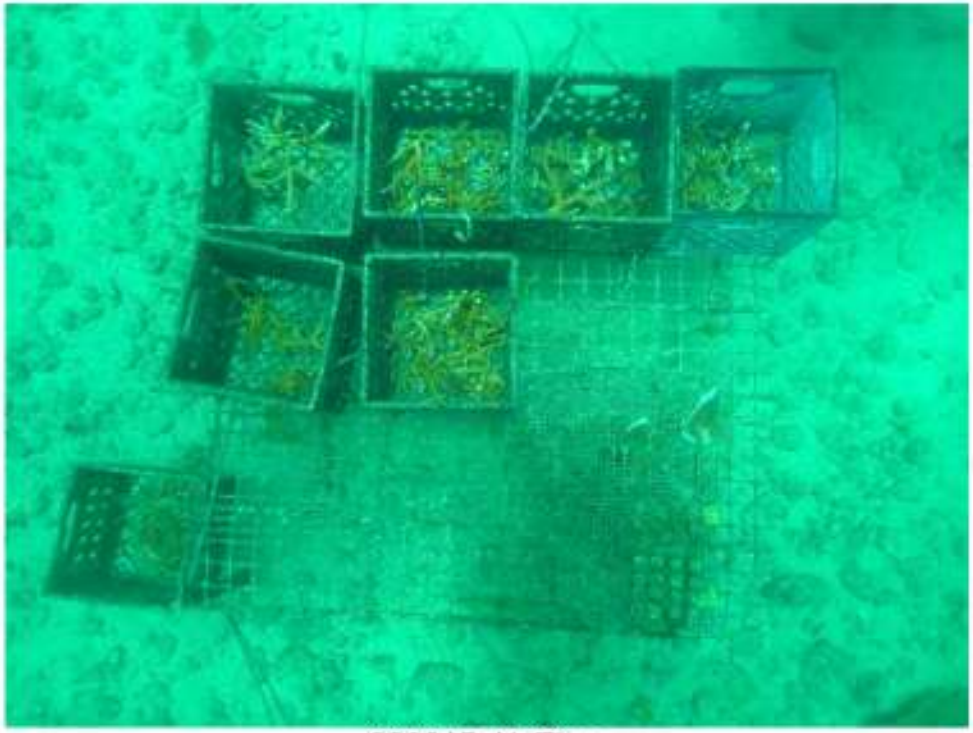

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Broward County Segment III Shore Protection
Endangered Species Act
Listed Corals Collection –Additional 8 Sites
Summary Report

Draft Report

March 2023

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1.0 INTRODUCTION

1.1 Study Context and Objective

In 2006, *Acropora cervicornis* (staghorn coral) and *Acropora palmata* (elkhorn coral) were listed as threatened species under the Endangered Species Act of 1973 (ESA; Federal Register/Vol. 71, No. 129/Thursday, July 6, 2006 / Rules and Regulations, http://www.gpo.gov/fdsys/pkg/FR-2006-07-06/pdf/06-6017.pdf). Five additional Caribbean stony coral species were listed as threatened in 2014 under the Endangered Species Act: *Orbicella annularis* (lobed star coral), *Orbicella faveolata* (mountainous star coral), *Orbicella franksi* (boulder star coral), *Dendrogyra cylindrus* (pillar coral), and *Mycetophyllia ferox* (rough cactus coral) (https://www.fisheries.noaa.gov/action/listing-20-reef-building-coral-species-under-esa).

As part of the Broward County Shore Protection Segment III Beach Renourishment Project, the United States Army Corps of Engineers (USACE) was required to perform ESA-listed coral collection/relocation efforts, in accordance with the 2020 South Atlantic Regional Biological Opinion (SARBO). The USACE contracted GLE Associates, Inc. (GLE), who sub-contracted Dial Cordy and Associates (DCA) to conduct a desktop assessment utilizing previously collected data to determine the extent of the coral collection/relocation efforts in select nearshore hardbottom habitats (Walker et al. 2008) between Port Everglades Inlet and south to the Miami-Dade/Broward counties boundary (approximately State R Monuments R-86 to R-128), in Broward County, FL.

Initial survey data collected as part of ESA-coral and hardbottom surveys, were provided in the contents of a March 2020 draft report provided by Olsen Associates (Gilliam et al. 2020) utilizing survey data collected in 2019, as well as GIS data, under the guidance of the NOAA Fisheries Service's recommended protocol. Surveys were conducted at a total of 356 sites (178 of these being hardbottom adjacent). The survey protocol instituted a 2-tiered survey approach to document the distribution and abundance of the seven threatened species. The first tier was a rapid assessment of all sites to locate any occurrences of listed threatened species. The second tier was a more comprehensive effort designed to provide greater detail on colony density, size, and location. The provided report and data were used to create a coral relocation/collection list that was provided to the USACE on October 8, 2021.

Due to the lack of colony specific coordinates, or even general locations (i.e., quadrants), for individual colonies or clusters of corals, the provided list was an estimate of the total number of colonies that could possibly be collected. The initial relocation list included 158 ESA-corals recorded at 26 sites, with 145 *A. cervicornis* possibly occurring within 200-ft of the project equilibrium tow of fill (ETOF) and 13 *O. faveolata* colonies occurring within 500-ft of the ETOF. After a December 17, 2021, conference call between representatives from the USACE, GLE, and DCA it was determined that the SARBO survey methods were not ideal for accomplishing the ESA-relocation efforts for these nourishment projects, and at the request of the USACE, DCA prepared a revised survey/collection methods proposal and an updated collection/relocation list for the survey/collection efforts for Segment III. The methods were modified based on the DCA field team's experience surveying and collecting corals from the Segment II nourishment project in northern Broward County during the fall of 2021 (DCA 2022a). The updated list included 21 of

the originally proposed ETOF-adjacent sites, and three additional sites based on the assumption that the adjacent sites had higher densities of *A. cervicornis* colonies and there was high potential that since the original 2019 surveys that fragments had migrated (D'Antonio et al. 2016) or reefs potentially expanded into these sites (Walker et al. 2012).

DCA was provided with an updated performance work statement (PWS) in April 2022. The updated PWS and attachments indicated that the DCA proposed methods were approved and would be utilized to survey and collect ESA-corals from 9 of the recommended 24 sites (DCA 2022b). The survey and collection efforts were completed in June 2022, when 46 ESA-listed colonies were transferred to the offshore coral nursery managed by Dr. David Gilliam from NOVA Southeastern University (NSU).

During the June 2022 survey and relocation efforts the DCA dive team unknowingly entered a site adjacent (Site 100) to one of the approved sites (Site 98) and began recording coordinates for observed *A. cervicornis* colonies. Based on the provided report and data used to compile the initial collection/relocation reports Site 100 potentially had the highest number of corals (30 *A. cervicornis* colonies) of any of the 24 recommended collection sites. Within a 10-minute casual survey of Site 100 more than 15 colonies were observed at the site. Due to Site 100 not being approved for surveys or collections, DCA only collected qualitative data of the colonies to provide to USACE, as work conducted within Site 100 was outside of the scope of the initial contract.

The GLE project manager coordinated a conference call with representatives from the USACE and DCA to relay the DCA field team's findings. The call occurred on June 24, 2022, and all information shared on the call with the USACE representatives was shared in Section 5 of August 2022 Collection Summary Report (DCA 2022b). The USACE indicated that they would coordinate with the regulating agencies to determine the appropriate course of action. Based on previous analyses of the provided reports and field observations, DCA included their recommended course of action in the 2022 report.

In January 2023, USACE provide an updated PWS that required the surveys/collection of ESA-listed corals at eight additional sites based on the previous DCA recommendations and USACE's own analyses of the data. All ESA-listed colonies observed within 200-ft of the ETOF were to have pertinent qualitative/quantitative data and geographic data collected prior to the collection and transfer of each colony.

All ESA-listed corals were collected under the authorization of Florida Fish and Wildlife Commission (FWC) special activity licenses (SAL): SAL-23-2441-R (Appendix B). Coordination efforts, between DCA staff and Dr. Diego Lirman's (University of Miami's Rosensteil School of Atmospheric and Marine Sciences (RSMAS)) coral nursery staff for the transfer of the corals, occurred between February 3 and February 20, 2023, when the nursery staff indicate they would be in the field to receive the corals on a single day (February 21) during the week of planned collection activities of February 20. All collected colonies were transferred to Dr. Diego Lirman's offshore coral nursery located approximately three miles east of Key Biscayne in Miami-Dade County, Florida.

1.2 Study Area

The eight additional USACE approved sites fell between Broward County R-102 and Miami-Dade County R-001 encompassing approximately 4.09 acres of hardbottom habitat (Figure 1) and had an estimated 112 *A. cervicornis* colonies and 1 *O. faveolata* colony (Table 1). Water depths within the collection sites ranged 4m-5.5m. ESA-listed corals were observed at all 8 sites during the 2019 surveys. *A. cervicornis* were found as attached and unattached colonies, as well as individual fragments. Habitat within most of the sites was low relief hardbottom and/or sand closer to the ETOF line, with the two northern (242 and 244) sites having low relief hardbottom or sand adjacent to the 200-ft ETOF boundary and artificial reef comprised of large boulders to the west. Site 110 was comprised of only sand within the approved survey area.

Table 1. The estimated number of colonies proposed for collection/relocation identified at additional 8 USACE approved sites based on the provided 2020 draft report and GIS data. The acreage of the approximate amount of hardbottom within 200-ft of the ETOF is included as well.

Additional Approved Sites	Acres within 200-ft ETOF	*A. Cervicornis*	*O. faveolata*
46	0.04	10	
100	0.935	30	
102	0.884	17	
106	0.771	17	
108	0.358	6	
110	0.00	10	
242	0.448	5	1
244	0.651	17	
Total (n=8)	4.09	112	1

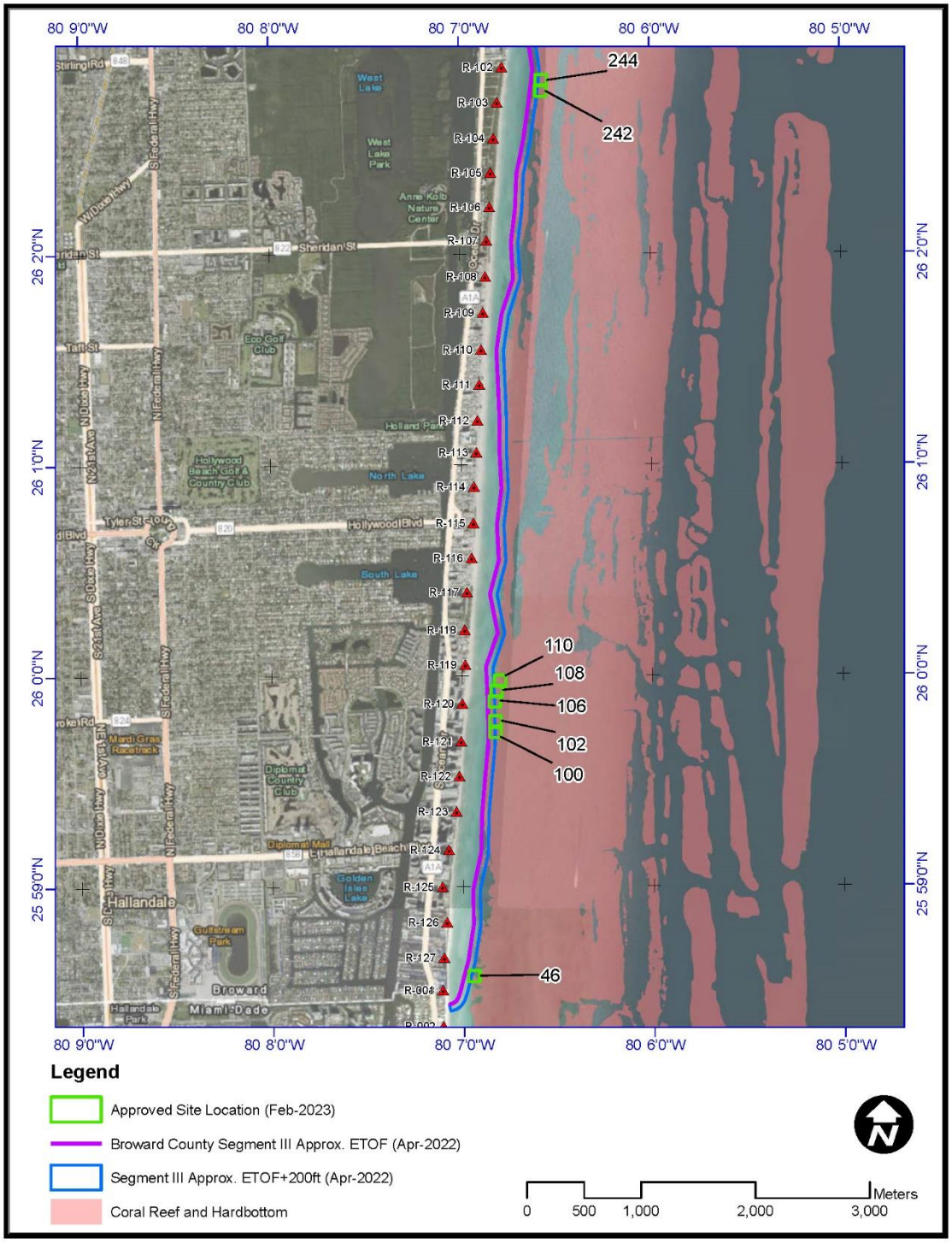

Figure 1. Map depicting the general location of the eight additional USACE approved ESA-coral collection sites for Segment III in Broward County, FL. The purple line indicates the approximate ETOF, and the blue line represents the approximate 200-ft boundary.

2.0 METHODS

Initial survey efforts were conducted in order to locate and record all ESA-listed corals within 200-ft of the project ETOF. To delineate the 200-ft ETOF boundary, a weighted line (lead line) was deployed along the path of the 200-ft boundary from the vessel utilizing Hypack navigational software paired with a sub-meter differential GPS. The lead line provided a visual reference on the substrate for the divers to remain within the delineated survey area. The start and end points of the lead line were marked with surface buoys. Qualified divers surveyed all the hardbottom to the west of the lead line and the locations of all *A. cervicornis colonies* were recorded utilizing a diver-towed surface buoy. For each observed colony, species, colony ID number, the maximum dimension (cm), percent live tissue, and any other relevant observations were recorded.

ESA-listed coral collection/relocation was conducted by qualified personnel as outlined in the NOAA/NMFS "ESA-Listed Coral Colony and Acropora Critical Habitat Survey Protocol" (included in Appendix A) and adhered to the standards outlined in the FWC special activities licenses that the collection activities were permitted under (Appendix B). To ensure that all surveyed colonies within the 200-ft ETOF boundary were collected the lead line was placed in the same manner as it was for the initial, survey efforts. In addition to the lead line, weighted lines with buoys were dropped near individual colonies, or groups of colonies, with specific location data. The buoys allowed the divers to confirm they were collecting the previously identified colonies.

For the collection process, like the surveys, the dive team surveyed all of the habitat extending west of the lead line to the hardbottom edge to collect any additional corals that may have been missed during the initial surveys. Once colonies were found they were collected using hammer and chisels, for larger *A. cervicornis* colonies, and gardening clippers on smaller *A. cervicornis colonies*. Per the stipulation of the FWC SAL all *A. cervicornis* colonies had all dead branch ends removed, as well as any other biota (e.g. sponges, corallivores, invertebrates, macroalgae, etc.). Pursuant to the FWC SAL a visual health assessment was conducted for each coral prior to collection (Appendix B).

Collected colonies were placed in 5-galllon buckets while collection activities occurred underwater. If additional colonies were observed during the collection process the same quantitative and qualitative metrics, as well as photographs, were recorded prior to the clipping of the colonies. After the completion of the collection efforts at each site the total number of colonies/fragments were recorded as they were transferred to 35-gallon tote bins that were filled with fresh seawater and covered by tarps to maintain a lower temperature while collection efforts continued. All colonies were transported by boat in a single trip to the RSMAS coral nursery on the day of collection efforts.

3.0 SUMMARY OF SURVEY AND COLLECTION EFFORTS

During the initial survey efforts, underwater visibility ranged from approximately 7-ft to greater than 25-ft, with a northerly current that was observed as light to moderate. A total of 49 *A. cervicornis* were observed at 5 of the 8 sites (Table 2, Figure 2 and Figure 3). *O. faveolata* colonies were not observed within the survey areas. After examining the GPS data the six

colonies observed at Sites 242 and 244 were recognized as being 15-ft east of the 200-ft ETOF line and were not included in the collection efforts (Figure 2).

During the initial survey of Site 100, visibility was 7-10-ft and a moderate northerly current was present. The current was pushing the divers off their planned survey track and did not allow for adequate coverage of the site. It was determined that a more thorough collection survey effort would be conducted during the collection efforts. On the day of collection, visibility was 25-ft at all the collection sites, with a light northerly current. An additional 32 *A. cervicornis* colonies were observed and collected at Site 100 (Table 3) during the collection efforts. A total of 237 *A. cervicornis* colonies/fragments were collected from the 75 colonies present within the survey areas at Site 100, Site 102, and Site 106.

Table 2. The number of colonies of each species observed during the initial survey efforts at the eight USACE approved.

Site	*A. Cervicornis*	*O. faveolata*	Total
46	0	0	0
100	27	0	27
102	8	0	8
106	8	0	8
108	0	0	0
110	0	0	0
242	3	0	3
244	3	0	3
Segment 3 Total	49	0	49

Table 3. The number of colonies of each species collected from the five sites where colonies were initially observed.

Site	*A. Cervicornis*	*O. faveolata*	Total
100	59	0	59
102	8	0	8
106	8	0	8
242	0	0	0
244	0	0	0
Segment 3 Total	75	0	75

Figure 2. Map depicting the location of the six *A. cervicornis* colonies observed at Sites 242 and 244. All colonies were observed within 2m of the recorded coordinates. The colonies were not collected due to being 15-ft east of the 200-ft ETOF line.

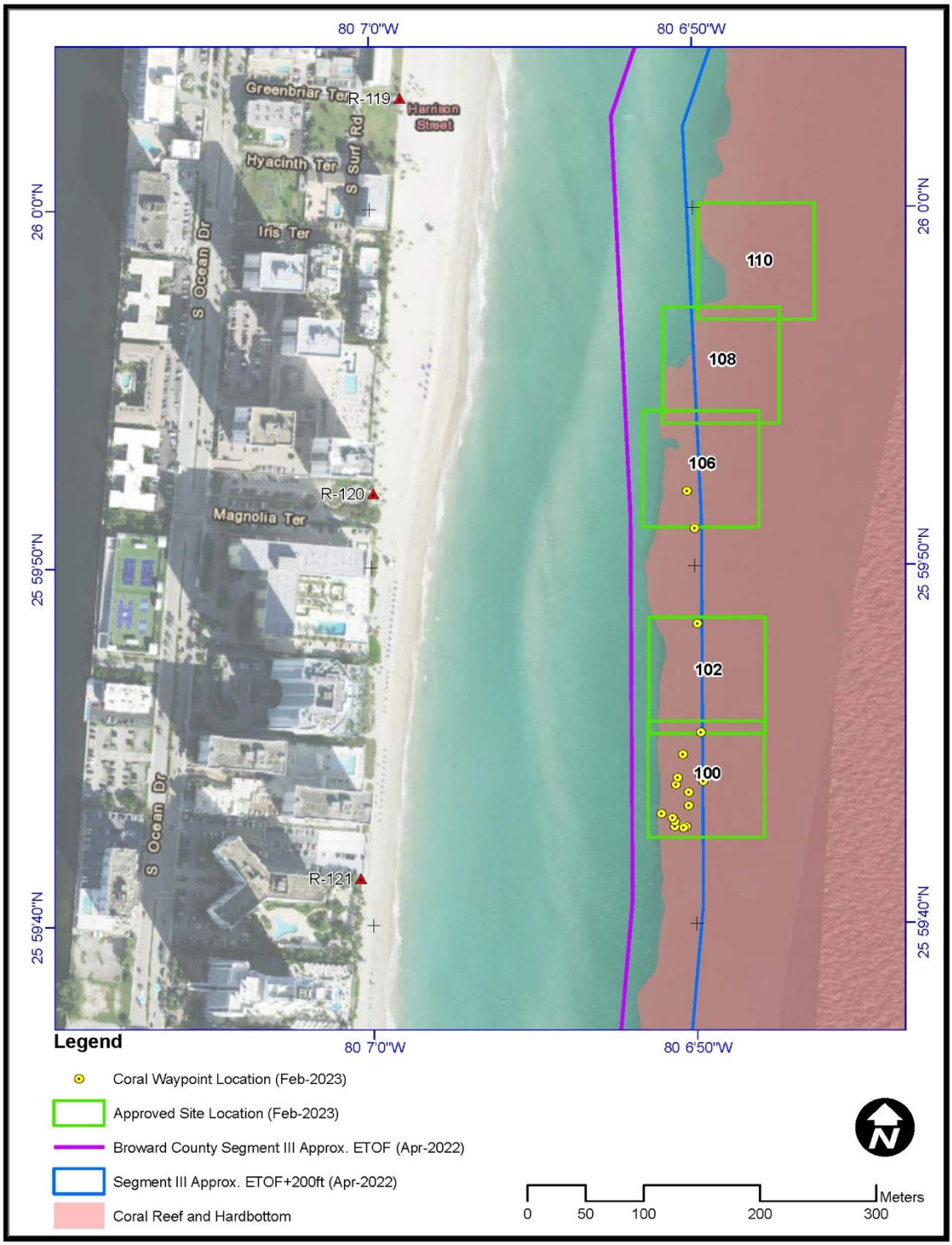

Figure 3. Map depicting the location of the *A. cervicornis* colonies collected from Sites 100, 102, and 106.

Mean (±Std. Dev.) colony size (based on maximum dimension) of all the collected *A. cervicornis* colonies was 23.4cm (±7.5cm). The largest colony collected had a maximum dimension of 45 cm and 15% live tissue. Mean (±Std. Dev.) percentage of live tissue of all collected colonies was 64% (±31%). Seven colonies at Site 100 had experienced recent mortality, with no colony exhibiting more than 5% recent mortality. Mean (± SD) percent live tissue for all collected *A. cervicornis* was 72% (±24%). Approximately 89% (67 of 75) of the collected colonies, were recorded as being loose/unattached (Figure 4). Additional stressors affecting the colonies included competitive mortality due to sponge overgrowth and partial burial of the colonies/fragments resulting in recent small areas of recent mortality on the colonies (Figure 5).

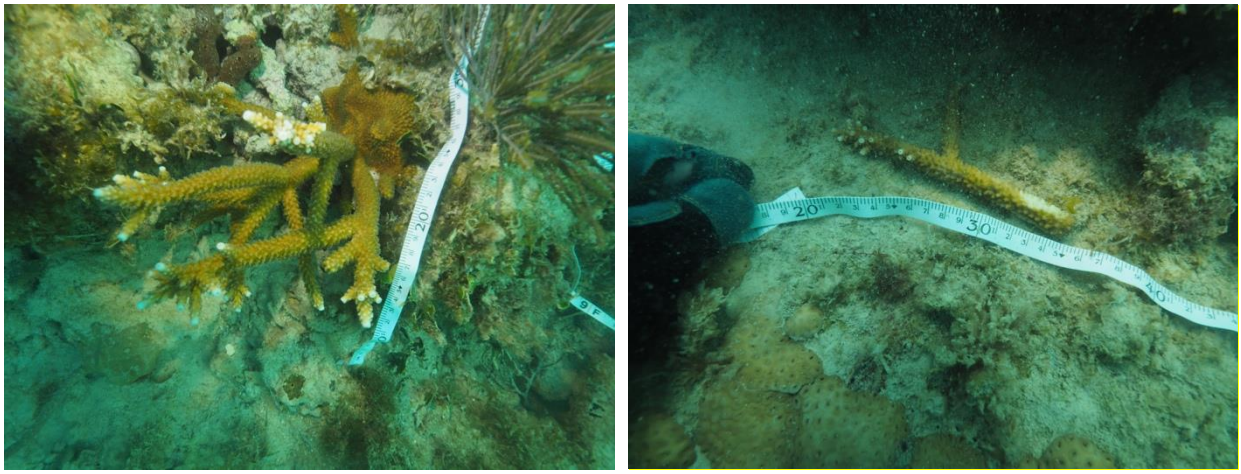

Figure 4. Images of an attached *A. cervicornis* colony (left) and a loose fragment (right) with an abrasion collected from Site 100.

Figure 5. Images of a large attached and smaller unattached A. *cervicornis* colonies exhibiting mortality. The large attached colony shows approximately 80% old mortality (unknown cause) at Site 100 (left) and the unattached colony is experiencing competitive mortality due to sponge overgrowth , as well asmortality of the branches at the top right of the colony being buried in sediment at Site 102 (right).

4.0 TRANSFER OF COLONIES

All colonies were collected on the day of the transfer to the RSMAS coral nursery (February 21, 2023). Transfer efforts were coordinated with Dr. Diego Lirman, and two of his research associates, Joseph Unsworth (MSc) and Dalton Hesley (MSc). The collected colonies were transferred from the DCA boat to the RSMAS staff on their boat, which was anchored at the location of the coral nursery. Staff from the nursery then transferred the larger fragments to a dedicated Broward County coral tree. The largest intact colony is going to be used for gardening and tracking as a unique genotype (Figure 6). The new fragments will be integrated into future research and restoration efforts. A total of 237 fragments from 75 colonies were delivered to the nursery staff.

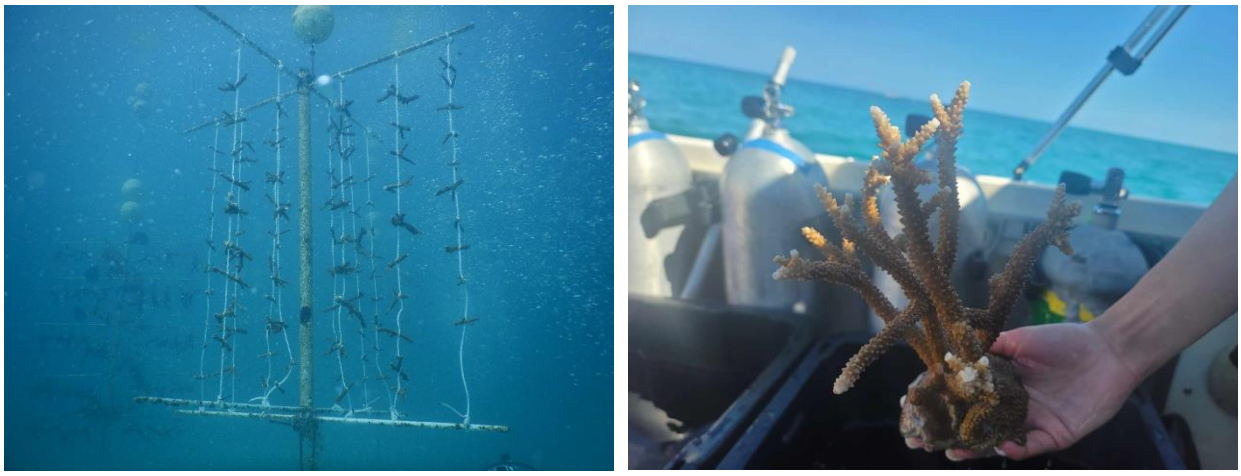

Figure 6. Images of transferred colonies and fragments attached to the Broward County specific coral tree at the RSMAS offshore coral nursery (left). Intact *A. cervicornis* colony that will be used for genotype tracking and gardening (right).

Per the specifications of the PWS the following information has been provided digitally to the USACE: field photographs (all collected corals), raw data and Excel summary spreadsheets, and scanned datasheets.

5.0 REFERENCES

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Appendix A

USACE Performance Work Statement Updated 2023

Attachment 1 – Survey Area Description

Attachment 2 - NMFS/SARBO Survey Protocol

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Appendix B

FWC Special Activity Licenses and FWC Visual Health Assessment Protocols

Appendix C

Submitted Coral Collection/Relocation List

(February 2023)

Appendix D

Field Photographs

APPENDIX I. PORT EVERGLADES HARBOR OPERATION AND MAINTENANCE (O&M) DREDGING PROJECT POST-CONSTRUCTION SEAGRASS SURVEY PORT EVERGLADES HARBOR

Port Everglades Harbor
Operation and Maintenance (O&M) Dredging Project
Post-Construction Seagrass Survey
Port Everglades Harbor

Ft. Lauderdale, Florida

February 2022

Prepared for:
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ASSESSMENT SCOPE

This assessment has been prepared to address portions of the Performance Work Statement provided by the U.S. Army Corps of Engineers for the Port Everglades Harbor Operation and Maintenance Dredging Project, Post-Construction Seagrass Survey. Specifically, this assessment addresses Tasks 2-3. Site conditions documented in this report are based on local knowledge, research of available resources, and direct observations during site visits conducted by Aerostar Environmental and Construction LLC, in September and October of 2021.

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1.0 INTRODUCTION

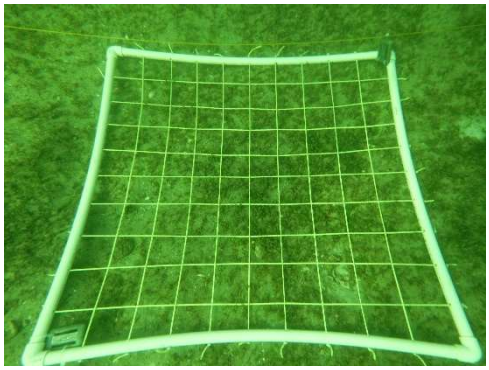
Aerostar Environmental and Construction LLC (AEC) deployed to Port Everglades, Ft. Lauderdale, Florida to assess and map existing seagrass resources located within the Port Everglades Harbor Operation and Maintenance (O&M) Dredging Project limits (Figure 1). Submerged aquatic vegetation (SAV) surveys were conducted according to the survey protocol provided in the Performance Work Statement (PWS), Port Everglades Harbor Operation and Maintenance (O&M) Dredging Project Post Construction Seagrass Survey, July 2021.

2.0 METHODOLOGY

AEC biologists deployed to the project area between September 20 and September 28, 2021, and again between October 18 and October 27, 2021. During the September assessment, AEC mapped and assessed seagrass beds identified in the Pre-Construction Study that was performed by Atkins in the fall of 2020. Previously identified seagrass beds were located using ArcGIS shape files provided by the U.S. Army Corps of Engineers (USACE). ArcGIS was utilized to establish survey transects and sampling quadrats within the seagrass beds. Transects were spaced ten meters apart across the seagrass beds and one-meter by one-meter quadrats were randomly established on the transects prior to deployment to the site. The number of quadrats within each seagrass bed was determined by assigning sufficient quadrats to cover 5% of the assessment area.

Prior to the start of field work, all scientific divers responsible for in situ quadrat data collection participated in cross-training and calibration activities to verify correct species identification and survey practices. Quality Assessment and Quality Control (QA/QC) results reflected a minimum of 90% consistency for frequency of occurrence and correct identification of SAV taxa between observers.

Scientific divers placed one-meter by one-meter sampling quadrats at each pre-identified quadrat location and estimated percent cover of seagrasses and rhyzophitic macroalgae. A representative photograph of each quadrat was taken and the general condition of the SAV was documented. The percent coverage of seagrasses and rhizophytic macroalgae was estimated using the Braun Blanquet density score, which can be found on Table 1.



Photograph 1. Example Quadrat Photo

Table 1. Braun Blanquet density scores	
Score	**Cover**
0	Taxa absent from quadrat
0.1	Taxa represented by a solitary shoot, <5% cover
0.5	Taxa represented by a few (<5) shoots, <5% cover
1	Taxa represented by many (>5) shoots, <5% cover
2	Taxa represented by many (>5) shoots, 5-25% cover
3	Taxa represented by many (>5) shoots, 25-50% cover
4	Taxa represented by many (>5) shoots, 50-75% cover
5	Taxa represented by many (>5) shoots, 75-100% cover

Areas not previously identified as seagrass beds were surveyed during the October field effort. Prior to mobilization, ArcGIS was utilized to identify survey transects within the areas devoid of seagrass beds. These transects were spaced ten meters apart and were designed to mirror, as closely as possible, the pre-construction transect locations. As with the Pre-Construction Study, transects started at the cut edge of the channel and traversed east-west. Transects within the inlet were established parallel to shore, ten meters apart. Inlet transects were limited by short slack tide windows and safety concerns due to heavy boat traffic.

Scientific divers were deployed in teams of two using a towed diver surface buoy with a Global Navigation Satellite System (GNSS) navigation R2 receiver antenna. The GNSS provided sub-foot position accuracy and the continual position of the divers along the survey transects.

During the surveys, the divers delineated the “start” and “stop” points for SAV resources along each transect using the GNSS attached to the surface buoy. At SAV start/stop points, the diver signaled the topside data support specialist by holding the buoy tow line as tightly as possible to the desired location and repeatedly submerging the buoy. The data support specialist then recorded the desired GPS point location. The diver also recorded a general description of the resource being documented (e.g., presence of seagrass and/or macroalgae resources, species/genera observed, whether resources are continuous/discontinuous, and/or substrate type). General wildlife observations were also taken in each area.

A total of 652 diver transects were completed in order to assess the project area. AEC divers worked from the northernmost transect to the southernmost transect within the project boundary. SAV resources were mapped from north to south.

Exhibits 2 A-G show the locations and orientation of transects within the project area.

3.0 RESULTS

3.1 SAV Delineation – Qualitative Transects

ArcGIS shape files provided by USACE were utilized to establish transects for SAV delineation. Seagrass beds were delineated by scientific divers using the methodology described above. The ArcGIS shape files generated during the two mobilizations were compared to the ArcGIS shape files provided by the USACE in order to compare size and extents of grass beds post-construction compared to those observed during the

pre-construction survey. Seagrass and macro algae beds were assigned numbers generally from north to south in order to organize data efficiently. In general, grass bed depths and extents did not substantially change from the pre-construction report.

TABLE 2. SAV Delineation Results

Bed # (Post-Construction)	Acreage (Post Construction)	Bed # (Pre-Construction)	Acreage (Pre-Construction)	Acreage Difference
1 (New)	0.05	Not Found	0	+0.05
2	0.17	I	0.09	+0.08
3	0.21	H	0.21	0
4	0.62	G	0.35	+0.27
5	1.53	K	2.08	-0.55
6	0.06	L	0.06	0
7	0.15	M	0.15	0
8	0.10	T	0.10	0
9	0.002	N	0.002	0
10	0.05	O	0.05	0
11	0.42	P	0.44	-0.02
12	0.11	Q	0.44	-0.33
13	3.79	J	2.80	+0.99
14	1.07	D	1.39	-0.32
15	0.12	E	0.08	+0.04
16	0.17	C	0.26	-0.09
17	0.01	W	0.004	+0.006
18	0.01	U	0.01	0
19	0.01	V	0.003	+0.007
20	0.42	A/B	0.02	+0.4
21*				
22*				
23*				
24*				
25*				
26A	0.01	Not Identified	0	+0.01
26B	0.01	Not Identified	0	+0.01
27*				
28	1.21	F	1.87	-0.66
29*				
30*		S		
31*				
Not Identified	0	R	0.02	-0.02
	10.302		**10.429**	**-0.127**

* -- Macroalgae Bed (No seagrass survey data)

A small bed of *Halophila decipiens* was identified within the yacht basin at the northern end of the project area that had not been identified during the Pre-Construction Study (Bed 1). Bed 25 (Bed R in the pre-construction report) was not located during either field event (0.02 Ac). Differences in extents and the addition or loss of very small beds is potentially a result of seasonal growth. There did not appear to be any evidence of mechanical impacts or impacts associated with siltation within the assessment areas which may have caused the loss of seagrass beds.

The location and size of SAV and macroalgae beds identified in both the pre- and post-construction monitoring events can be found in Exhibits 3 A-G.

3.2 SAV Quantification

Three species of seagrass, *Halophila decipiens*, *Halophila johnsonii*, and *Halodule wrightii,* were observed within the assessment areas. Table 3 shows the acreage, number of quadrats, species cover, total seagrass density, and Braun Blanquet Score of each SAV bed. Qualitative quadrats were not taken in macro algae beds as that would have disproportionately skewed the Braun-Blanquet Density score. Spreadsheets for each seagrass bed can be found in Appendix 1.

TABLE 3. SAV Survey Results

			Number of Quadrats				Average Percent Cover					
Bed # (Post -Con)	Bed # (Pre - Con)	Area (acres)	Total	Seagrass/ Macroalgae	Macroalgae Only	Bare Substrate	Hd	Hj	Hw	Macroalgae	Total Seagrass Density	Braun-Blanquet Density Score
1	N/A	0.05	13	8	0	5	20.69	0	0	0	20.69	**2.08**
2	I	0.17	47	24	4	19	8.26	0	0	0.34	8.26	**1.03**
3	H	0.21	45	31	14	0	1.76	0.13	0	37.07	1.89	**0.58**
4	G	0.62	157	101	38	17	0.82	1.32	0	86.84	2.14	**0.68**
5	K	1.53	417	201	45	171	5.62	0	0	0.84	5.32	**0.81**
6	L	0.06	13	13	0	0	21.38	0	0	10.08	21.38	**2.15**
7	M	0.15	30	29	0	1	55.03	0	0	0	55.03	**3.60**
8	T	0.1	19	19	0	0	41.32	0	0	0.1	41.32	**3.05**
9	N	0.002	1	1	0	0	9	0	0	4	9	**2**
10	O	0.05	9	8	0	1	17.11	0	0	0.78	17.11	**1.67**
11	P	0.42	90	75	3	12	32.99	0	0	0.74	32.99	**2.45**
12	Q	0.11	86	27	10	49	5.74	0.33	0	2.09	6.08	**0.69**
13	J	3.79	967	544	238	185	17.25	0.77	0	3.06	18.02	**1.49**
14	D	1.07	303	166	14	123	24.7	0	0	0.93	24.7	**1.77**
15	E	0.12	50	24	26	0	2	3.34	0	38.92	5.34	**0.84**
16	C	0.17	61	32	25	4	13.02	0	0	36.8	13.02	**1.31**
17	W	0.01	2	2	0	0	0	0	9	83.5	9	**2**
18	U	0.01	3	3	0	0	0	36.37	0	6.33	36.67	**3**
19	V	0.01	1	1	0	0	0	1	0	1.86	1	**0.5**
20	A/B	0.42	96	71	16	9	68.25	0	0	1.86	68.25	**3.89**
21*												
22*												
23*												
24*												
25*												
26A	N/A	0.01	3	3	0	0	42.83	0	0	0	42.83	**1.02**
26B	N/A	0.01	3	1	0	2	2.67	0	0	0	2.67	**.67**
27*												
28	F	1.21	556	176	271	109	13.45	0.98	0.42	26.8	14.85	**1.02**
29*												
30*	S											
31*												
NI**	R											
Total		**10.302**	**2972**	**1560**	**704**	**708**						

Halophila decipiens – Hd, *Halophila johnsonii* – Hj, *Halodule wrightii* – Hw,
* -- Macroalgae Bed (No seagrass survey data)
** -- Not Identified

Approximately 10.293 acres of seagrass beds were mapped in 23 discrete areas. A total of 2,972 quadrats were sampled across the SAV beds. Of these, 1,560 quadrats contained seagrasses and macroalgae, 704 quadrats contained macroalgae only, and 708 quadrats were bare substrate. Consistent with the pre-construction survey, *Halophila decipiens* was the dominant seagrass species observed with a presence in 19 of the 23 seagrass beds. Density of *Halophila decipiens* ranged from 0.82% coverage in Bed 4 to 68.25% coverage in Bed 20. *Halophila johnsonii* was present in 7 seagrass beds with density ranging from 0.13% coverage in Bed 3 to 36.37% coverage in Bed 18. *Halodule wrightii* was observed in two seagrass beds with density ranging from a low of 0.42% in Bed 28 to 9% in Bed 17. Seagrass density within the beds ranged from a low of 1% coverage in Area 19 to a high of 68.25% coverage in Area 20. Seagrass Beds 26A and 26B are separate beds but for organizational purposes were identified as "A" and "B". This was done in the field and in order to avoid confusion during reporting the beds were not renamed.

Photograph 2. Halophila decipiens

Macroalgae was observed in the majority of seagrass beds. *Caulerpa* sp., *Halimeda* sp., *Jania* sp., and *Gracilaria* sp. were observed within the project area. *Caulerpa* sp. was the dominant macroalgae species observed and was anchored on rocks and hard substrate. Beds 21 through 25, 27, and 29 through 31 consisted completely of macroalgae with no sea grass observed. As with the pre-construction survey the southernmost SAV bed, Area 28 (Bed F in pre-construction survey), contained the highest species richness with all four macroalgae genera represented.

Photograph 3. Caulerpa sp.

Locations of seagrass beds with their composition by species can be found in Exhibits 4 A-G.

4.0 GENERAL WILDLIFE OBSERVATIONS

Animal species observed within the survey area includes birds, reptiles, fish, mammals, and marine invertebrates. Two federally-listed species were observed: the green sea turtle (*Chelonia mydas*) and the West Indian manatee (*Trichechus manatus latirostris*). A young green sea turtle was observed on the east bank of the intracoastal waterway at the creek mouth near Area 15. West Indian manatees were observed swimming along the east bank of the intracoastal waterway between the inlet and the southern extent of the project area. Bottlenose dolphin (*Tursiops truncatus*) were primarily observed within the intracoastal waterway between the mouth of the inlet and the 15th Street Bridge. A table of all observed species is included below.

Table 4. Wildlife Species Observed			
Class	**Family**	**Genus species**	**Common name**
Marine Invertebrates			
Polychaeta	Amphinomidae	*Hermodice carunculata*	Bearded fireworm
Malacostraca	Menippidae	*Menippe mercenaria*	Stone crab
Malacostraca	Diogenidae	*Clibanarius vittatus*	Thinstripe hermit crab
Malacostraca	Palinuridae	*Panulirus argus*	Spiny Lobster
Malacostraca	Portunidae	*Callinectes sapidus*	Atlantic blue crab
Fish			
Actinopterygii	Acanthuridae	*Acnthurus coeruleus*	Blue tang
Actinopterygii	Carangidae	*Caranx crysos*	Blue runner
Actinopterygii	Carangidae	*Caranx hippos*	Jack crevalle
Actinopterygii	Carangidae	*Selene vomer*	Lookdown
Actinopterygii	Centropomidae	*Centrpomus undecimalis*	Common snook
Actinopterygii	Haemulidae	*Anisotremus virginicus*	Porkfish
Actinopterygii	Labridae	*Lachnolaimus maximus*	Hogfish
Actinopterygii	Lutjanidae	*Lutjanus apodus*	Schoolmaster snapper
Actinopterygii	Lutjanidae	*Lutjanus analis*	Mutton snapper
Actinopterygii	Lutjanidae	*Lutjanus griseus*	Grey snapper
Actinopterygii	Megalopidae	*Megalops atlanticus*	Tarpon
Actinopterygii	Ostraciidae	*Acanthostracion polygonius*	Honeycomb cowfish
Actinopterygii	Pomacanthidae	*Pamacanthus paru*	French Angelfish
Actinopterygii	Scombridae	*Scomberomorus regalis*	Cero Mackerel
Actinopterygii	Sphyraenidae	*Sphyraena barracuda*	Great barracuda
Actinopterygii	Synanceiidae	*Synanceia verrucosa*	Stonefish
Actinopterygii	Tetraodontidae	*Sphoeroides testudineus*	Checkered puffer
Chondricthyes	Dasyatidae	*Dasyatis americanus*	Southern stingray
Chondrichtyes	Ginglymostomatidae	*Ginglymostoma cirratum*	Nurse shark
Reptiles			
Reptilia	Cheloniidae	*Chelonia mydas*	Green sea turtle
Birds			
Aves	Anhingidae	*Anhinga anhinga*	Anhinga
Aves	Laridae	*Sternula antillarum*	Least tern
Mammals			
Mammalia	Delphinidae	*Tursiops truncatus*	Bottlenose dolphin
Mammalia	Trichechidae	*Trichechus manatus*	West Indian manatee

6.0 SUMMARY

The Port Everglades Harbor O&M Dredging, Post-Construction Seagrass Survey Project was evaluated for the presence of federally protected seagrasses within the project footprint. All benthic habitats were assessed, mapped, and quantified within the project area.

The survey was done in two separate phases. Due to time constraints, seagrass beds identified in the Pre-Construction Survey were assessed first. AEC conducted initial surveys of the seagrass beds identified in the Pre-Construction Study by Atkins in September 2020. Previously identified seagrass beds were located using ArcGIS shape files provided by USACE. AEC utilized ArcGIS to create an assessment methodology that utilized survey transects, space ten meters apart, throughout the previously identified assessment areas. AEC utilized randomly placed one-meter by one-meter quadrats along the transects to evaluate seagrass and macroalgae coverage. The number of quadrats within the seagrass beds was established to ensure a minimum of 5% of the documented beds were assessed. A representative photograph of each quadrat was taken and general condition of the SAV was documented. The percent coverage of seagrasses and rhizophytic macroalgae was estimated using the Braun Blanquet density score.

In October 2021, AEC mobilized to inspect areas of the project that did not previously contain seagrass beds. Survey transects were established at 10-meter intervals utilizing ArcGIS to ensure appropriate survey coverage of the areas previously devoid of seagrass beds. Transect placement was designed to mirror, as closely as possible, the pre-construction transects locations. General wildlife observations were also noted during each dive.

Halophila decipiens was the dominant seagrass species observed, appearing in 19 of 23 seagrass beds. *Halophila johnsonii* appeared in 7 seagrass beds.

In general, SAV beds were in the same location as were observed during the Pre-Construction Survey. Minor differences in acreages and boundaries were observed (a total of -0.127 ac. discrepancy between pre- and post- construction events) across the project area. Three new seagrass beds (Bed 1-0.05 ac., Bed 26A-0.01 ac. and Bed 26 B-0.01 ac.) were located within the project area. Previously identified Bed R (Bed 25) was not located during either mobilization. There was no evidence of disturbance, mechanical or otherwise, observed at any of the seagrass beds within the project area. Changes between the pre and post construction evaluations are potentially due to natural seasonal fluctuations that frequently occur in seagrass beds.

Two listed animal species, the green turtle and West Indian manatee, were observed swimming along the eastern edge of the Intracoastal Waterway within the project boundaries. Bottle-nosed dolphin were observed daily passing through the survey site. No other federally-listed animal species or marine mammals were observed during the site assessments.

7.0 SOURCES

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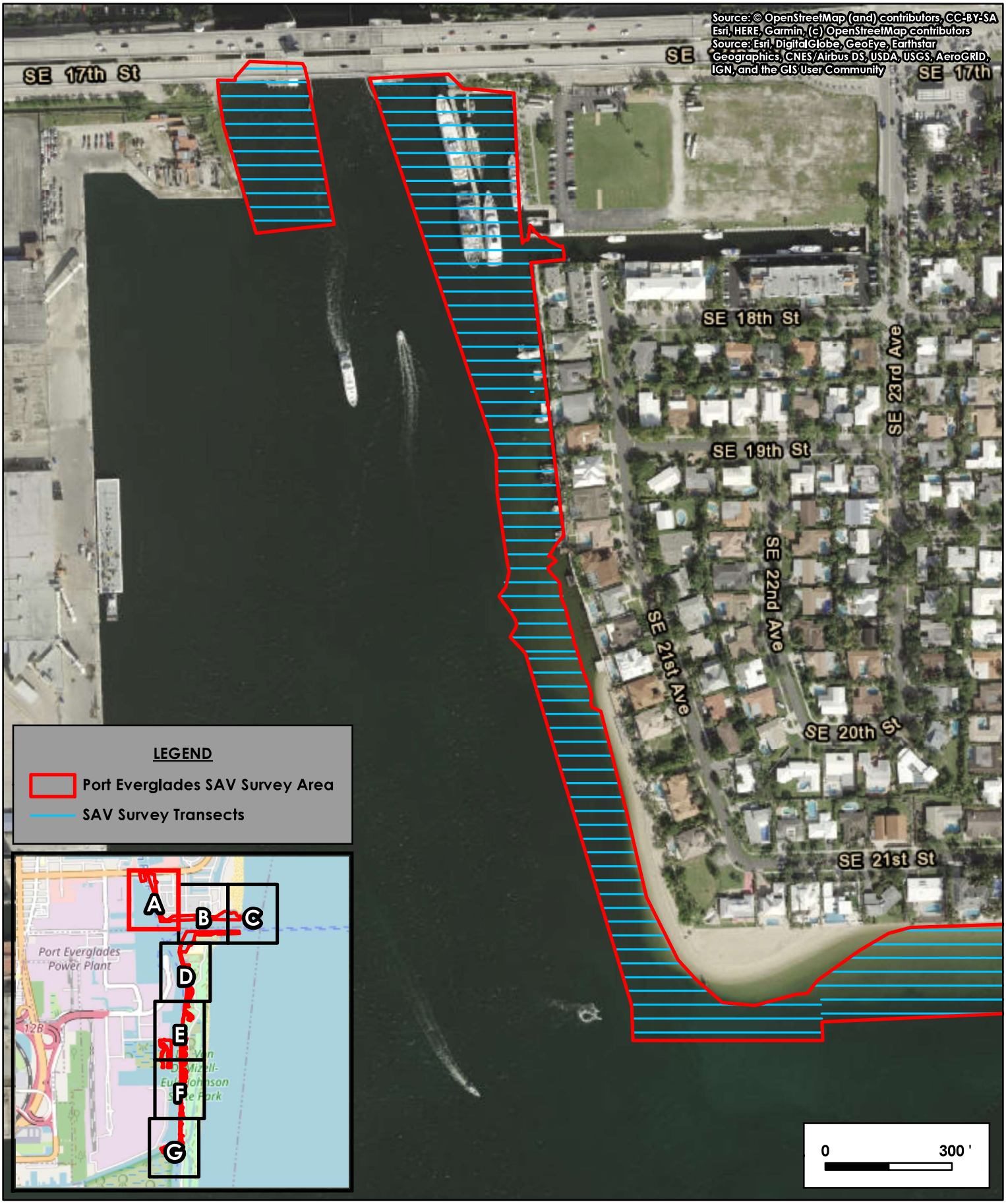
FIGURES



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Port Everglades Seagrass Survey
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By: NEE	Rev. Date:

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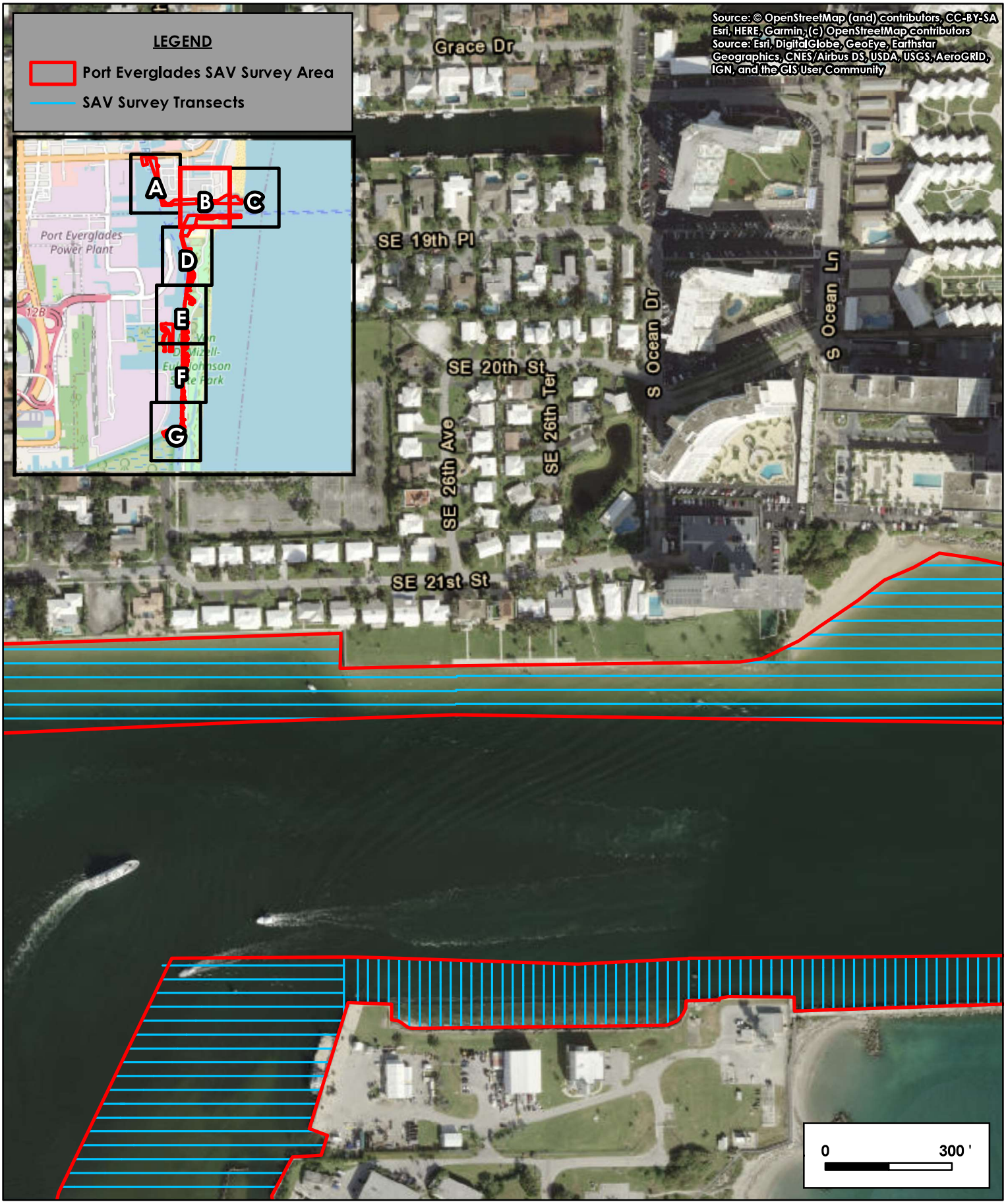

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By: NEE	Rev. Date:

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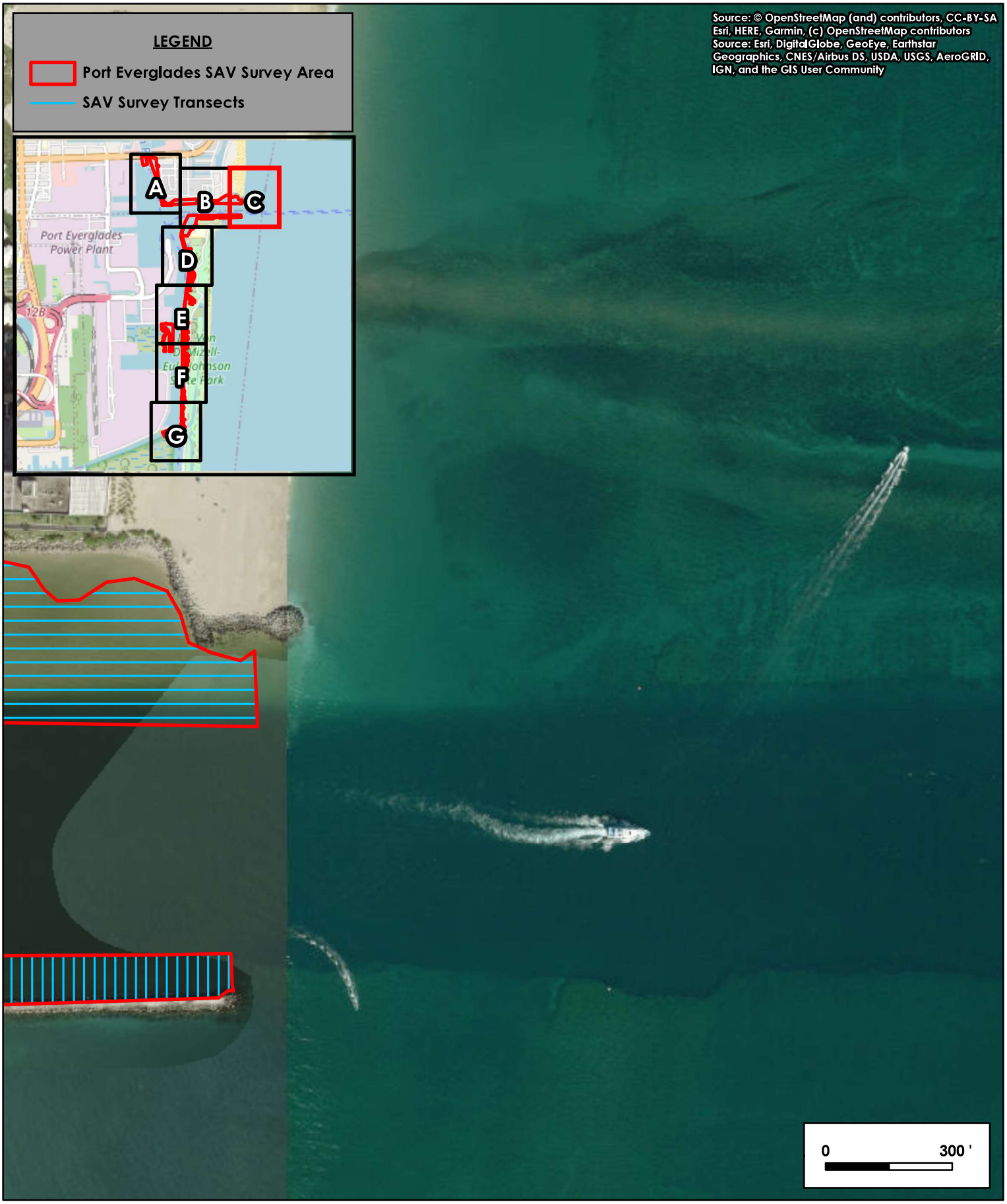

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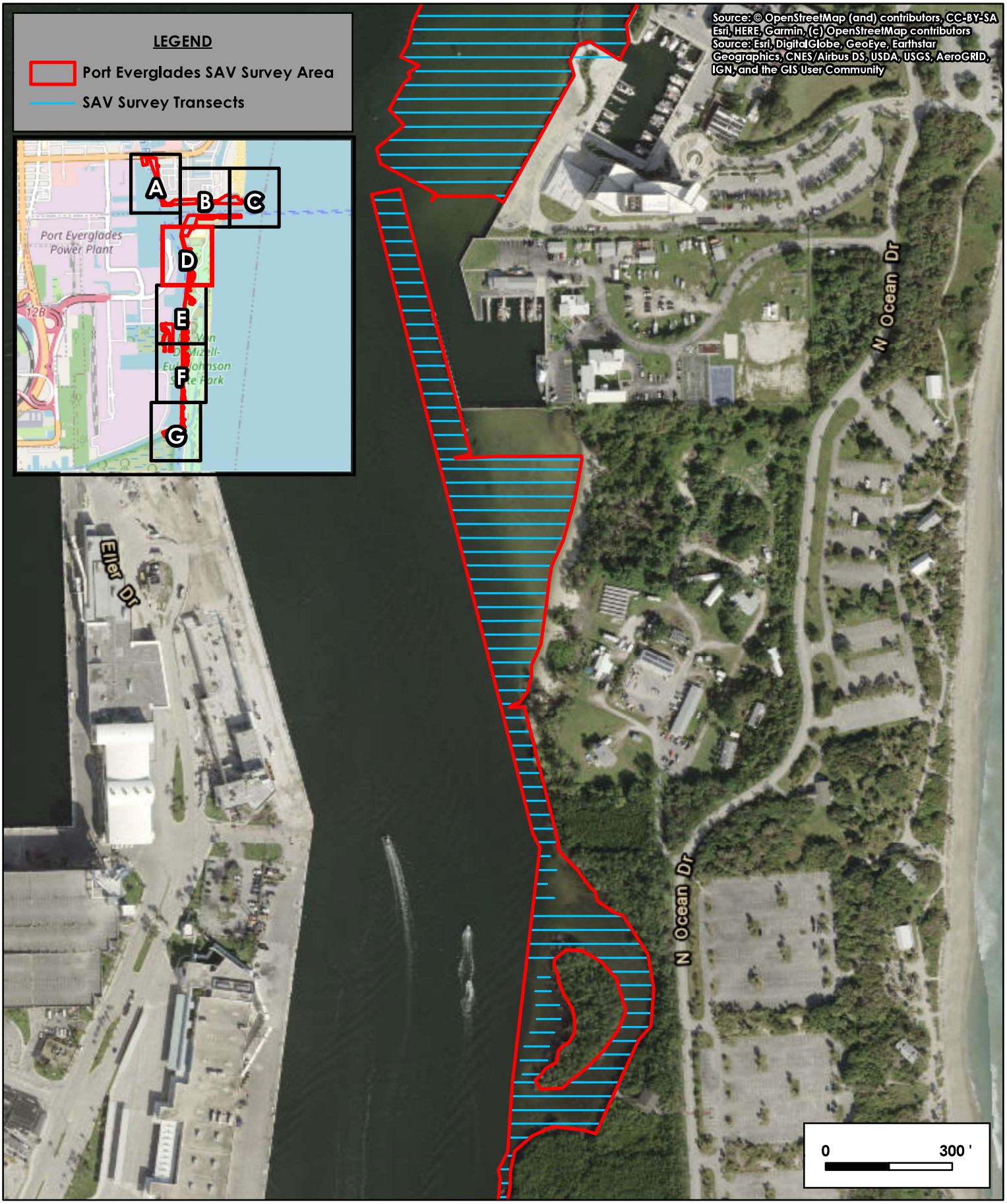

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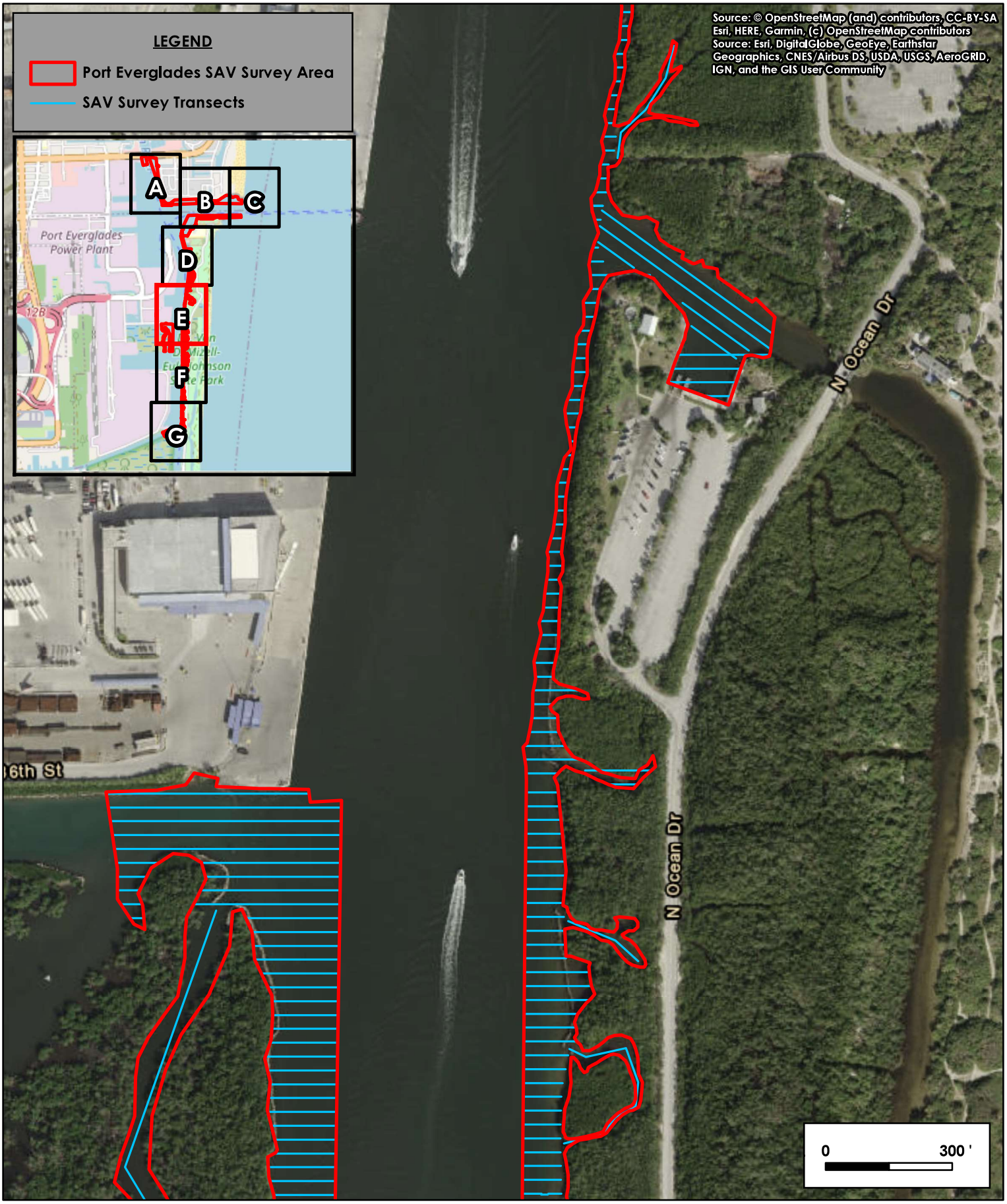

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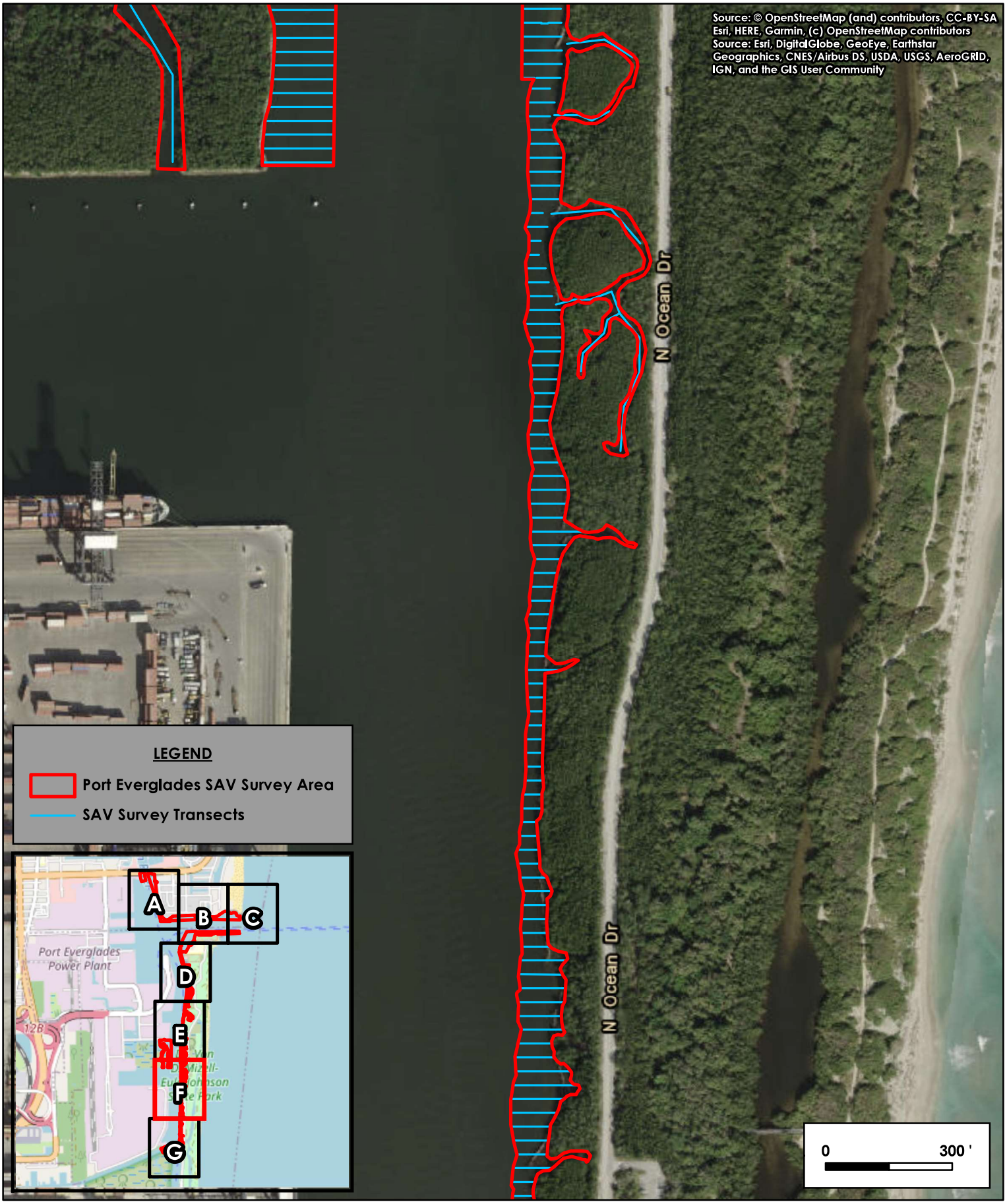

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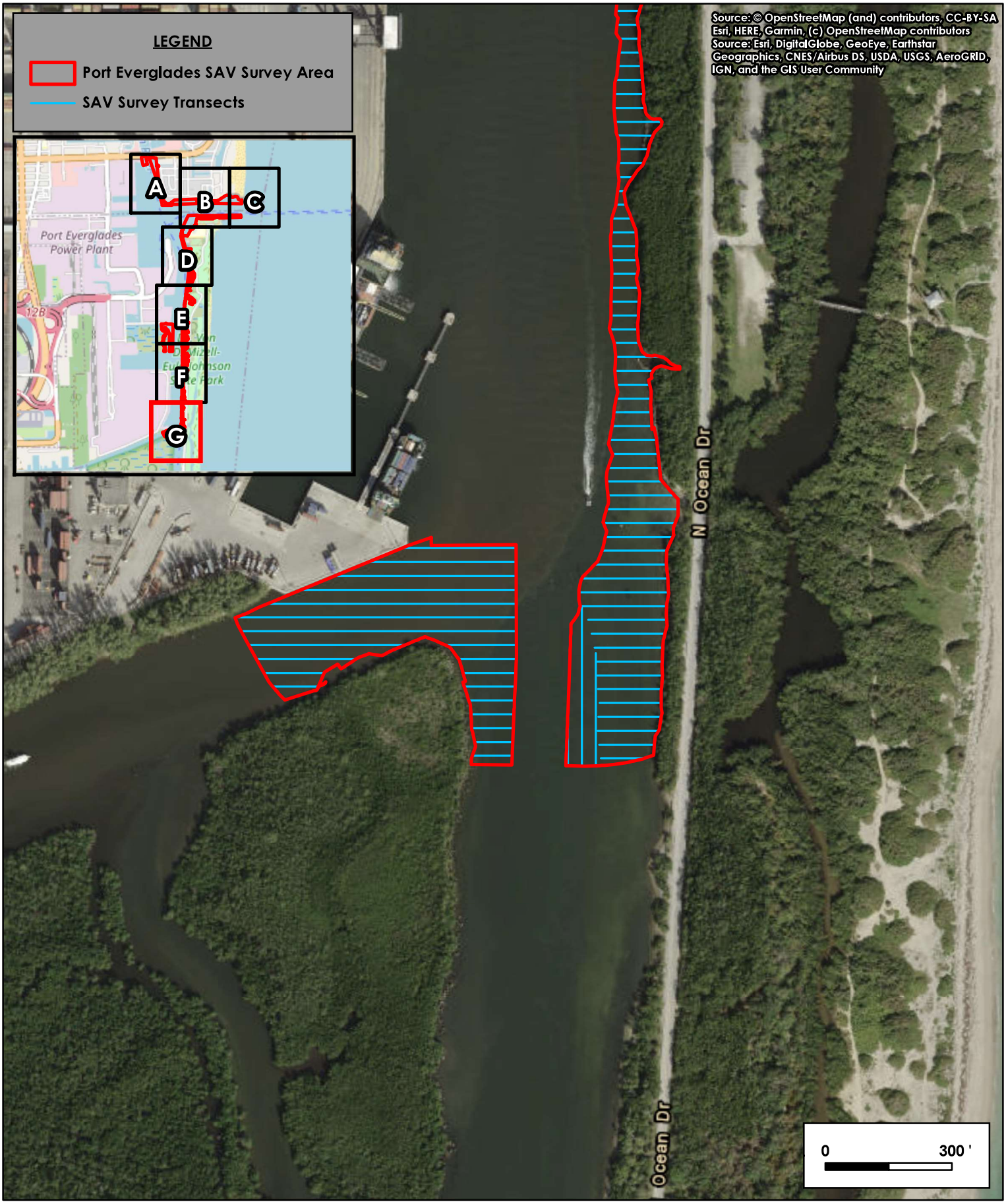

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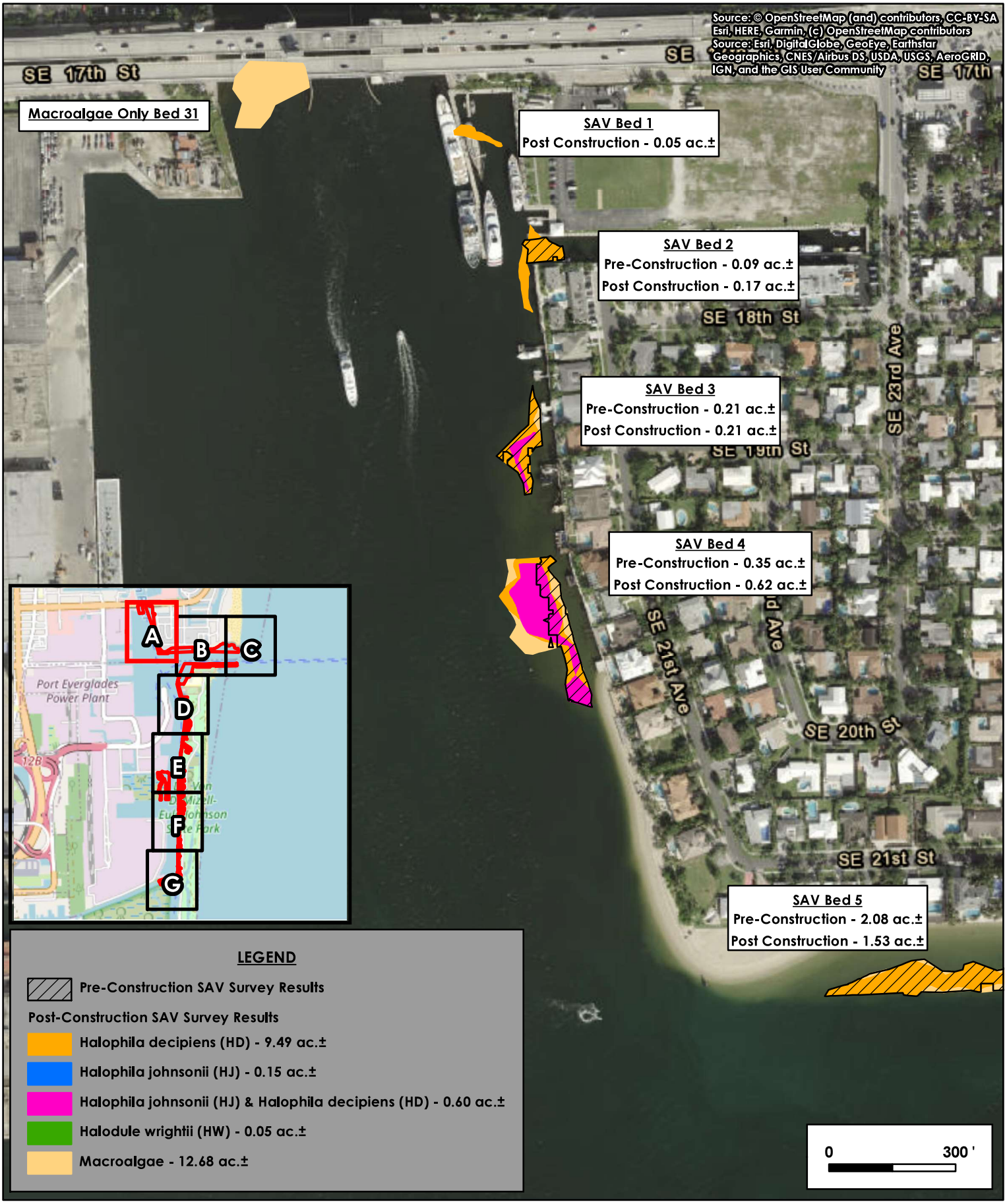

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Port Everglades Seagrass Survey
Submerged Aquatic Vegetation Beds
2020/2021 Comparison

Project No.:	21179
Exhibit No.:	3-A
Date:	2-24-22
By: NEE	Rev. Date:

Source: ArcGIS Online Imagery and World Transportation

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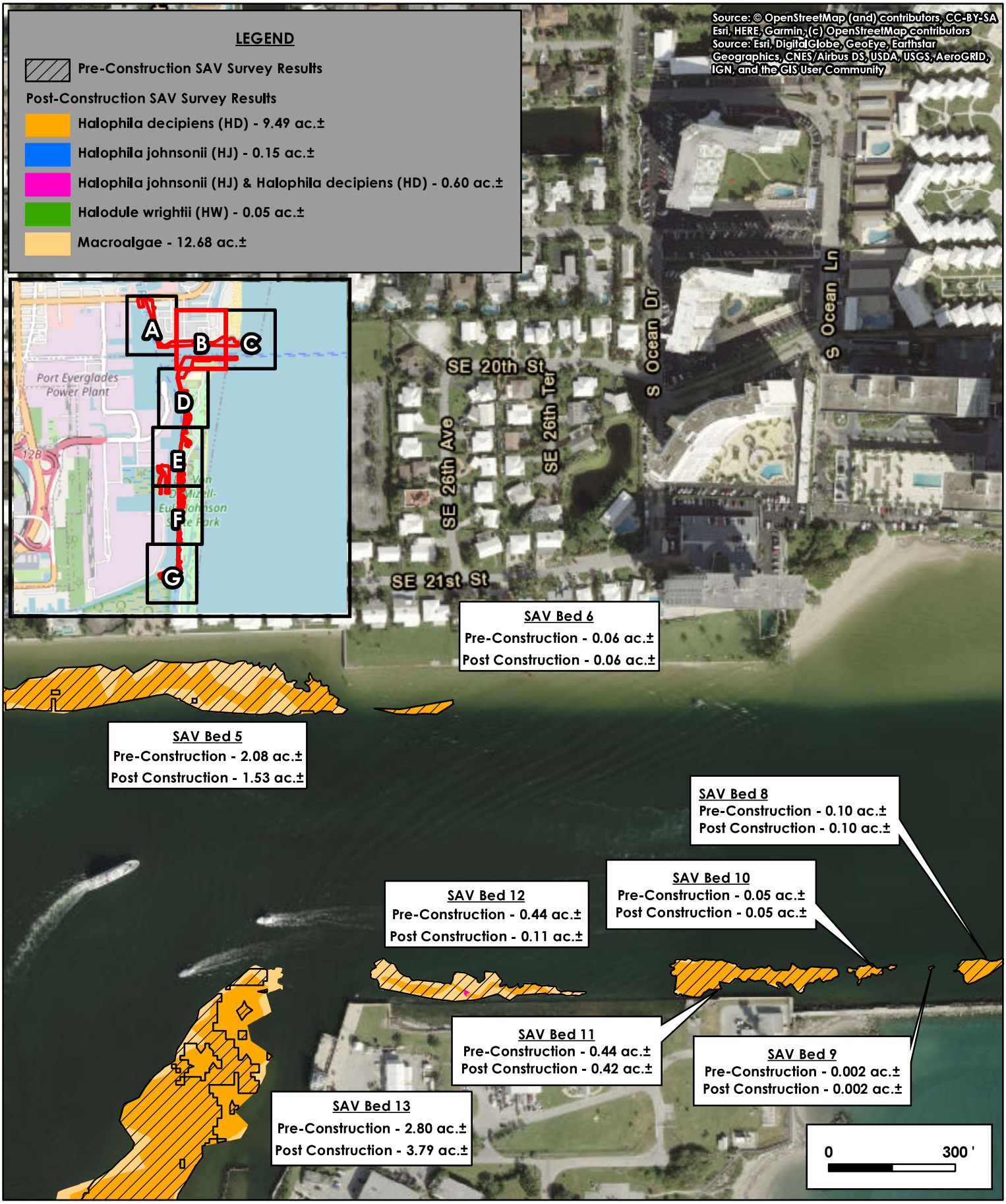

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Exhibit No.:	3-B
Date:	2-24-22
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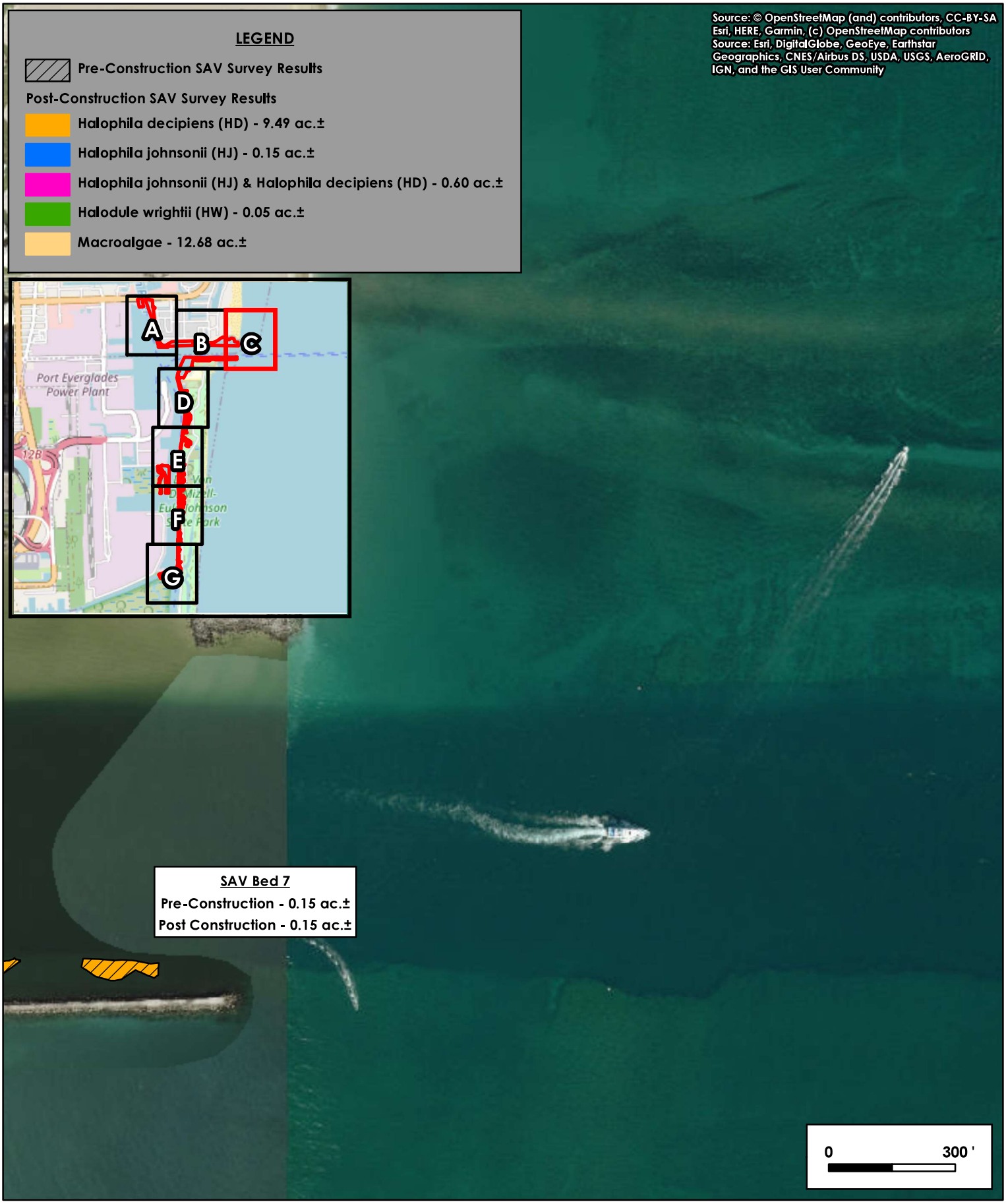

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Project No.:	21179
Exhibit No.:	3-C
Date:	2-24-22
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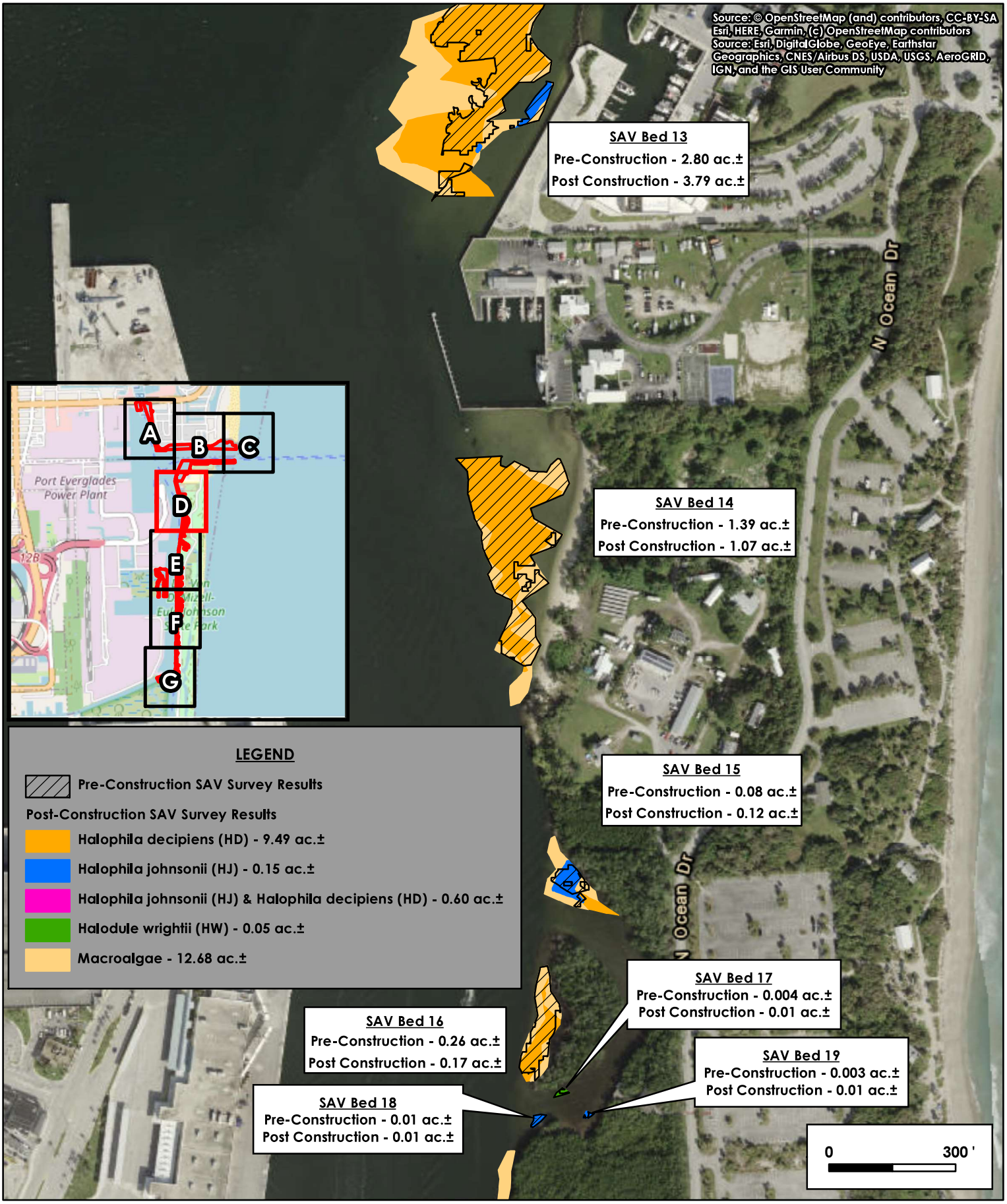

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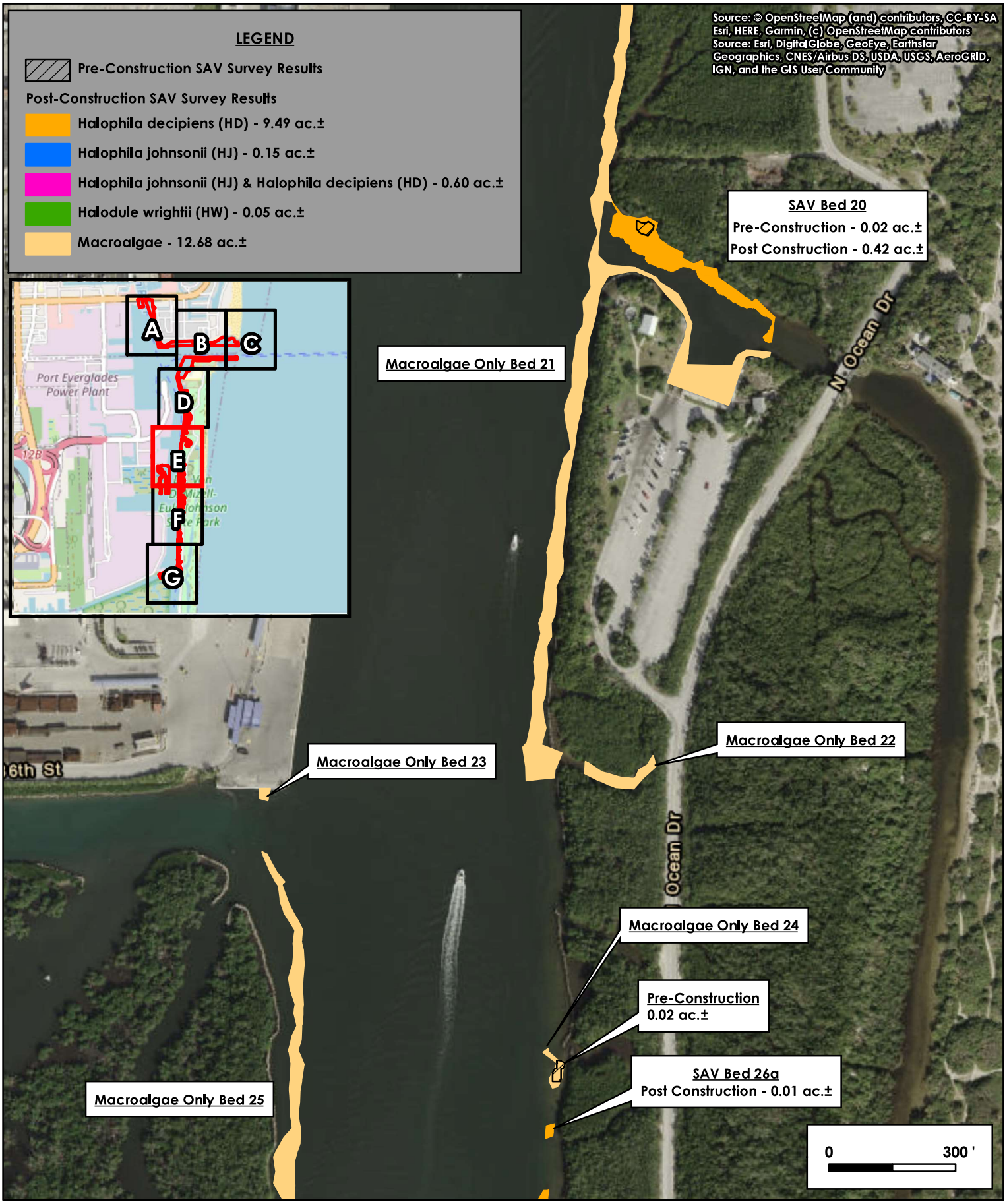

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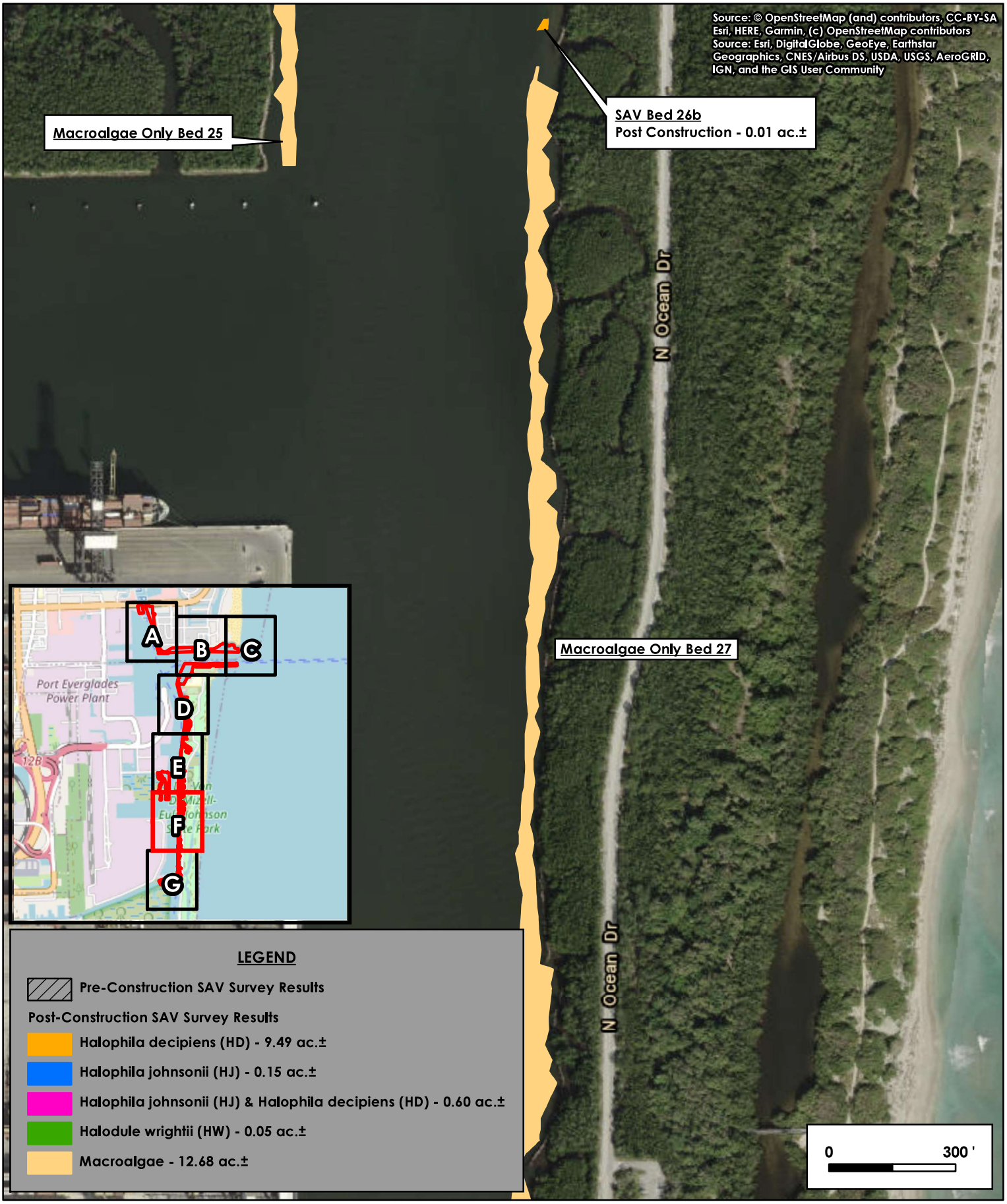

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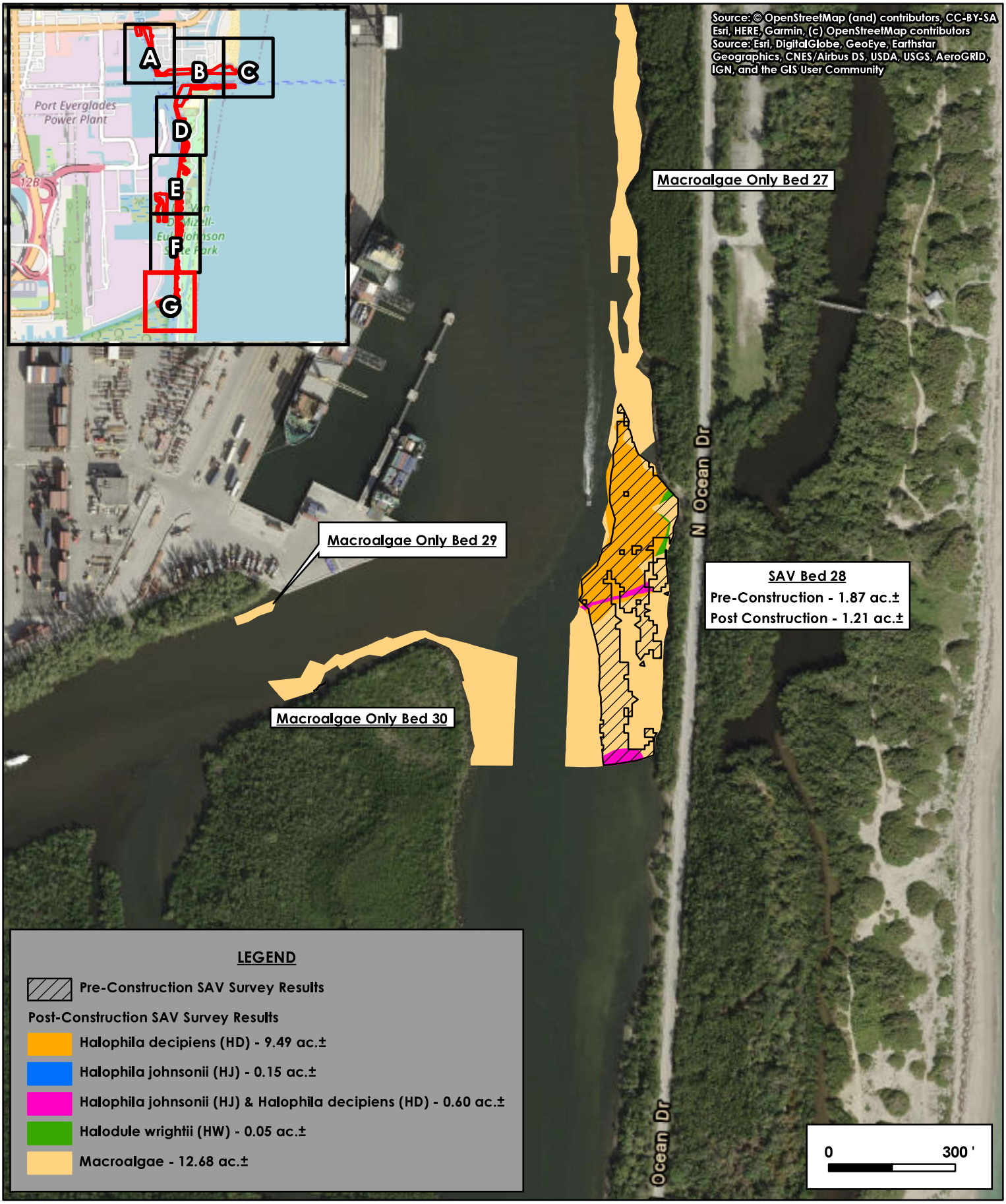

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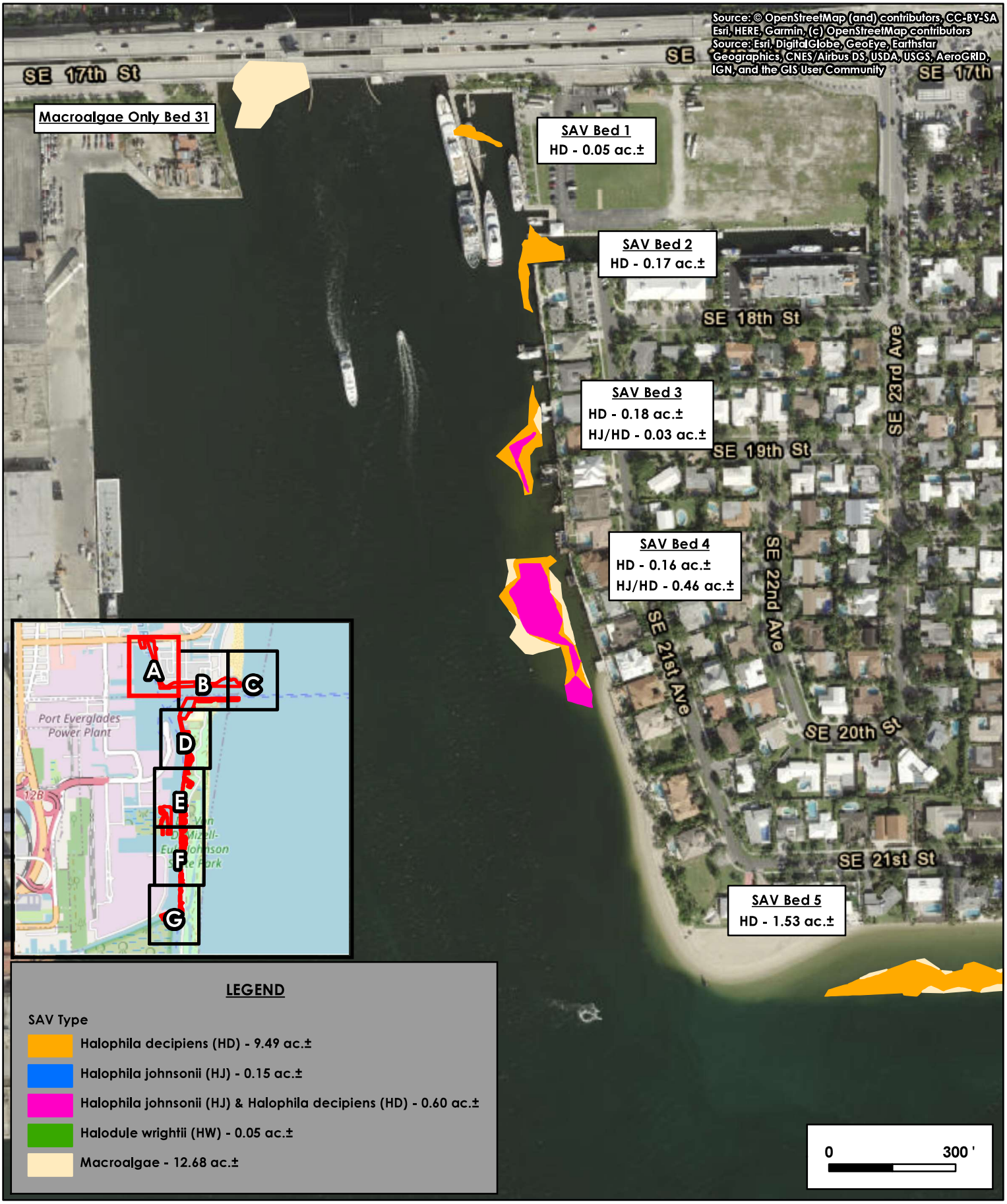

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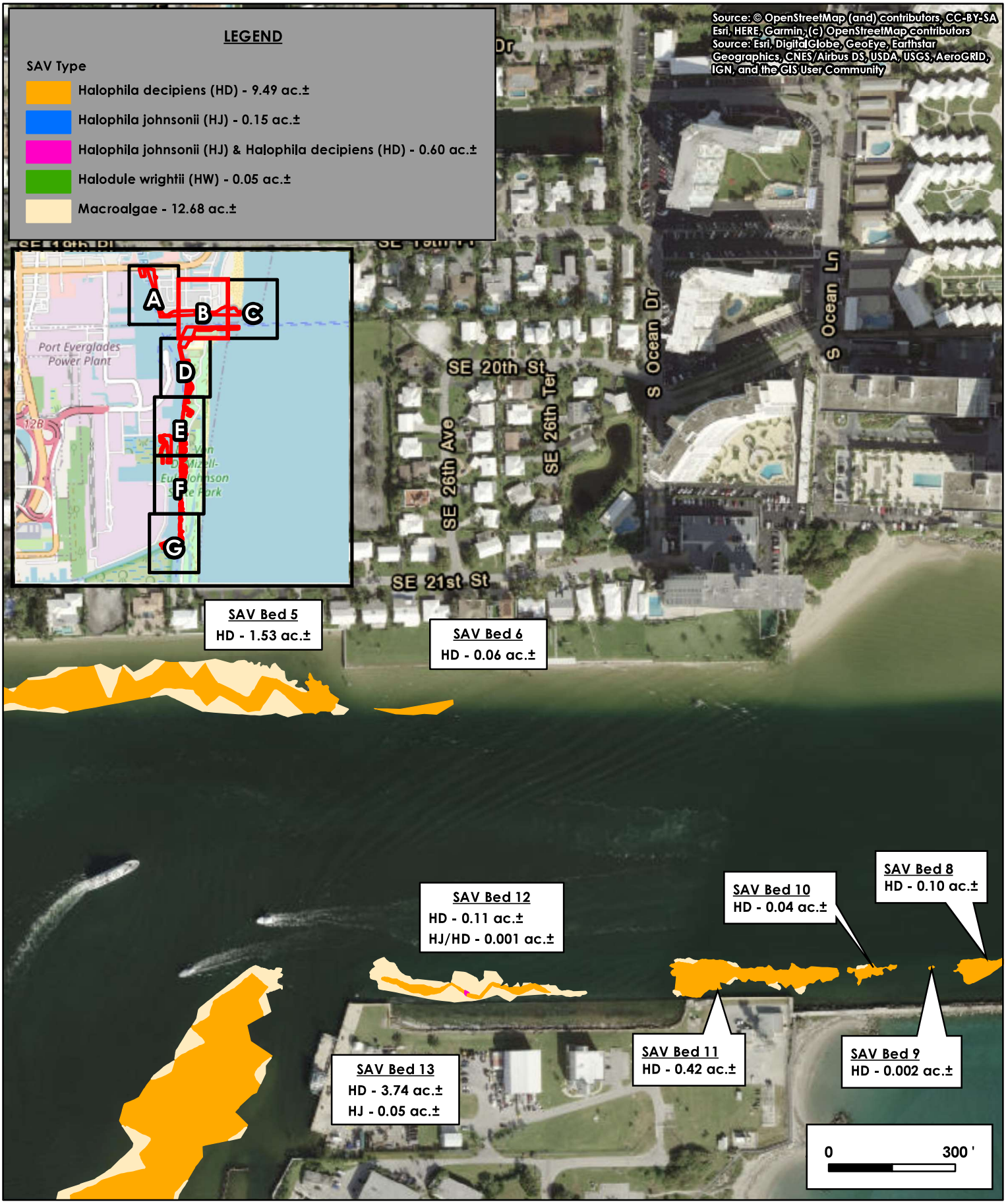

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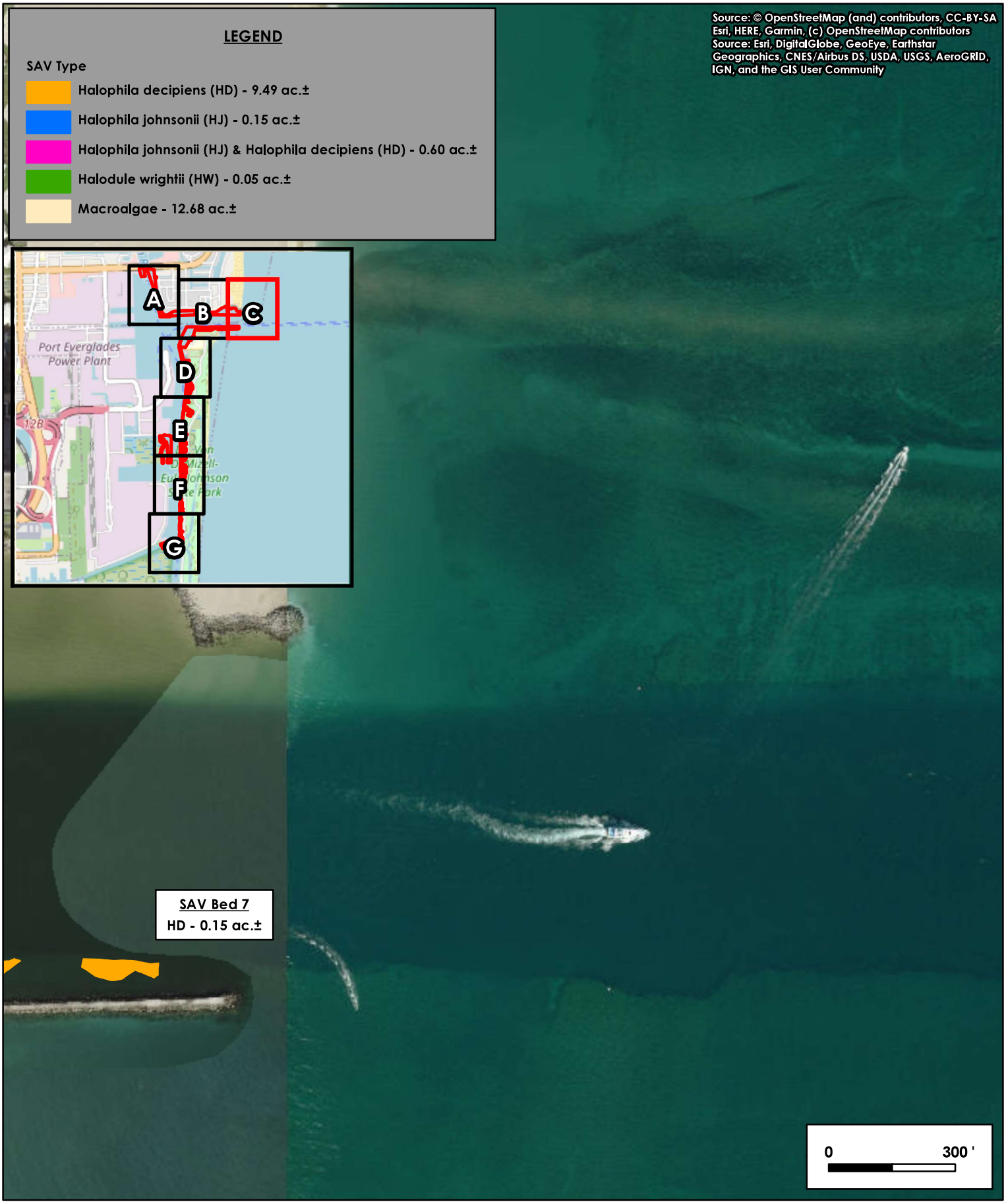

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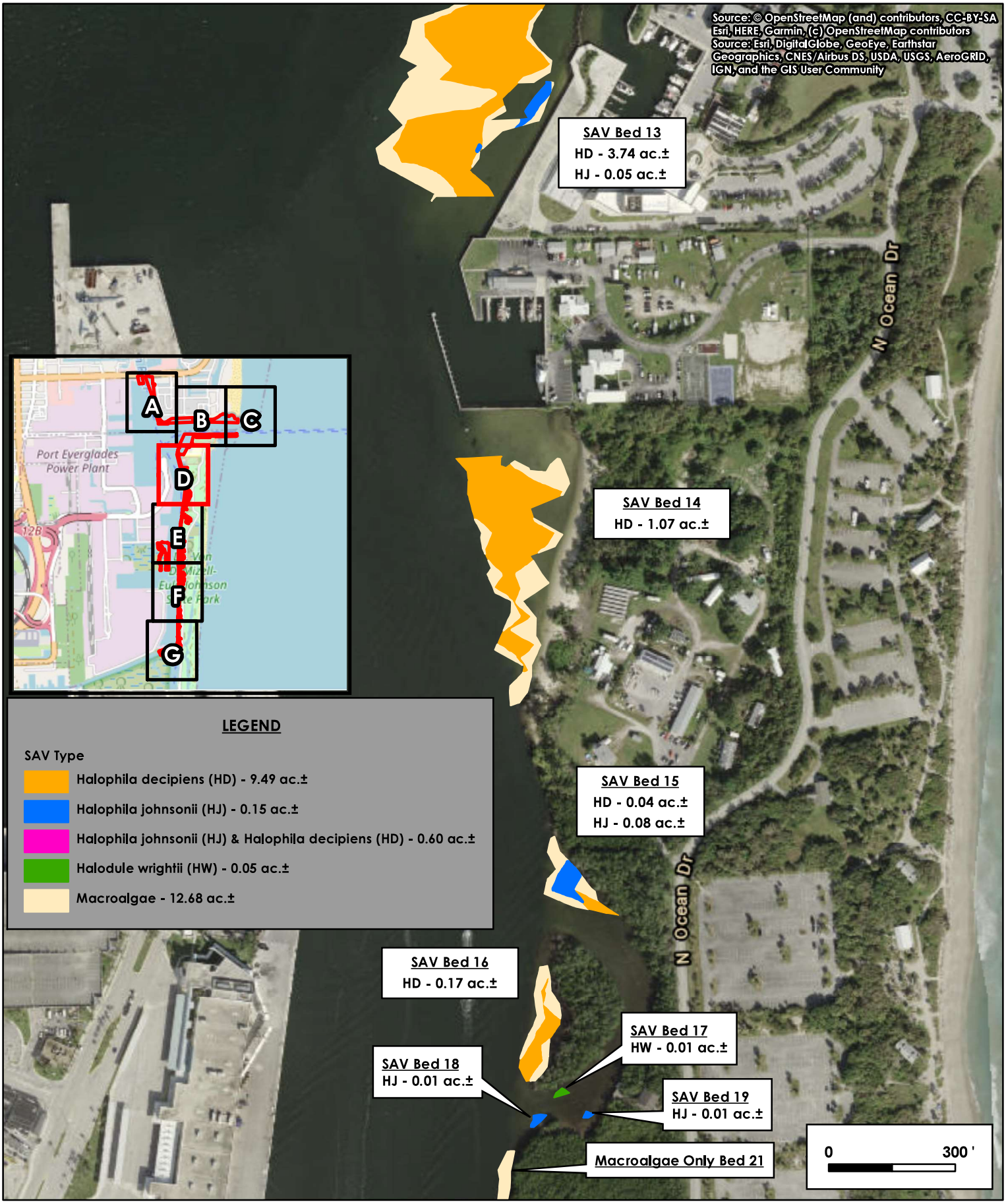

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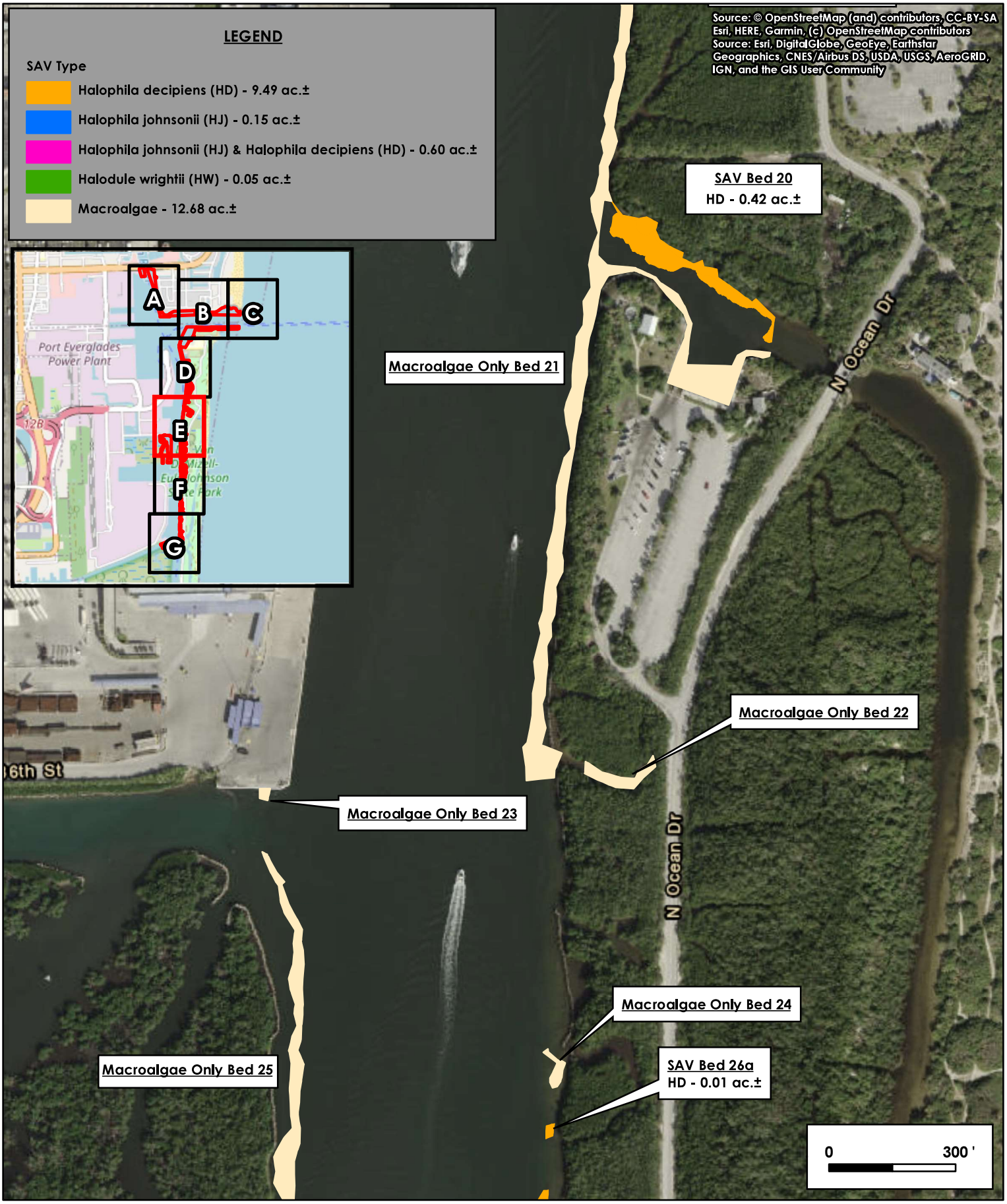

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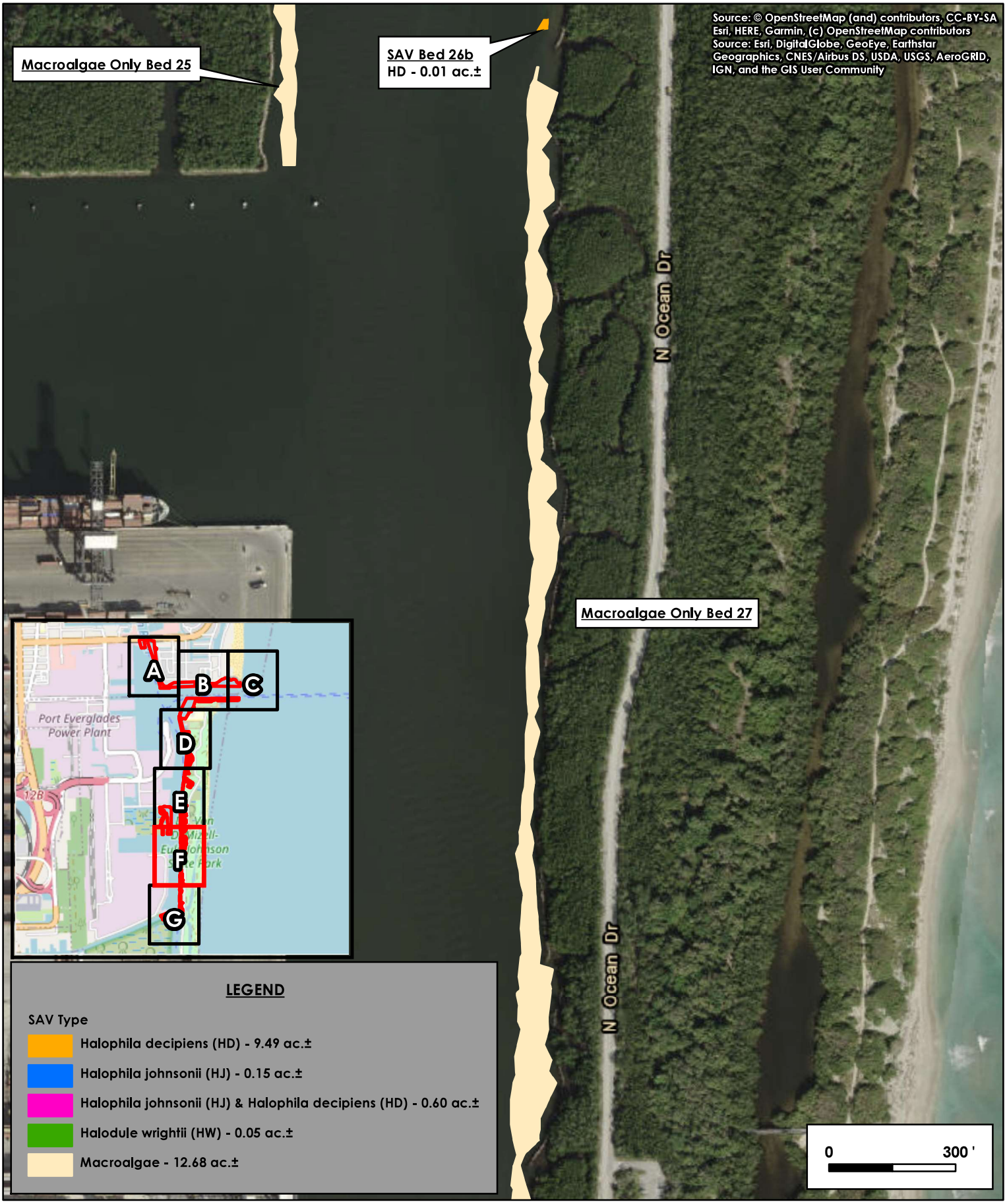

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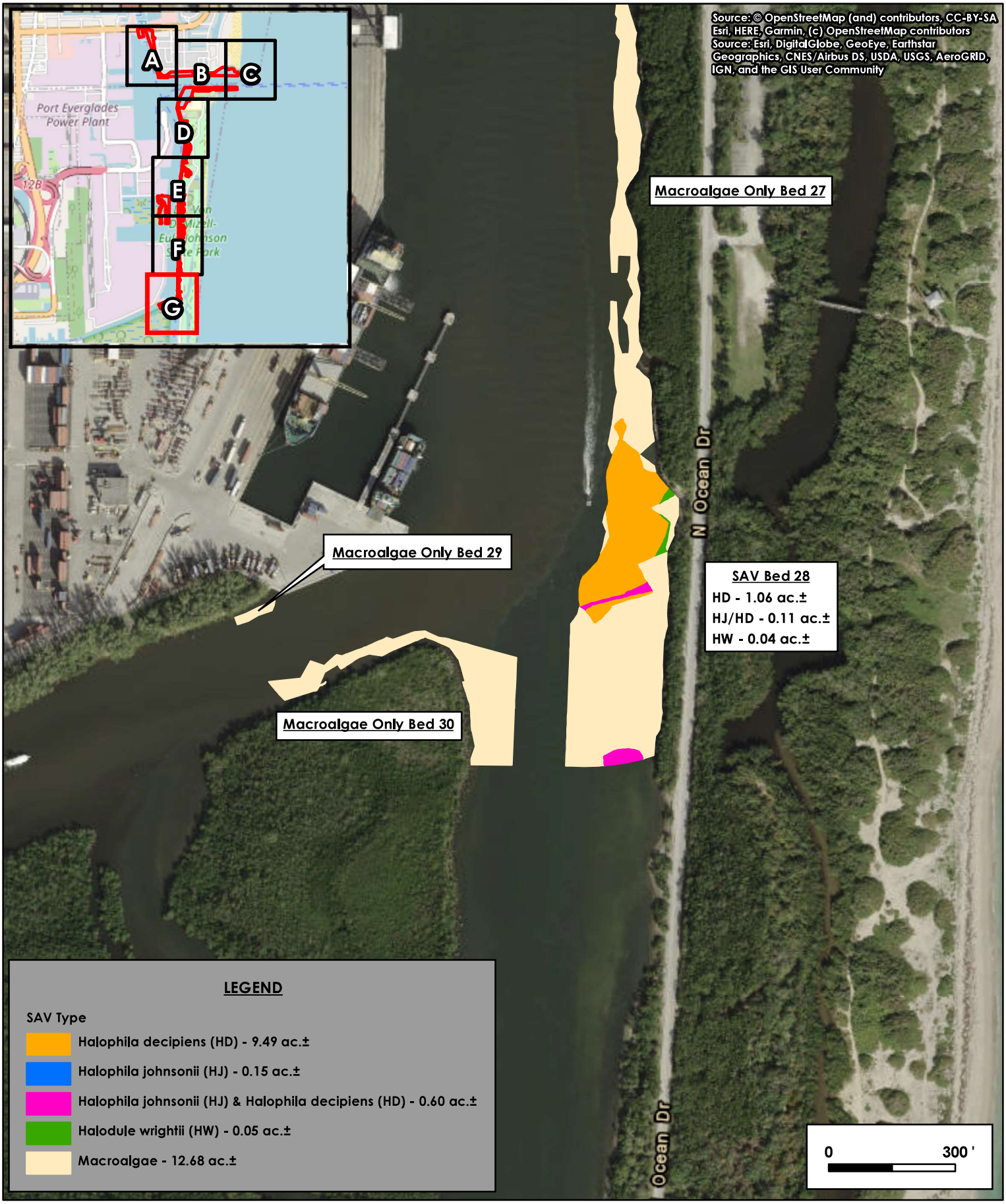

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APPENDIX 1. SAV SURVEY RESULTS

SAV SUMMARY

		Number of Quadrats				Average Percent Cover					
Bed number	Area	Total # of Quadrats	# of Quadrats with Seagrass/Macroalgae	Quadrats with Macroalgae only	Bare Substrate	Hd	Hj	Hw	Macroalgae	Total Seagrass Density	Braun-Blanquet Density Score
1	0.05	13	8	0	5	20.69	0	0	0	20.69	2.08
2	0.17	47	24	4	19	8.26	0	0	0.34	8.26	1.03
3	0.21	45	31	14	0	1.76	0.13	0	37.07	1.89	0.58
4	0.62	157	101	38	18	0.82	1.32	0	86.84	2.14	0.68
5	1.53	417	201	45	171	5.62	0	0	0.84	5.32	0.81
6	0.06	13	13	0	0	21.38	0	0	10.08	21.38	2.15
7	0.15	30	29	0	1	55.03	0	0	0	55.03	3.6
8	0.1	19	19	0	0	41.32	0	0	0.1	41.32	3.05
9	0.002	1	1	0	0	9	0	0	4	9	2
10	0.05	9	8	0	1	17.11	0	0	0.78	17.11	1.67
11	0.42	90	75	3	12	32.99	0	0	0.74	32.99	2.45
12	0.11	86	27	10	49	5.74	0.33	0	2.09	6.08	0.69
13	3.79	967	544	238	185	17.25	0.77	0	3.06	18.02	1.49
14	1.07	303	166	14	123	24.7	0	0	0.93	24.7	1.77
15	0.12	50	24	26	0	2	3.34	0	38.92	5.34	0.84
16	0.17	61	32	25	4	13.02	0	0	36.8	13.02	1.31
17	0.01	2	2	0	0	0	0	9	83.5	9	2
18	0.01	3	3	0	0	0	36.37	0	6.33	36.67	3
19	0.01	1	1	0	0	0	1	0	0	1	0.5
20	0.42	96	71	16	9	68.25	0	0	1.86	68.25	3.89
26A	0.01	3	3	0	0	42.83	0	0	0	42.83	3
26B	0.01	3	1	0	2	2.67	0	0	0	2.67	0.67
28	1.21	556	176	271	109	13.45	0.98	0.42	26.8	14.85	1.02
Total	10.302	2972	1560	704	708						

Bed 1 - 0.05 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun-Blanquet Density
1	0	52	0	0	0	48	52	100	4
	2	70	0	0	0	30	70	100	4
	6	3	0	0	0	97	3	100	5
	7	78	0	0	0	22	78	100	5
	10	27	0	0	0	73	27	100	3
	11	22	0	0	0	78	22	100	2
2	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	8	11	0	0	0	89	11	100	2
	11	6	0	0	0	94	6	100	2
	14	0	0	0	0	100	0	100	0
Total	65								
Avg Cover	**0**	**20.69231**	0	0	0	**79.30769231**	**20.69230769**		**2.076923**

BED 2 - 0.17 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	4	14	0	0	0	86	14	100	2
	7	12	0	0	0	88	12	100	2
	9	12	0	0	0	88	12	100	2
	10	14	0	0	2	84	14	100	2
	12	0	0	0	1	99	0	100	0
	15	17	0	0	0	83	17	100	2
	16	12	0	0	0	88	12	100	2
	20	0	0	0	0	100	0	100	0
B	2	0	0	0	1	99	0	100	0
	3	11	0	0	2	87	11	100	2
	5	12	0	0	2	86	12	100	2
	6	0	0	0	0	100	0	100	0
	9	14	0	0	0	86	14	100	2
	11	0	0	0	0	100	0	100	0
	14	12	0	0	1	87	12	100	2
	15	13	0	0	1	86	13	100	2
	21	15	0	0	0	85	15	100	2
	22	3	0	0	0	97	3	100	1
	24	2	0	0	0	98	2	100	0.5
	26	0	0	0	0	100	0	100	0
A_10.21	1	67	0	0	0	33	67	100	4
	4	17	0	0	0	83	17	100	2
	6	6	0	0	0	94	6	100	2
	8	0	0	0	0	100	0	100	0
	10	0	0	0	0	100	0	100	0
	12	4	0	0	0	96	4	100	1
B_10.21	1	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	5	0	0	0	3	97	0	100	0
C_10.21	2	0	0	0	0	100	0	100	0
	4	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
D_10.21	1	0	0	0	0	100	0	100	0
	2	17	0	0	0	83	17	100	2
	4	36	0	0	0	64	36	100	3
	6	9	0	0	0	91	9	100	2
E_10.21	1	11	0	0	0	89	11	100	2
	2	16	0	0	0	84	16	100	2
	4	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
F_10.21	3	0	0	0	0	100	0	100	0
	5	42	0	0	0	58	42	100	3
	6	0	0	0	3	97	0	100	0
G_10.21	1	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
H_10.21	1	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
Total	47								
Avg Coverage		8.255319	0	0	0.3404255	91.40425532	8.255319149		1.03191489

BED 3 - 0.21 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	1	2	0	0	98	0	2	100	1
B	1	1	0	0	94	5	1	100	0.5
	3	0	0	0	94	6	0	100	0
	4	3	0	0	90	7	3	100	1
	5	4	0	0	82	14	4	100	1
C	3	1	0	0	47	52	1	100	0.5
	4	1	0	0	79	20	1	100	0.5
	6	0	0	0	17	83	0	100	0
	8	0	0	0	28	72	0	100	0
D	3	3	0	0	96	1	3	100	1
	4	3	0	0	84	13	3	100	1
	5	1	0	0	48	51	1	100	0.5
	9	4	0	0	37	59	4	100	1
	11	0	0	0	2	98	0	100	0
	12	4	1	0	10	85	5	100	1
	15	1	0	0	8	91	1	100	0.5
E	2	2	0	0	63	35	2	100	1
	4	1	0	0	94	5	1	100	0.5
	5	2	1	0	86	11	3	100	1
	8	3	0	0	38	59	3	100	1
	9	0	0	0	65	35	0	100	0
	11	2	0	0	2	96	2	100	1
	12	4	1	0	18	77	5	100	1
	14	0	0	0	12	88	0	100	0
	17	0	0	0	31	69	0	100	0
	18	3	0	0	75	22	3	100	1
	20	2	0	0	54	44	2	100	1
	21	2	0	0	39	59	2	100	1
F	2	1	0	0	32	67	1	100	0.5
	7	0	0	0	10	90	0	100	0
	8	0	0	0	15	85	0	100	0
	10	4	1	0	50	45	5	100	1
	13	3	0	0	14	83	3	100	1
	15	1	0	0	0	99	1	100	0.5
	16	1	0	0	10	89	1	100	0.5
	18	0	0	0	6	94	0	100	0
	19	0	0	0	5	95	0	100	0
G	1	0	0	0	2	98	0	100	0
	3	0	0	0	2	98	0	100	0
	6	0	0	0	2	98	0	100	0
	7	1	0	0	8	91	1	100	0.5
	8	1	0	0	3	96	1	100	0.5
H	3	14	2	0	12	72	16	100	2
	4	3	0	0	4	93	3	100	1
	5	1	0	0	2	97	1	100	0.5
Total	45								
Avg Coverage		1.755556	0.133333	0	37.066667	61.04444444	1.888888889		0.577778

BED 4 - 0.62 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	2	0	0	0	3	97	0	100	0
	5	0	0	0	8	92	0	100	0
	6	1	0	0	23	76	1	100	0.5
	8	3	1	0	37	59	4	100	1
	10	2	0	0	32	66	2	100	1
	12	0	0	0	3	97	0	100	0
	13	0	0	0	1	99	0	100	0
	16	0	0	0	0	100	0	100	0
	17	1	0	0	2	97	1	100	0.5
	19	0	0	0	0	100	0	100	0
	21	1	1	0	13	85	2	100	1
	22	1	3	0	45	51	4	100	1
	25	1	3	0	32	64	4	100	1
	26	0	0	0	4	96	0	100	0
	28	2	1	0	17	80	3	100	1
	29	0	0	0	11	89	0	100	0
	32	2	0	0	3	95	2	100	1
B	5	0	0	0	48	52	0	100	0
	6	0	0	0	47	53	0	100	0
	8	2	0	0	74	24	2	100	1
	9	0	0	0	37	63	0	100	0
	10	0	2	0	43	55	2	100	1
	13	0	1	0	34	65	1	100	0.5
	14	0	0	0	31	69	0	100	0
	16	1	2	0	27	70	3	100	1
	17	0	3	0	21	76	3	100	1
	21	2	2	0	36	60	4	100	1
	23	1	2	0	23	74	3	100	1
	24	0	0	0	0	100	0	100	0
	25	0	0	0	2	98	0	100	0
	26	0	2	0	14	84	2	100	1
	30	2	3	0	19	76	5	100	2
	31	0	0	0	1	99	0	100	0
C	5	1	2	0	24	73	3	100	1
	8	0	0	0	44	56	0	100	0
	9	1	4	0	36	59	5	100	2
	12	2	0	0	4	94	2	100	1
	13	1	0	0	31	68	1	100	0.5
	14	1	0	0	19	80	1	100	0.5
	15	1	1	0	27	71	2	100	1
	18	1	3	0	6	90	4	100	1
	19	1	2	0	15	82	3	100	1
	20	0	5	0	9	86	5	100	2
	23	2	1	0	18	79	3	100	1
	27	1	0	0	12	87	1	100	0.5
	28	0	3	0	7	90	3	100	1
	29	0	0	0	9	91	0	100	0
	32	0	2	0	1	97	2	100	1
	35	1	4	0	0	95	5	100	2
	39	0	0	0	0	100	0	100	0
	40	0	0	0	0	100	0	100	0

	42	0	0	0	0	100	0	100	0
D	7	2	0	0	31	67	2	100	1
	8	2	4	0	27	67	6	100	2
	10	1	3	0	22	74	4	100	1
	12	1	4	0	43	52	5	100	2
	16	2	1	0	24	73	3	100	1
	18	1	5	0	44	50	6	100	2
	19	1	2	0	30	67	3	100	1
	24	0	2	0	39	59	2	100	1
	25	0	4	0	15	81	4	100	1
	26	0	1	0	22	77	1	100	1
	30	0	1	0	23	76	1	100	0.5
	31	0	4	0	11	85	4	100	1
	33	1	2	0	30	67	3	100	1
	35	0	1	0	7	92	1	100	0.5
	36	2	8	0	37	53	10	100	2
	37	8	26	0	9	57	34	100	3
	44	0	0	0	8	92	0	100	0
E	2	0	0	0	8	92	0	100	0
	4	0	1	0	11	88	1	100	0.5
	7	0	1	0	7	92	1	100	0.5
	9	0	0	0	75	25	0	100	0
	11	0	2	0	22	76	2	100	1
	12	0	1	0	4	95	1	100	0.5
	19	0	2	0	6	92	2	100	1
	20	0	1	0	4	95	1	100	0.5
	22	2	2	0	4	92	4	100	1
	23	1	0	0	2	97	1	100	0.5
	27	1	1	0	6	92	2	100	1
	29	3	2	0	4	91	5	100	2
	31	4	5	0	8	83	9	100	2
	32	2	1	0	12	85	3	100	1
	34	3	0	0	6	91	3	100	1
	35	2	1	0	3	94	3	100	1
	36	0	0	0	0	100	0	100	0
	38	0	0	0	0	100	0	100	0
	39	0	0	0	0	100	0	100	0
F	5	0	0	0	4	96	0	100	0
	7	0	0	0	2	98	0	100	0
	10	0	0	0	6	94	0	100	0
	11	0	1	0	2	97	1	100	0.5
	12	0	0	0	6	94	0	100	0
	14	0	0	0	5	95	0	100	0
	15	0	0	0	3	97	0	100	0
	16	0	0	0	9	91	0	100	0
	21	0	0	0	6	94	0	100	0
	22	0	0	0	4	96	0	100	0
	24	0	2	0	2	96	2	100	1
	25	0	2	0	4	94	2	100	1
	27	0	4	0	1	95	4	100	1
	28	0	2	0	4	94	2	100	1
	31	0	2	0	8	90	2	100	1
	32	0	2	0	3	95	2	100	1
	33	0	0	0	7	93	0	100	0
	34	0	1	0	6	93	1	100	0.5
	36	1	0	0	4	95	1	100	0.5

	38	1	0	0	1	98	1	100	0.5
	40	0	0	0	0	100	0	100	0
	41	0	0	0	0	100	0	100	0
	42	0	0	0	0	100	0	100	0
	43	0	0	0	0	100	0	100	0
G	3	0	0	0	2	98	0	100	0
	6	0	0	0	19	81	0	100	0
	7	0	0	0	12	88	0	100	0
	10	0	0	0	7	93	0	100	0
	11	0	0	0	1	99	0	100	0
	14	0	0	0	1	99	0	100	0
	15	0	0	0	0	100	0	100	0
	16	0	0	0	3	97	0	100	0
	19	0	0	0	2	98	0	100	0
	21	0	0	0	2	98	0	100	0
	22	0	0	0	0	100	0	100	0
	24	0	0	0	0	100	0	100	0
	25	0	0	0	1	99	0	100	0
	26	0	0	0	2	98	0	100	0
	33	4	0	0	1	95	4	100	1
	36	0	1	0	3	96	1	100	0.5
	37	3	2	0	0	95	5	100	1
	39	4	2	0	3	91	6	100	1
	40	4	1	0	1	94	5	100	1
H	4	2	0	0	0	98	2	100	1
	5	1	1	0	0	98	2	100	1
	6	1	1	0	0	98	2	100	1
	8	0	0	0	0	100	0	100	0
	9	1	1	0	0	98	2	100	1
	11	1	3	0	6	90	4	100	1
I	6	1	0	0	3	96	1	100	0.5
	7	1	1	0	1	97	2	100	1
	8	1	0	0	1	98	1	100	0.5
	11	2	0	0	0	98	2	100	1
	13	0	0	0	0	100	0	100	0
J	2	1	1	0	1	97	2	100	1
	3	3	1	0	1	95	4	100	1
	6	4	2	0	0	94	6	100	2
	8	2	2	0	3	93	4	100	1
	9	2	1	0	0	97	3	100	1
	10	2	1	0	0	97	3	100	1
	11	4	2	0	1	93	6	100	2
	13	3	1	0	0	96	4	100	1
	14	2	4	0	0	94	6	100	2
	16	1	6	0	2	91	7	100	2
K	4	1	7	0	3	89	8	100	2
	6	0	4	0	0	96	4	100	1
	7	1	3	0	1	95	4	100	1
	9	0	1	0	3	96	1	100	0.5
	10	0	2	0	0	98	2	100	1
Total	156								
Avg Coverage		0.815287	1.324841	0	11.019108	86.84076433	2.140127389		0.684713

BED 5 - 1.53 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	1	4	0	0	2	94	4	100	1
	2	3	0	0	0	97	3	100	1
	3	3	0	0	6	91	3	100	1
	5	14	0	0	2	84	14	100	2
B	1	4	0	0	1	95	4	100	1
	3	1	0	0	0	99	1	100	0.5
	6	2	0	0	2	96	2	100	1
	8	5	0	0	3	92	5	100	2
C	3	13	0	0	2	85	13	100	2
	4	7	0	0	3	90	7	100	2
	5	5	0	0	1	94	5	100	2
	6	2	0	0	1	97	2	100	1
	7	2	0	0	1	97	2	100	1
	12	14	0	0	3	83	14	100	2
D	1	27	0	0	0	73	27	100	3
	3	46	0	0	0	54	46	100	3
	5	7	0	0	0	93	7	100	2
	6	4	0	0	1	95	4	100	1
	9	11	0	0	0	89	11	100	2
	10	7	0	0	0	93	7	100	2
	11	6	0	0	2	92	6	100	2
	14	4	0	0	2	94	4	100	1
	15	0	0	0	2	98	0	100	0
E	4	1	0	0	0	99	1	100	0.5
	5	3	0	0	0	97	3	100	1
	6	4	0	0	0	96	4	100	1
	7	1	0	0	0	99	1	100	0.5
	8	8	0	0	0	92	8	100	1
	11	43	0	0	3	54	43	100	3
	13	40	0	0	1	59	40	100	3
	15	23	0	0	2	75	23	100	2
	17	12	0	0	0	88	12	100	2
	18	8	0	0	3	89	8	100	2
F	1	2	0	0	0	98	2	100	1
	3	2	0	0	0	98	2	100	1
	5	0	0	0	0	100	0	100	0
	6	1	0	0	0	99	1	100	0.5
	12	4	0	0	6	90	4	100	1
	16	0	0	0	2	98	0	100	0
	17	2	0	0	3	95	2	100	1
	19	5	0	0	3	92	5	100	2
	20	3	0	0	2	95	3	100	1
	21	7	0	0	4	89	7	100	2
G	7	4	0	0	3	93	4	100	1
	8	0	0	0	0	100	0	100	0
	9	2	0	0	0	98	2	100	1
	11	5	0	0	0	95	5	100	2
	13	22	0	0	0	78	22	100	2
	14	44	0	0	0	56	44	100	3
	18	59	0	0	0	41	59	100	4
	19	7	0	0	0	93	7	100	2

	20	1	0	0	3	96	1	100	0.5
	24	13	0	0	0	87	13	100	2
	25	23	0	0	0	77	23	100	2
H	1	0	0	0	0	100	0	100	0
	3	0	0	0	1	99	0	100	0
	5	1	0	0	0	99	1	100	0.5
	6	0	0	0	4	96	0	100	0
	11	0	0	0	4	96	0	100	0
	12	1	0	0	0	99	1	100	0.5
	14	4	0	0	0	96	4	100	1
	18	0	0	0	0	100	0	100	0
	19	0	0	0	0	100	0	100	0
	20	1	0	0	1	98	1	100	0.5
	21	0	0	0	0	100	0	100	0
I	1	3	0	0	0	97	3	100	1
	2	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	7	2	0	0	1	97	2	100	1
	8	3	0	0	4	93	3	100	1
	12	8	0	0	0	92	8	100	2
	14	1	0	0	1	98	1	100	0.5
	15	0	0	0	0	100	0	100	0
J	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	4	3	0	0	0	97	3	100	1
	5	0	0	0	0	100	0	100	0
	8	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	13	0	0	0	0	100	0	100	0
	14	1	0	0	0	99	1	100	0.5
	15	10	0	0	0	90	10	100	2
K	1	2	0	0	0	98	2	100	1
	2	0	0	0	0	100	0	100	0
	6	1	0	0	0	99	1	100	0.5
	7	4	0	0	0	96	4	100	1
	13	0	0	0	0	100	0	100	0
	14	4	0	0	0	96	4	100	1
	17	1	0	0	0	99	1	100	0.5
	18	2	0	0	0	98	2	100	1
L	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	8	4	0	0	0	96	4	100	1
	11	0	0	0	0	100	0	100	0
	12	0	0	0	0	100	0	100	0
	15	0	0	0	0	100	0	100	0
	17	0	0	0	0	100	0	100	0
	18	1	0	0	0	99	1	100	0.5
M	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	4	0	0	0	1	99	0	100	0
	7	1	0	0	2	97	1	100	0.5
	10	0	0	0	0	100	0	100	0
	13	1	0	0	0	99	1	100	0.5
	14	0	0	0	0	100	0	100	0
	15	0	0	0	0	100	0	100	0

N	1	0	0	0	0	100	0	100	0
	4	3	0	0	4	93	3	100	1
	5	0	0	0	12	88	0	100	0
	8	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	14	0	0	0	0	100	0	100	0
	15	4	0	0	0	96	4	100	1
	18	2	0	0	0	98	2	100	1
	19	0	0	0	0	100	0	100	0
	20	10	0	0	0	90	10	100	2
	21	7	0	0	0	93	7	100	2
O	1	1	0	0	0	99	1	100	0.5
	2	0	0	0	0	100	0	100	0
	5	0	0	0	19	81	0	100	0
	6	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	9	2	0	0	0	98	2	100	1
	11	0	0	0	0	100	0	100	0
	15	0	0	0	0	100	0	100	0
	16	3	0	0	0	97	3	100	1
	18	5	0	0	0	95	5	100	2
	23	2	0	0	1	97	2	100	1
	24	0	0	0	0	100	0	100	0
P	3	0	0	0	0	100	0	100	0
	6	6	0	0	1	93	6	100	2
	7	7	0	0	1	92	7	100	2
	9	2	0	0	0	98	2	100	1
	12	0	0	0	0	100	0	100	0
	13	0	0	0	0	100	0	100	0
	16	0	0	0	0	100	0	100	0
	17	0	0	0	0	100	0	100	0
	18	4	0	0	0	96	4	100	1
	21	2	0	0	0	98	2	100	1
	22	0	0	0	0	100	0	100	0
	25	3	0	0	0	97	3	100	1
	26	0	0	0	0	100	0	100	0
	27	0	0	0	0	100	0	100	0
Q	1	24	0	0	0	76	24	100	2
	2	22	0	0	0	78	22	100	2
	3	18	0	0	0	82	18	100	2
	4	25	0	0	0	75	25	100	3
	6	6	0	0	0	94	6	100	2
	7	0	0	0	0	100	0	100	0
	10	0	0	0	0	100	0	100	0
	11	0	0	0	0	100	0	100	0
	15	0	0	0	0	100	0	100	0
	16	0	0	0	0	100	0	100	0
	19	0	0	0	0	100	0	100	0
	22	5	0	0	0	95	5	100	2
	23	2	0	0	0	98	2	100	1
	26	8	0	0	2	90	8	100	2
	27	2	0	0	0	98	2	100	1
	28	1	0	0	0	99	1	100	0.5
	31	0	0	0	2	98	0	100	0
	32	0	0	0	0	100	0	100	0
R	1	1	0	0	0	99	1	100	0.5

	2	4	0	0	0	96	4	100	1
	3	3	0	0	1	96	3	100	1
	4	7	0	0	0	93	7	100	2
	6	8	0	0	0	92	8	100	2
	7	7	0	0	1	92	7	100	2
	8	12	0	0	13	75	12	100	2
	12	0	0	0	1	99	0	100	0
	14	0	0	0	0	100	0	100	0
	16	4	0	0	0	96	4	100	1
	20	3	0	0	1	96	3	100	1
	22	5	0	0	0	95	5	100	2
	25	2	0	0	0	98	2	100	1
	26	3	0	0	1	96	3	100	1
	29	6	0	0	1	93	6	100	2
	30	1	0	0	1	98	1	100	0.5
	31	16	0	0	5	79	16	100	2
S	1	0	0	0	0	100	0	100	0
	2	13	0	0	1	86	13	100	2
	5	22	0	0	2	76	22	100	2
	6	49	0	0	1	50	49	100	3
	7	32	0	0	2	66	32	100	3
	11	12	0	0	0	88	12	100	2
	12	25	0	0	1	74	25	100	3
	14	4	0	0	0	96	4	100	1
	15	6	0	0	7	87	6	100	2
	17	17	0	0	5	78	17	100	2
	20	4	0	0	0	96	4	100	1
	22	11	0	0	3	86	11	100	2
	26	46	0	0	4	50	46	100	3
	28	83	0	0	2	15	83	100	5
	29	86	0	0	0	14	86	100	5
	30	74	0	0	0	26	74	100	4
T	1	27	0	0	0	73	27	100	3
	2	20	0	0	0	80	20	100	2
	4	16	0	0	0	84	16	100	2
	5	7	0	0	1	92	7	100	22
	6	8	0	0	1	100	0	100	0
	9	4	0	0	0	100	0	100	0
	10	8	0	0	0	100	0	100	0
	16	14	0	0	0	100	0	100	0
	17	13	0	0	0	100	0	100	0
	20	10	0	0	0	100	0	100	0
	22	9	0	0	0	100	0	100	0
	23	14	0	0	0	100	0	100	0
	25	8	0	0	0	100	0	100	0
	26	6	0	0	0	100	0	100	0
U	1	28	0	0	0	72	28	100	3
	2	20	0	0	0	80	20	100	2
	6	9	0	0	0	91	9	100	2
	8	1	0	0	0	99	1	100	0.5
	9	0	0	0	0	100	0	100	0
	11	1	0	0	0	99	1	100	0.5
	15	4	0	0	0	96	4	100	1
	16	2	0	0	1	97	2	100	1
	20	2	0	0	0	98	2	100	1
	21	4	0	0	2	94	4	100	1

	24	0	0	0	3	97	0	100	0
	25	0	0	0	3	97	0	100	0
V	4	1	0	0	2	97	1	100	0.5
	5	3	0	0	0	97	3	100	1
	7	0	0	0	0	100	0	100	0
	10	1	0	0	2	97	1	100	0.5
	13	0	0	0	3	97	0	100	0
	14	2	0	0	0	98	2	100	1
	15	0	0	0	0	100	0	100	0
	18	0	0	0	0	100	0	100	0
	19	0	0	0	2	98	0	100	0
W	4	38	0	0	0	62	38	100	3
	5	17	0	0	1	82	17	100	2
	6	19	0	0	1	80	19	100	2
	9	3	0	0	1	96	3	100	1
	10	3	0	0	0	97	3	100	1
	13	0	0	0	0	100	0	100	0
	14	14	0	0	0	86	14	100	2
	17	0	0	0	5	95	0	100	0
	18	0	0	0	0	100	0	100	0
	19	0	0	0	2	98	0	100	0
	23	0	0	0	5	95	0	100	0
	24	0	0	0	3	97	0	100	0
	25	0	0	0	3	97	0	100	0
X	1	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	4	0	0	0	1	99	0	100	0
	8	2	0	0	0	98	2	100	1
	9	0	0	0	2	98	0	100	0
	10	4	0	0	6	90	4	100	1
	13	4	0	0	0	96	4	100	1
	14	0	0	0	0	100	0	100	0
	15	7	0	0	0	93	7	100	2
	20	3	0	0	1	96	3	100	1
	21	5	0	0	0	95	5	100	2
	22	2	0	0	0	98	2	100	1
	23	1	0	0	0	99	1	100	0.5
	24	8	0	0	2	90	8	100	2
Y	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	14	47	0	0	3	50	47	100	3
	17	5	0	0	1	94	5	100	2
	18	0	0	0	3	97	0	100	0
	19	0	0	0	0	100	0	100	0
	20	1	0	0	0	99	1	100	0.5
	22	0	0	0	4	96	0	100	0
	24	0	0	0	0	100	0	100	0
	26	0	0	0	2	98	0	100	0
	26	0	0	0	3	97	0	100	0
	27	1	0	0	3	96	1	100	0.5
Z	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0

	5	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	10	0	0	0	0	100	0	100	0
	11	0	0	0	0	100	0	100	0
	15	33	0	0	0	67	33	100	3
	16	73	0	0	0	27	73	100	4
	17	22	0	0	0	78	22	100	5
	21	8	0	0	4	96	0	100	0
	24	0	0	0	3	97	0	100	0
	25	0	0	0	1	99	0	100	0
	26	8	0	0	4	96	0	100	0
	29	4	0	0	1	99	0	100	0
	30	12	0	0	8	92	0	100	0
	31	3	0	0	7	93	0	100	0
AA	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	6	2	0	0	0	98	2	100	1
	7	4	0	0	0	96	4	100	1
	8	3	0	0	0	97	3	100	1
	10	8	0	0	0	92	8	100	2
	13	1	0	0	0	99	1	100	0.5
	14	0	0	0	0	100	0	100	0
	15	0	0	0	0	100	0	100	0
	23	0	0	0	0	100	0	100	0
	26	0	0	0	0	100	0	100	0
	29	0	0	0	3	97	0	100	0
	31	0	0	0	2	98	0	100	0
	32	0	0	0	2	98	0	100	0
	35	0	0	0	0	100	0	100	0
	36	1	0	0	0	99	1	100	0.5
AB	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	4	0	0	0	2	98	0	100	0
	8	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	11	0	0	0	0	100	0	100	0
	14	2	0	0	0	98	2	100	1
	16	6	0	0	0	94	6	100	2
	18	4	0	0	0	96	4	100	1
	22	0	0	0	0	100	0	100	0
	23	0	0	0	0	100	0	100	0
	25	0	0	0	0	100	0	100	0
	27	0	0	0	0	100	0	100	0
	28	0	0	0	0	100	0	100	0
	29	0	0	0	1	99	0	100	0
	35	0	0	0	0	100	0	100	0
	36	0	0	0	0	100	0	100	0
	37	0	0	0	3	97	0	100	0
AC	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	4	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	9	18	0	0	0	82	18	100	2

	10	15	0	0	0	85	15	100	2
	11	55	0	0	0	45	55	100	4
	13	2	0	0	0	98	2	100	1
	14	0	0	0	0	100	0	100	0
	16	2	0	0	0	98	2	100	1
	18	0	0	0	0	100	0	100	0
	20	0	0	0	0	100	0	100	0
	22	0	0	0	0	100	0	100	0
	23	0	0	0	0	100	0	100	0
	25	0	0	0	0	100	0	100	0
	27	0	0	0	0	100	0	100	0
	28	0	0	0	0	100	0	100	0
	31	0	0	0	0	100	0	100	0
	32	0	0	0	2	98	0	100	0
	33	0	0	0	1	99	0	100	0
AD	1	4	0	0	0	96	4	100	1
	5	8	0	0	0	92	8	100	2
	8	25	0	0	0	75	25	100	3
	12	3	0	0	0	97	3	100	1
	14	0	0	0	0	100	0	100	0
	17	0	0	0	0	100	0	100	0
	18	0	0	0	0	100	0	100	0
	22	0	0	0	3	97	0	100	0
	24	0	0	0	1	99	0	100	0
	25	0	0	0	1	99	0	100	0
	27	0	0	0	1	99	0	100	0
	28	0	0	0	0	100	0	100	0
	31	0	0	0	0	100	0	100	0
	32	0	0	0	0	100	0	100	0
AE	2	0	0	0	0	100	0	100	0
	3	2	0	0	0	98	2	100	1
	7	2	0	0	0	98	2	100	1
	8	11	0	0	0	89	11	100	2
	10	17	0	0	0	83	17	100	2
	15	0	0	0	0	100	0	100	0
	16	0	0	0	0	100	0	100	0
	18	0	0	0	0	100	0	100	0
	20	0	0	0	0	100	0	100	0
	23	0	0	0	0	100	0	100	0
	25	1	0	0	7	92	1	100	1
	26	0	0	0	3	97	0	100	0
	27	2	0	0	3	95	2	100	1
	29	0	0	0	3	97	0	100	0
	33	0	0	0	0	100	0	100	0
	34	0	0	0	0	100	0	100	0
	35	0	0	0	0	100	0	100	0
AF	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	4	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	11	0	0	0	0	100	0	100	0
	12	0	0	0	0	100	0	100	0
	14	0	0	0	0	100	0	100	0
	17	0	0	0	0	100	0	100	0
	18	3	0	0	0	97	3	100	1
	21	40	0	0	2	58	40	100	3

	22	0	0	0	20	80	0	100	0
	23	0	0	0	0	100	0	100	0
	26	0	0	0	0	100	0	100	0
	29	0	0	0	0	100	0	100	0
	30	0	0	0	0	100	0	100	0
AG	4	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	8	0	0	0	0	100	0	100	0
	10	0	0	0	0	100	0	100	0
	13	0	0	0	0	100	0	100	0
	15	0	0	0	0	100	0	100	0
	18	0	0	0	0	100	0	100	0
	22	0	0	0	0	100	0	100	0
	23	0	0	0	0	100	0	100	0
	24	0	0	0	0	100	0	100	0
AH	3	30	0	0	0	70	30	100	3
	4	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	12	0	0	0	0	100	0	100	0
	16	4	0	0	0	96	4	100	1
	17	0	0	0	0	100	0	100	0
	18	0	0	0	0	100	0	100	0
AJ	1	0	0	0	0	100	0	100	0
	3	42	0	0	0	58	42	100	3
	5	33	0	0	0	67	33	100	3
	9	29	0	0	0	71	29	100	3
	12	21	0	0	0	79	21	100	2
	13	24	0	0	0	76	24	100	2
AK	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
Total	417								
Avg Coverage		5.631579	0	0	0.8205742	93.85885167	5.322966507		0.811005

BED 6 - 0.06 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	1	9	0	0	2	89	9	100	2
	2	4	0	0	16	80	4	100	1
B	1	2	0	0	6	92	2	100	1
	2	3	0	0	18	79	3	100	1
C	1	3	0	0	7	90	3	100	1
	4	7	0	0	25	68	7	100	2
	5	2	0	0	4	94	2	100	1
D	1	53	0	0	17	30	53	100	4
	3	62	0	0	16	22	62	100	4
	6	14	0	0	6	80	14	100	2
E	2	66	0	0	4	30	66	100	4
	3	43	0	0	6	51	43	100	3
	6	10	0	0	4	86	10	100	2
Total	13								
Avg Coverage		21.38462	0	0	10.076923	68.53846154	21.38461538		2.153846

BED 7 - 0.15 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	2	93	0	0	0	7	93	100	5
	3	94	0	0	0	6	94	100	5
	5	67	0	0	0	33	67	100	4
	8	56	0	0	0	44	56	100	4
B	2	91	0	0	0	9	91	100	5
	4	97	0	0	0	3	97	100	5
	6	72	0	0	0	28	72	100	4
	8	73	0	0	0	27	73	100	4
	10	64	0	0	0	36	64	100	4
	11	72	0	0	0	28	72	100	4
	13	10	0	0	0	90	10	100	2
C	1	52	0	0	0	48	52	100	4
	2	47	0	0	0	53	47	100	2
	3	43	0	0	0	57	43	100	3
	8	84	0	0	0	16	84	100	5
	9	69	0	0	0	31	69	100	4
	11	11	0	0	0	89	11	100	2
	14	13	0	0	0	87	13	100	2
D	2	54	0	0	0	46	54	100	4
	3	53	0	0	0	47	53	100	4
	7	14	0	0	0	86	14	100	2
	9	2	0	0	0	98	2	100	2
	10	0	0	0	0	100	0	100	0
E	2	77	0	0	0	23	77	100	5
	3	57	0	0	0	43	57	100	4
	6	66	0	0	0	34	66	100	4
F	2	51	0	0	0	49	51	100	4
	3	53	0	0	0	47	53	100	4
	7	48	0	0	0	52	48	100	3
	8	68	0	0	0	32	68	100	4
Total	30								
Avg Coverage		55.03333	0	0	0	44.96666667	55.03333333		3.6

BED 8 - 0.1 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	2	59	0	0	0	41	59	100	4
	4	48	0	0	0	52	48	100	3
	5	44	0	0	0	56	44	100	3
B	1	56	0	0	0	44	56	100	4
	4	24	0	0	0	76	24	100	2
	7	59	0	0	0	41	59	100	4
	9	32	0	0	0	68	32	100	3
	11	18	0	0	0	82	18	100	2
	12	28	0	0	0	72	28	100	3
	14	13	0	0	2	85	13	100	2
	16	4	0	0	0	96	4	100	1
C	2	84	0	0	0	16	84	100	5
	3	87	0	0	0	13	87	100	5
	6	32	0	0	0	68	32	100	3
	7	39	0	0	0	61	39	100	3
	9	64	0	0	0	36	64	100	4
	10	47	0	0	0	53	47	100	3
D	2	43	0	0	0	57	43	100	3
	5	4	0	0	0	96	4	100	1
Total	19								
Avg Coverage		41.31579	0	0	0.1052632	58.57894737	41.31578947		3.052632

BED 9 - 0.002 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	1	9	0	0	4	87	9	100	2
Total	1								
Avg Coverage		9	0	0	4	87	9		2

BED 10 - 0.04 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	2	85	0	0	0	15	85	100	5
	4	46	0	0	0	54	46	100	3
B	1	0	0	0	0	100	0	100	0
	2	1	0	0	2	97	1	100	0.5
	5	2	0	0	1	97	2	100	1
	7	1	0	0	0	99	1	100	0.5
C	2	2	0	0	3	95	2	100	1
	5	10	0	0	1	89	10	100	2
D	1	7	0	0	0	93	7	100	2
Total	9								
Avg Coverage		17.11111	0	0	0.7777778	82.11111111	17.11111111		1.666667

BED 11 - 0.42 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	1	0	0	0	0	100	0	100	0
	3	100	0	0	0	0	100	100	5
	4	100	0	0	0	0	100	100	5
	6	100	0	0	0	0	100	100	5
	8	89	0	0	0	11	89	100	5
	9	93	0	0	0	7	93	100	5
	15	97	0	0	0	3	97	100	5
	16	88	0	0	0	12	88	100	5
	18	74	0	0	0	26	74	100	4
	19	0	0	0	0	100	0	100	0
	21	2	0	0	0	98	2	100	1
	22	12	0	0	0	88	12	100	1
	24	0	0	0	10	90	0	100	0
	25	0	0	0	0	100	0	100	0
B	2	0	0	0	0	100	0	100	0
	4	77	0	0	0	23	77	100	5
	5	78	0	0	0	22	78	100	5
	6	96	0	0	0	4	96	100	5
	8	98	0	0	0	2	98	100	5
	10	69	0	0	0	31	69	100	4
	11	86	0	0	0	14	86	100	5
	13	16	0	0	0	84	16	100	2
	15	0	0	0	0	100	0	100	0
	23	0	0	0	0	100	0	100	0
	25	0	0	0	0	100	0	100	0
	26	4	0	0	0	96	4	100	1
C	1	17	0	0	0	83	17	100	2
	2	77	0	0	0	23	77	100	5
	4	73	0	0	0	27	73	100	4
	6	30	0	0	0	70	30	100	3
	8	78	0	0	0	22	78	100	5
	10	67	0	0	0	33	67	100	4
	13	15	0	0	0	85	15	100	2
	15	30	0	0	0	70	30	100	3
	16	11	0	0	0	89	11	100	2
	18	3	0	0	6	91	3	100	1
D	4	4	0	0	0	96	4	100	1
	6	82	0	0	0	18	82	100	5
	7	74	0	0	0	26	74	100	4
	8	71	0	0	0	29	71	100	4
	15	7	0	0	0	93	7	100	2
	16	2	0	0	2	96	2	100	1
E	2	0	0	0	0	100	0	100	0
	3	67	0	0	0	33	67	100	4
	7	86	0	0	0	14	86	100	5
	10	46	0	0	0	54	46	100	3
	11	0	0	0	0	100	0	100	0
F	1	33	0	0	0	67	33	100	3
	2	84	0	0	0	16	84	100	5
	5	64	0	0	0	36	64	100	4
	7	8	0	0	0	92	8	100	1

G	1	31	0	0	0	69	31	100	3
	2	33	0	0	10	57	33	100	3
	4	2	0	0	5	93	2	100	1
	5	24	0	0	0	76	24	100	2
	8	37	0	0	0	63	37	100	3
	9	10	0	0	0	90	10	100	2
H	1	22	0	0	0	78	22	100	2
	2	29	0	0	0	71	29	100	3
	4	50	0	0	0	50	50	100	4
	6	21	0	0	0	79	21	100	2
	8	6	0	0	0	94	6	100	2
	10	0	0	0	0	100	0	100	0
	11	0	0	0	0	100	0	100	0
I	2	47	0	0	0	53	47	100	3
	4	38	0	0	0	62	38	100	3
	5	7	0	0	0	93	7	100	2
	9	2	0	0	7	91	2	100	1
J	1	12	0	0	0	88	12	100	2
	3	37	0	0	0	63	37	100	3
	6	28	0	0	0	72	28	100	3
	9	21	0	0	0	79	21	100	2
	11	14	0	0	0	86	14	100	2
	12	8	0	0	4	88	8	100	2
	14	0	0	0	6	94	0	100	0
K	3	10	0	0	4	86	10	100	2
	5	17	0	0	0	83	17	100	2
	6	12	0	0	0	88	12	100	2
	7	6	0	0	0	94	6	100	2
	9	11	0	0	0	89	11	100	2
L	1	10	0	0	1	89	10	100	2
	3	8	0	0	1	91	8	100	2
	4	6	0	0	0	94	6	100	2
	5	1	0	0	0	99	1	100	0.5
	7	0	0	0	3	97	0	100	0
	8	2	0	0	5	93	2	100	1
	9	0	0	0	0	100	0	100	0
Total	90								
Avg Coverage		32.98851	0	0	0.7356322	66.27586207	32.98850575		2.454023

BED 12 - 0.111 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	4	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	11	0	0	0	0	100	0	100	0
	15	22	0	0	0	78	22	100	2
	16	12	0	0	0	88	12	100	2
	19	0	7	0	0	93	7	100	2
	21	0	0	0	0	100	0	100	0
B	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	9	14	0	0	0	86	14	100	2
	12	4	0	0	4	92	4	100	1
	15	0	0	0	0	100	0	100	0
	17	0	0	0	0	100	0	100	0
C	1	0	5	0	0	95	5	100	2
	2	0	0	0	0	100	0	100	0
	4	0	0	0	14	86	0	100	0
	5	0	0	0	0	100	0	100	0
	8	3	0	0	0	97	3	100	1
	9	0	0	0	0	100	0	100	0
	11	11	0	0	0	89	11	100	2
	12	0	0	0	0	100	0	100	0
D	2	0	0	0	0	100	0	100	0
	4	43	0	0	0	57	43	100	3
	5	6	0	0	0	94	6	100	2
	6	0	0	0	0	100	0	100	0
	8	0	0	0	0	100	0	100	0
	10	0	0	0	0	100	0	100	0
	11	51	0	0	0	49	51	100	4
	12	0	0	0	0	100	0	100	0
E	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	7	16	0	0	0	84	16	100	2
	9	0	0	0	0	100	0	100	0
	13	0	0	0	0	100	0	100	0
F	2	8	0	0	0	92	8	100	2
	3	0	0	0	0	100	0	100	0
	4	0	0	0	0	100	0	100	0
	7	0	0	0	24	76	0	100	0
	10	0	0	0	18	82	0	100	0
	11	0	0	0	20	80	0	100	0
	14	0	0	0	0	100	0	100	0
	15	0	0	0	0	100	0	100	0
G	1	0	0	0	0	100	0	100	0
	4	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	8	0	0	0	0	100	0	100	0

	14	0	17	0	0	83	17	100	2
	15	18	0	0	0	82	18	100	2
	17	0	0	0	0	100	0	100	0
	18	0	0	0	0	100	0	100	0
H	4	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	11	9	0	0	0	91	9	100	2
	12	41	0	0	0	59	41	100	3
I	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	4	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	8	23	0	0	0	77	23	100	2
	10	0	0	0	0	100	0	100	0
	12	3	0	0	16	81	3	100	1
	13	3	0	0	12	85	3	100	1
	16	0	0	0	0	100	0	100	0
J	2	39	0	0	4	57	39	100	3
	4	17	0	0	14	69	17	100	2
	8	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	10	0	0	0	0	100	0	100	0
K	2	22	0	0	0	78	22	100	2
	4	19	0	0	8	73	19	100	2
	5	16	0	0	2	82	16	100	2
L	1	81	0	0	0	19	81	100	5
	2	10	0	0	0	90	10	100	2
	4	0	0	0	4	96	0	100	0
	7	0	0	0	12	88	0	100	0
M	1	0	0	0	9	91	0	100	0
	3	0	0	0	2	98	0	100	0
	5	9	0	0	9	82	9	100	2
	6	0	0	0	7	93	0	100	0
N	1	0	0	0	3	97	0	100	0
	2	0	0	0	0	100	0	100	0
O	1	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
Total	86								
Avg Coverage		5.747126	0.333333	0	2.091954	91.82758621	6.08045977		0.689655

BED 13 - 3.79 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	4	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	7	0	0	0	24	76	0	100	0
	10	0	0	0	0	100	0	100	0
	13	0	0	0	0	100	0	100	0
	14	6	0	0	8	86	6	100	2
	15	0	0	0	0	100	0	100	0
	17	0	0	0	32	68	0	100	0
	18	0	0	0	5	95	0	100	0
	20	16	0	0	0	84	16	100	2
	22	0	0	0	2	98	0	100	0
B	3	0	0	0	1	99	0	100	0
	4	0	0	0	17	83	0	100	0
	6	0	0	0	0	100	0	100	0
	7	1	0	0	8	91	1	100	0.5
	8	0	0	0	2	98	0	100	0
	9	0	0	0	2	98	0	100	0
	12	15	0	0	4	81	15	100	2
	13	0	0	0	7	93	0	100	0
	17	0	0	0	71	29	0	100	0
	18	0	0	0	59	41	0	100	0
	19	2	0	0	45	53	2	100	1
	20	0	0	0	14	86	0	100	0
	23	0	0	0	2	98	0	100	0
	24	0	0	0	4	96	0	100	0
	26	0	0	0	1	99	0	100	0
	31	4	0	0	2	94	4	100	1
	32	0	0	0	2	98	0	100	0
	33	0	0	0	0	100	0	100	0
C	2	0	0	0	1	99	0	100	0
	3	3	0	0	2	95	3	100	1
	4	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	9	5	0	0	10	85	5	100	2
	11	3	0	0	0	97	3	100	1
	13	20	0	0	14	66	20	100	2
	15	3	0	0	2	95	3	100	1
	17	28	0	0	0	72	28	100	3
	20	0	0	0	0	100	0	100	0
	22	7	0	0	36	57	7	100	2
	25	2	0	0	23	75	2	100	1
	30	12	0	0	2	86	12	100	2
	31	0	0	0	2	98	0	100	0
	32	0	0	0	2	98	0	100	0
	33	1	0	0	3	96	1	100	0.5
	34	0	0	0	1	99	0	100	0
	35	0	0	0	0	100	0	100	0
	37	4	0	0	0	96	4	100	2
	39	0	0	0	6	94	0	100	0
	40	0	0	0	1	99	0	100	0

	41	0	0	0	2	98	0	100	0
	42	0	0	0	0	100	0	100	0
D	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	9	1	0	0	2	97	1	100	0.5
	12	4	0	0	0	96	4	100	1
	14	2	0	0	0	98	2	100	1
	15	0	0	0	0	100	0	100	0
	16	1	0	0	1	98	1	100	0.5
	17	0	0	0	0	100	0	100	0
	22	3	0	0	0	97	3	100	1
	23	0	0	0	0	100	0	100	0
	24	1	0	0	0	99	1	100	0.5
	27	40	0	0	6	54	40	100	3
	28	40	0	0	0	60	40	100	3
	32	17	0	0	0	83	17	100	2
	33	6	0	0	0	94	6	100	2
	35	0	0	0	0	100	0	100	0
	36	6	0	0	3	91	6	100	2
	37	0	0	0	85	15	0	100	0
	42	18	0	0	35	47	18	100	2
	43	5	0	0	4	91	5	100	2
	44	25	0	0	15	60	25	100	3
	45	61	0	0	8	31	61	100	4
	46	74	0	0	0	26	74	100	4
	47	79	0	0	0	21	79	100	5
	48	18	0	0	8	74	18	100	2
E	1	1	0	0	0	99	1	100	0.5
	2	0	0	0	0	100	0	100	0
	3	1	0	0	11	88	1	100	0.5
	4	1	0	0	0	99	1	100	0.5
	5	0	0	0	0	100	0	100	0
	20	16	0	0	27	57	16	100	2
	21	42	0	0	20	38	42	100	3
	22	25	0	0	2	73	25	100	3
	25	33	0	0	11	56	33	100	3
	26	21	0	0	3	76	21	100	2
	27	7	0	0	1	92	7	100	2
	30	8	0	0	3	89	8	100	2
	31	66	0	0	4	30	66	100	4
	32	61	0	0	2	37	61	100	4
	33	63	0	0	6	31	63	100	4
	38	72	0	0	1	27	72	100	4
	39	83	0	0	0	17	83	100	5
	41	48	0	0	0	52	48	100	3
	42	33	0	0	0	67	33	100	3
F	1	0	0	0	1	99	0	100	0
	2	0	0	0	2	98	0	100	0
	4	0	0	0	6	94	0	100	0
	5	0	0	0	2	98	0	100	0
	6	0	0	0	3	97	0	100	0
	8	0	0	0	3	97	0	100	0
	10	0	0	0	4	96	0	100	0

	13	0	0	0	2	98	0	100	0
	16	4	0	0	1	95	4	100	1
	17	67	0	0	0	33	67	100	4
	18	87	0	0	0	13	87	100	5
	19	83	0	0	3	14	83	100	5
	25	73	0	0	1	26	73	100	4
	26	71	0	0	0	29	71	100	4
	27	82	0	0	0	18	82	100	5
	30	75	0	0	3	22	75	100	5
	35	0	0	0	0	100	0	100	0
	36	14	0	0	0	86	14	100	2
	37	1	0	0	1	98	1	100	0.5
	39	0	0	0	0	100	0	100	0
	42	0	0	0	18	82	0	100	0
	43	0	0	0	100	0	0	100	0
	45	0	0	0	44	56	0	100	0
	46	10	0	0	10	80	10	100	2
	47	0	0	0	47	53	0	100	0
	50	0	0	0	3	97	0	100	0
	51	4	0	0	1	95	4	100	1
G	1	0	0	0	1	99	0	100	0
	2	0	0	0	1	99	0	100	0
	3	1	0	0	2	97	1	100	0.5
	4	0	0	0	0	100	0	100	0
	5	1	0	0	4	95	1	100	0.5
	7	24	0	0	3	73	24	100	2
	8	9	0	0	1	90	9	100	2
	15	0	0	0	11	89	0	100	0
	16	0	0	0	7	93	0	100	0
	17	0	0	0	6	94	0	100	0
	18	5	0	0	3	92	5	100	2
	20	0	0	0	57	43	0	100	0
	23	11	0	0	10	79	11	100	2
	26	35	0	0	3	62	35	100	3
	27	20	0	0	2	78	20	100	2
	29	29	0	0	3	68	29	100	3
	32	62	0	0	0	38	62	100	4
	35	37	0	0	3	60	37	100	3
	36	5	0	0	2	93	5	100	2
	37	17	0	0	0	83	17	100	2
	38	6	0	0	2	92	6	100	2
	42	65	0	0	0	35	65	100	4
	43	81	0	0	0	19	81	100	5
	45	88	0	0	0	12	88	100	5
	46	84	0	0	0	16	84	100	5
	50	24	0	0	3	73	24	100	2
	51	35	0	0	1	64	35	100	3
	52	31	0	0	2	67	31	100	3
	53	33	0	0	1	66	33	100	3
	54	0	0	0	0	100	0	100	0
	59	30	0	0	0	70	30	100	3
	60	26	0	0	0	74	26	100	3
	61	29	0	0	3	68	29	100	3
	65	0	0	0	0	100	0	100	0
	66	10	0	0	0	90	10	100	2
	67	0	0	0	0	100	0	100	0

	68	0	0	0	0	100	0	100	0
H	1	0	0	0	17	83	0	100	0
	2	0	0	0	5	95	0	100	0
	3	0	0	0	1	99	0	100	0
	4	0	0	0	8	92	0	100	0
	5	0	0	0	16	84	0	100	0
	6	0	0	0	3	97	0	100	0
	8	0	0	0	8	92	0	100	0
	9	5	0	0	4	91	5	100	2
	10	0	0	0	9	91	0	100	0
	15	0	0	0	4	96	0	100	0
	16	0	0	0	30	70	0	100	0
	17	1	0	0	33	66	1	100	0.5
	21	0	0	0	4	96	0	100	0
	22	0	0	0	3	97	0	100	0
	23	0	0	0	1	99	0	100	0
	24	0	0	0	1	99	0	100	0
	25	0	0	0	1	99	0	100	0
	27	0	0	0	2	98	0	100	0
	32	44	0	0	0	56	44	100	3
	34	25	0	0	0	75	25	100	3
	35	26	0	0	0	74	26	100	3
	38	57	0	0	0	43	57	100	4
	39	61	0	0	4	35	61	100	4
	40	45	0	0	0	55	45	100	3
	44	34	0	0	0	66	34	100	3
	45	47	0	0	3	50	47	100	3
	46	63	0	0	1	36	63	100	4
	47	84	0	0	2	14	84	100	5
	48	25	0	0	6	69	25	100	3
	51	30	0	0	1	69	30	100	3
	53	53	0	0	0	47	53	100	4
	60	65	0	0	0	35	65	100	4
	61	100	0	0	0	0	100	100	5
	63	79	0	0	0	21	79	100	5
	64	92	0	0	0	8	92	100	5
	67	38	0	0	0	62	38	100	3
	68	12	0	0	0	88	12	100	2
	69	0	0	0	0	100	0	100	0
	70	2	0	0	5	93	2	100	1
	71	0	0	0	0	100	0	100	0
	73	0	0	0	0	100	0	100	0
	74	0	0	0	0	100	0	100	0
	75	0	0	0	4	96	0	100	0
I	2	8	0	0	0	92	8	100	2
	4	6	0	0	0	94	6	100	2
	5	8	0	0	0	92	8	100	2
	8	15	0	0	1	84	15	100	2
	9	7	0	0	2	91	7	100	2
	11	6	0	0	0	94	6	100	2
	12	13	0	0	0	87	13	100	2
	13	6	0	0	0	94	6	100	2
	14	6	0	0	0	94	6	100	2
	18	7	0	0	0	93	7	100	2
	21	9	0	0	0	91	9	100	2
	22	4	0	0	0	96	4	100	1

	23	16	0	0	0	84	16	100	2
	25	9	0	0	0	91	9	100	2
	27	4	0	0	0	96	4	100	1
	28	3	0	0	0	97	3	100	1
	29	9	0	0	0	91	9	100	2
	34	3	0	0	0	97	3	100	1
	35	6	0	0	0	94	6	100	2
	36	8	0	0	0	92	8	100	2
	39	13	0	0	0	87	13	100	2
	49	21	0	0	3	76	21	100	2
	50	20	0	0	3	77	20	100	2
	51	24	0	0	2	74	24	100	2
	52	19	0	0	1	80	19	100	2
	55	14	0	0	2	84	14	100	2
	56	17	0	0	1	82	17	100	2
	60	15	0	0	2	83	15	100	2
	61	6	0	0	1	93	6	100	2
	62	8	0	0	2	90	8	100	2
	63	4	0	0	1	95	4	100	1
	64	14	0	0	0	86	14	100	2
	69	12	0	0	0	88	12	100	2
	76	6	0	0	0	94	6	100	2
	77	0	0	0	0	100	0	100	0
	78	14	0	0	0	86	14	100	2
	79	34	0	0	12	54	34	100	3
	80	14	0	0	0	86	14	100	2
	82	16	0	0	0	84	16	100	2
J	1	8	0	0	4	88	8	100	2
	2	12	0	0	3	85	12	100	2
	3	7	0	0	1	92	7	100	2
	4	9	0	0	2	89	9	100	2
	6	16	0	0	3	81	16	100	2
	7	4	0	0	1	95	4	100	1
	8	2	0	0	0	98	2	100	1
	10	0	0	0	0	100	0	100	0
	14	1	0	0	3	96	1	100	0.5
	15	1	0	0	2	97	1	100	0.5
	18	0	0	0	0	100	0	100	0
	20	3	0	0	1	96	3	100	1
	24	7	0	0	1	92	7	100	2
	25	6	0	0	2	92	6	100	2
	27	22	0	0	3	75	22	100	2
	30	21	0	0	4	75	21	100	2
	34	16	0	0	3	81	16	100	2
	35	11	0	0	2	87	11	100	2
	36	9	0	0	1	90	9	100	2
	37	7	0	0	3	90	7	100	2
	38	4	0	0	3	93	4	100	1
	41	7	0	0	2	91	7	100	2
	47	2	0	0	1	97	2	100	1
	48	8	0	0	2	90	8	100	2
	49	0	0	0	0	100	0	100	0
	50	1	0	0	1	98	1	100	0.5
	51	0	0	0	0	100	0	100	0
	52	0	0	0	0	100	0	100	0
	55	0	0	0	0	100	0	100	0

	59	4	0	0	2	94	4	100	1
	60	7	0	0	0	93	7	100	2
	61	11	0	0	1	88	11	100	2
	62	3	0	0	1	96	3	100	1
	63	6	0	0	0	94	6	100	2
	64	2	0	0	0	98	2	100	1
	67	24	0	0	0	76	24	100	2
	68	10	0	0	2	88	10	100	2
	69	2	0	0	0	98	2	100	1
K	17	4	0	0	2	94	4	100	1
	18	1	0	0	1	98	1	100	0.5
	20	0	0	0	0	100	0	100	0
	21	5	0	0	2	93	5	100	2
	22	5	0	0	2	93	5	100	2
	23	1	0	0	0	99	1	100	0.5
	24	4	0	0	1	95	4	100	1
	25	8	0	0	2	90	8	100	2
	27	34	0	0	0	66	34	100	3
	28	52	0	0	0	48	52	100	4
	30	5	0	0	2	93	5	100	2
	31	3	0	0	1	96	3	100	1
	51	0	0	0	0	100	0	100	0
	52	16	0	0	4	80	16	100	2
	53	17	0	0	3	80	17	100	2
	54	14	0	0	2	84	14	100	2
	56	3	0	0	0	97	3	100	1
	57	0	0	0	0	100	0	100	0
	59	4	0	0	0	96	4	100	1
	60	3	0	0	0	97	3	100	1
	65	0	0	0	0	100	0	100	0
	67	0	0	0	0	100	0	100	0
	68	0	0	0	0	100	0	100	0
	69	4	0	0	0	96	4	100	1
	72	3	0	0	0	97	3	100	1
	73	8	0	0	0	92	8	100	2
	74	0	0	0	0	100	0	100	0
	77	0	0	0	0	100	0	100	0
	80	0	0	0	0	100	0	100	0
	81	0	0	0	0	100	0	100	0
	82	2	0	0	0	98	2	100	1
L	6	3	0	0	0	97	3	100	1
	7	1	0	0	0	99	1	100	0.5
	8	1	0	0	0	99	1	100	0.5
	9	0	0	0	0	100	0	100	0
	12	2	0	0	0	98	2	100	1
	13	0	0	0	0	100	0	100	0.5
	14	11	0	0	0	89	11	100	2
	15	9	0	0	0	91	9	100	2
	16	16	0	0	0	84	16	100	2
	17	18	0	0	2	80	18	100	2
	18	13	0	0	0	87	13	100	2
	21	12	0	0	0	88	12	100	2
	22	6	0	0	0	94	6	100	2
	25	10	0	0	1	89	10	100	2
	27	11	0	0	0	89	11	100	2
	29	8	0	0	0	92	8	100	2

	33	14	0	0	1	85	14	100	2
	34	14	0	0	0	86	14	100	2
	35	19	0	0	4	77	19	100	2
	36	24	0	0	4	72	24	100	2
	37	34	0	0	0	66	34	100	3
	40	24	0	0	0	76	24	100	2
	42	2	0	0	0	98	2	100	1
	47	8	0	0	0	92	8	100	2
	48	14	0	0	0	86	14	100	2
	49	17	0	0	0	83	17	100	2
	50	15	0	0	0	85	15	100	2
	51	17	0	0	0	83	17	100	2
	56	6	0	0	0	94	6	100	2
	57	2	0	0	0	98	2	100	1
	58	4	0	0	0	96	4	100	1
	60	3	0	0	0	97	3	100	1
	61	6	0	0	0	94	6	100	2
	62	9	0	0	2	89	9	100	2
	65	1	0	0	0	99	1	100	0.5
	66	2	0	0	1	97	2	100	1
	68	0	0	0	0	100	0	100	0
	73	21	0	0	4	75	21	100	2
	74	34	0	0	6	60	34	100	3
	75	22	0	0	0	78	22	100	2
	78	7	0	0	0	93	7	100	2
	79	11	0	0	0	89	11	100	2
	80	18	0	0	0	82	18	100	2
	81	0	0	0	0	100	0	100	0
M	1	0	0	0	4	96	0	100	0
	2	0	0	0	8	92	0	100	0
	3	0	0	0	4	96	0	100	0
	4	0	0	0	5	95	0	100	0
	13	0	0	0	3	97	0	100	0
	14	0	0	0	10	90	0	100	0
	15	1	0	0	3	96	1	100	0.5
	17	6	0	0	0	94	6	100	2
	18	18	0	0	6	76	18	100	2
	19	12	0	0	3	85	12	100	2
	20	14	0	0	6	80	14	100	2
	21	12	0	0	3	85	12	100	2
	22	15	0	0	4	81	15	100	2
	24	24	0	0	2	74	24	100	2
	25	5	0	0	1	94	5	100	2
	26	0	0	0	1	99	0	100	0
	27	4	0	0	2	94	4	100	1
	31	60	0	0	0	40	60	100	4
	33	68	0	0	0	32	68	100	4
	34	18	0	0	0	82	18	100	2
	43	7	0	0	1	92	7	100	2
	44	11	0	0	0	89	11	100	2
	45	33	0	0	0	67	33	100	3
	46	67	0	0	0	33	67	100	4
	47	62	0	0	0	38	62	100	4
	52	76	0	0	0	24	76	100	5
	53	78	0	0	0	22	78	100	5
	55	87	0	0	0	13	87	100	5

	56	81	0	0	0	19	81	100	5
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	61	92	0	0	0	8	92	100	5
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	65	71	0	0	0	29	71	100	4
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	72	17	0	0	0	83	17	100	2
	73	0	0	0	0	100	0	100	0
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	20	14	0	0	0	86	14	100	2
	24	3	0	0	4	93	3	100	1
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	26	36	0	0	1	63	36	100	3
	27	74	0	0	0	26	74	100	4
	32	56	0	0	0	44	56	100	4
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	36	67	0	0	0	33	67	100	4
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	49	88	0	0	0	12	88	100	5
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	42	44	0	0	0	56	44	100	3
	46	87	0	0	0	13	87	100	5
	47	77	0	0	0	23	77	100	5
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	54	45	0	0	0	55	45	100	3
	58	3	0	0	2	95	3	100	1
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	56	84	0	0	2	14	84	100	5
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	62	44	0	0	0	56	44	100	3
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	73	0	0	0	0	100	0	100	0
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	83	84	0	0	0	16	84	100	5
	84	59	0	0	0	41	59	100	4
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	37	0	0	0	0	100	0	100	0
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	45	79	0	0	0	21	79	100	5
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	47	68	0	0	0	32	68	100	4
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	65	24	0	0	0	76	24	100	2
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	68	21	0	0	0	79	21	100	2
	69	24	0	0	0	76	24	100	2
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	72	54	0	0	0	46	54	100	4
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T	2	0	0	0	0	100	0	100	0
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	77	92	0	0	0	8	92	100	5
	79	87	0	0	0	13	87	100	5
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	95	63	0	0	0	37	63	100	4
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	73	17	0	0	0	83	17	100	2
	76	7	0	0	0	93	7	100	2
	77	24	0	0	0	76	24	100	2
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W	4	0	0	0	14	86	0	100	0
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	75	74	0	0	0	26	74	100	4
	76	65	0	0	0	35	65	100	4
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	111	0	0	0	0	100	0	100	0
X	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	3	0	0	0	11	89	0	100	0
	4	0	0	0	36	64	0	100	0
	6	5	0	0	0	95	5	100	2

	11	1	0	0	4	95	1	100	0.5
	13	1	0	0	1	98	1	100	0.5
	14	0	0	0	2	98	0	100	0
	15	0	0	0	0	100	0	100	0
	19	0	0	0	0	100	0	100	0
	20	0	0	0	2	98	0	100	0
	23	1	0	0	2	97	1	100	0.5
	24	0	0	0	1	99	0	100	0
	25	0	0	0	0	100	0	100	0
	28	0	0	0	4	96	0	100	0
	29	0	0	0	2	98	0	100	0
	33	0	0	0	7	93	0	100	0
	34	0	0	0	7	93	0	100	0
	35	0	0	0	5	95	0	100	0
	39	22	0	0	15	63	22	100	2
	40	35	0	0	10	55	35	100	3
	45	0	0	0	3	97	0	100	0
	46	0	0	0	0	100	0	100	0
	48	2	0	0	0	98	2	100	1
	49	1	0	0	0	99	1	100	0.5
	50	0	0	0	3	97	0	100	0
	55	0	0	0	0	100	0	100	0
	56	0	0	0	1	99	0	100	0
	57	0	0	0	2	98	0	100	0
	59	0	0	0	0	100	0	100	0
	60	0	0	0	0	100	0	100	0
	61	2	0	0	0	98	2	100	1
	62	4	0	0	0	96	4	100	1
	88	0	88	0	0	12	88	100	5
	89	0	70	0	0	30	70	100	4
	92	0	16	0	0	84	16	100	2
	93	0	0	0	0	100	0	100	0
	94	0	0	0	0	100	0	100	0
	95	0	0	0	0	100	0	100	0
	96	0	0	0	0	100	0	100	0
	99	0	0	0	0	100	0	100	0
Y	2	0	0	0	0	100	0	100	0
	3	0	0	0	2	98	0	100	0
	4	0	0	0	0	100	0	100	0
	5	1	0	0	0	99	1	100	0.5
	7	0	0	0	3	97	0	100	0
	11	0	0	0	3	97	0	100	0
	12	0	0	0	0	100	0	100	0
	14	0	0	0	3	97	0	100	0
	16	0	0	0	0	100	0	100	0
	20	0	0	0	9	91	0	100	0
	21	1	0	0	5	94	1	100	0.5
	26	0	0	0	9	91	0	100	0
	28	0	0	0	4	96	0	100	0
	30	0	0	0	3	97	0	100	0
	33	2	0	0	7	91	2	100	1
	34	0	0	0	6	94	0	100	0
	35	0	0	0	9	91	0	100	0
	38	3	0	0	8	89	3	100	1
	39	0	0	0	12	88	0	100	0
	44	0	0	0	13	87	0	100	1

	47	0	0	0	5	95	0	100	0
	51	0	0	0	7	93	0	100	0
	52	3	0	0	0	97	3	100	1
	56	0	0	0	0	100	0	100	0
	57	43	0	0	0	57	43	100	3
	58	62	0	0	0	38	62	100	4
	62	63	0	0	0	37	63	100	4
	63	29	0	0	0	71	29	100	3
	65	2	0	0	0	98	2	100	1
	68	0	0	0	0	100	0	100	1
	69	0	0	0	0	100	0	100	1
	70	0	0	0	0	100	0	100	1
Z	1	0	0	0	17	83	0	100	1
	2	0	0	0	4	96	0	100	1
	3	0	0	0	22	78	0	100	1
	4	0	0	0	11	89	0	100	1
	8	0	0	0	2	98	0	100	1
	9	0	0	0	5	95	0	100	1
	10	0	0	0	7	93	0	100	1
	11	0	0	0	4	96	0	100	1
	13	8	0	0	0	92	8	100	2
	14	0	0	0	4	96	0	100	0
	15	0	0	0	3	97	0	100	0
	16	7	0	0	0	93	7	100	2
	18	0	0	0	1	99	0	100	0
	20	32	0	0	4	64	32	100	3
	23	6	0	0	4	90	6	100	2
	25	3	0	0	8	89	3	100	1
	26	13	0	0	8	79	13	100	2
	27	3	0	0	1	96	3	100	1
	28	2	0	0	4	94	2	100	1
	37	0	0	0	9	91	0	100	0
	38	0	0	0	2	98	0	100	0
	40	0	0	0	10	90	0	100	0
	41	0	0	0	5	95	0	100	0
	42	0	0	0	9	91	0	100	0
	43	0	0	0	4	96	0	100	0
	48	53	0	0	7	40	53	100	4
	51	85	0	0	3	12	85	100	5
	52	48	0	0	5	47	48	100	3
	54	65	0	0	17	18	65	100	4
	56	58	0	0	2	40	58	100	4
	58	30	0	0	3	67	30	100	3
	59	67	0	0	0	33	67	100	4
	60	74	0	0	0	26	74	100	4
	67	6	0	0	0	94	6	100	2
	69	9	0	0	0	91	9	100	2
	70	0	2	0	0	98	2	100	1
	72	0	0	0	0	100	0	100	0
	74	88	2	0	0	10	90	100	5
	76	84	0	0	0	16	84	100	5
AA	1	0	0	0	7	93	0	100	0
	2	0	0	0	8	92	0	100	0
	3	0	0	0	7	93	0	100	0
	5	0	0	0	8	92	0	100	0
	6	0	0	0	4	96	0	100	0

	7	0	0	0	7	93	0	100	0
	9	0	0	0	8	92	0	100	0
	13	0	0	0	17	83	0	100	0
	14	0	0	0	7	93	0	100	0
	15	0	0	0	5	95	0	100	0
	16	1	0	0	25	74	1	100	0.5
	18	0	0	0	2	98	0	100	0
	21	10	0	0	10	80	10	100	2
	24	0	0	0	23	77	0	100	0
	26	0	0	0	32	68	0	100	0
	27	0	0	0	0	100	0	100	0
	29	0	0	0	0	100	0	100	0
	30	0	0	0	1	99	0	100	0
	36	7	0	0	16	77	7	100	2
	37	85	0	0	3	12	85	100	5
	38	87	0	0	0	13	87	100	5
	40	81	0	0	1	18	81	100	5
	45	74	0	0	4	22	74	100	4
	48	58	0	0	0	42	58	100	4
	49	58	0	0	0	42	58	100	4
	51	49	0	0	0	51	49	100	3
	54	81	0	0	0	19	81	100	5
	55	12	0	0	2	86	12	100	2
	56	14	0	0	0	86	14	100	2
	59	19	0	0	0	81	19	100	2
	63	0	0	0	0	100	0	100	0
	65	0	0	0	0	100	0	100	0
	66	2	0	0	2	96	2	100	1
	68	0	0	0	0	100	0	100	0
	69	0	0	0	0	100	0	100	0
	70	0	0	0	0	100	0	100	0
AB	1	0	0	0	21	79	0	100	0
	2	0	0	0	16	84	0	100	0
	3	0	0	0	9	91	0	100	0
	5	0	0	0	6	94	0	100	0
	6	0	0	0	13	87	0	100	0
	7	0	0	0	20	80	0	100	0
	10	0	0	0	22	78	0	100	0
	12	0	0	0	12	88	0	100	0
	14	0	0	0	11	89	0	100	0
	17	0	0	0	13	87	0	100	0
	18	0	0	0	14	86	0	100	0
	22	0	0	0	16	84	0	100	0
	25	0	0	0	18	82	0	100	0
	26	2	0	0	12	86	2	100	1
	28	0	0	0	4	96	0	100	0
	34	0	0	0	5	95	0	100	0
	36	0	0	0	16	84	0	100	0
	37	0	0	0	7	93	0	100	0
	39	9	0	0	4	87	9	100	2
	45	0	0	0	14	86	0	100	0
	46	0	0	0	3	97	0	100	0
	49	21	0	0	0	79	21	100	2
	50	19	0	0	29	52	19	100	2
	51	9	0	0	0	91	9	100	2
	53	7	0	0	0	93	7	100	2

AC	2	0	0	0	5	95	0	100	0
	4	0	0	0	5	95	0	100	0
	6	0	0	0	13	87	0	100	0
	7	0	0	0	3	97	0	100	0
	12	0	0	0	2	98	0	100	0
	13	0	0	0	12	88	0	100	0
	15	0	0	0	31	69	0	100	0
	17	0	0	0	9	91	0	100	0
	18	0	0	0	3	97	0	100	0
	22	2	0	0	3	95	2	100	1
	23	13	0	0	1	86	13	100	2
	25	0	0	0	0	100	0	100	0
	26	0	0	0	3	97	0	100	0
	28	14	0	0	4	82	14	100	2
	29	0	0	0	12	88	0	100	0
	39	0	0	0	0	100	0	100	0
	40	62	0	0	0	38	62	100	4
	42	28	0	0	0	72	28	100	3
	43	87	0	0	0	13	87	100	5
	44	43	0	0	0	57	43	100	3
	45	12	0	0	0	88	12	100	2
Total	967								
Avg Coverage		17.24587	0.769628	0	3.0640496	78.92045455	18.01549587		1.491736

BED 14 - 1.07 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	1	37	0	0	0	63	37	100	3
	4	56	0	0	0	44	56	100	4
	5	97	0	0	0	3	97	100	5
	6	44	0	0	0	56	44	100	3
	11	83	0	0	0	17	83	100	5
	12	97	0	0	0	3	97	100	5
	14	96	0	0	0	4	96	100	5
	16	85	0	0	0	15	85	100	5
	18	28	0	0	0	72	28	100	3
	19	68	0	0	0	32	68	100	4
	20	97	0	0	0	3	97	100	5
	21	90	0	0	0	10	90	100	5
	22	33	0	0	0	67	33	100	3
	27	88	0	0	0	12	88	100	5
	28	91	0	0	0	9	91	100	5
	29	87	0	0	0	13	87	100	5
	35	91	0	0	0	9	91	100	5
	36	96	0	0	0	4	96	100	5
	37	90	0	0	0	10	90	100	5
	42	0	0	0	0	100	0	100	0
	43	0	0	0	0	100	0	100	0
	65	0	0	0	6	94	0	100	0
	66	0	0	0	4	96	0	100	0
	70	0	0	0	3	97	0	100	0
	71	0	0	0	0	100	0	100	0
B	1	92	0	0	0	8	92	100	5
	3	97	0	0	0	3	97	100	5
	5	97	0	0	0	3	97	100	5
	6	94	0	0	0	6	94	100	5
	8	96	0	0	0	4	96	100	5
	10	88	0	0	0	12	88	100	5
	11	100	0	0	0	0	100	100	5
	15	93	0	0	0	7	93	100	5
	16	91	0	0	0	9	91	100	5
	19	42	0	0	0	58	42	100	3
	20	97	0	0	0	3	97	100	5
	21	94	0	0	0	6	94	100	5
	22	93	0	0	0	7	93	100	5
	25	96	0	0	0	4	96	100	5
	27	86	0	0	0	14	86	100	5
	28	86	0	0	0	14	86	100	5
	29	91	0	0	0	9	91	100	5
	38	21	0	0	0	79	21	100	2
	39	19	0	0	0	81	19	100	2
	41	0	0	0	0	100	0	100	0
	42	0	0	0	0	100	0	100	0
	45	6	0	0	0	94	6	100	2
	46	0	0	0	0	100	0	100	0
	47	0	0	0	0	100	0	100	0

	50	0	0	0	0	100	0	100	0
	58	0	0	0	0	100	0	100	0
	59	0	0	0	0	100	0	100	0
	61	0	0	0	0	100	0	100	0
	62	0	0	0	0	100	0	100	0
	68	0	0	0	0	100	0	100	0
	72	0	0	0	0	100	0	100	0
C	1	0	0	0	0	100	0	100	0
	2	48	0	0	0	52	48	100	3
	6	82	0	0	0	18	82	100	5
	7	58	0	0	0	42	58	100	4
	10	44	0	0	0	56	44	100	3
	11	54	0	0	0	46	54	100	4
	14	99	0	0	0	1	99	100	5
	16	82	0	0	0	18	82	100	5
	20	72	0	0	0	28	72	100	4
	21	15	0	0	0	85	15	100	2
	24	54	0	0	0	46	54	100	4
	28	34	0	0	0	66	34	100	3
	30	32	0	0	0	68	32	100	3
	34	68	0	0	0	32	68	100	4
	36	72	0	0	0	28	72	100	4
	38	28	0	0	0	72	28	100	3
	43	55	0	0	0	45	55	100	4
	44	32	0	0	0	68	32	100	3
	47	11	0	0	0	89	11	100	2
	49	12	0	0	0	88	12	100	2
	51	34	0	0	0	66	34	100	3
	52	31	0	0	0	69	31	100	3
	57	20	0	0	0	80	20	100	2
	58	27	0	0	0	73	27	100	3
	63	10	0	0	0	90	10	100	2
	64	9	0	0	0	91	9	100	2
	68	6	0	0	0	94	6	100	2
	69	0	0	0	0	100	0	100	0
	70	0	0	0	0	100	0	100	0
D	1	83	0	0	0	17	83	100	5
	4	89	0	0	0	11	89	100	5
	7	94	0	0	0	6	94	100	5
	8	96	0	0	0	4	96	100	5
	9	12	0	0	0	88	12	100	2
	10	16	0	0	0	84	16	100	2
	11	47	0	0	0	53	47	100	3
	14	74	0	0	0	26	74	100	4
	15	0	0	0	0	100	0	100	0
	18	21	0	0	0	79	21	100	2
	19	80	0	0	0	20	80	100	5
	21	18	0	0	0	82	18	100	2
	22	3	0	0	0	97	3	100	1
	24	11	0	0	0	89	11	100	2
	26	38	0	0	0	62	38	100	3
	27	16	0	0	0	84	16	100	2
	29	24	0	0	0	76	24	100	2
	30	34	0	0	0	66	34	100	3
	32	0	0	0	0	100	0	100	0

	33	0	0	0	0	100	0	100	0
	36	30	0	0	0	70	30	100	3
	42	34	0	0	0	66	34	100	3
	43	16	0	0	0	84	16	100	2
	44	15	0	0	0	85	15	100	2
	45	13	0	0	0	87	13	100	2
E	2	38	0	0	0	62	38	100	3
	4	54	0	0	0	46	54	100	4
	5	30	0	0	9	61	30	100	3
	6	34	0	0	3	63	34	100	3
	8	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	10	41	0	0	0	59	41	100	3
	11	6	0	0	0	94	6	100	2
	14	0	0	0	0	100	0	100	0
	15	39	0	0	0	61	39	100	3
	16	0	0	0	0	100	0	100	0
	19	0	0	0	0	100	0	100	0
	20	0	0	0	0	100	0	100	0
	24	0	0	0	0	100	0	100	0
	27	14	0	0	0	86	14	100	2
	28	8	0	0	0	92	8	100	2
	29	7	0	0	0	93	7	100	2
	32	0	0	0	0	100	0	100	0
	35	0	0	0	0	100	0	100	0
	36	0	0	0	0	100	0	100	0
	39	30	0	0	0	70	30	100	3
	43	21	0	0	0	79	21	100	2
	44	13	0	0	0	87	13	100	2
F	3	0	0	0	0	100	0	100	0
	4	0	0	0	4	96	0	100	0
	5	0	0	0	7	93	0	100	0
	7	51	0	0	0	49	51	100	4
	8	54	0	0	0	46	54	100	4
	9	0	0	0	0	100	0	100	0
	11	22	0	0	0	78	22	100	2
	13	0	0	0	0	100	0	100	0
	18	0	0	0	0	100	0	100	0
	19	0	0	0	0	100	0	100	0
	21	14	0	0	0	86	14	100	2
	22	28	0	0	0	72	28	100	3
	25	0	0	0	0	100	0	100	0
	28	4	0	0	0	96	4	100	1
	29	7	0	0	0	93	7	100	2
	36	0	0	0	0	100	0	100	0
	37	35	0	0	0	65	35	100	3
	40	20	0	0	0	80	20	100	2
	41	8	0	0	0	92	8	100	2
	46	5	0	0	0	95	5	100	2
	47	0	0	0	0	100	0	100	0
	48	0	0	0	0	100	0	100	0
	49	0	0	0	0	100	0	100	0
	53	19	0	0	0	81	19	100	2
	54	8	0	0	0	92	8	100	2
	57	0	0	0	5	95	0	100	0

G	2	0	0	0	0	100	0	100	0
	4	20	0	0	0	80	20	100	2
	7	69	0	0	0	31	69	100	4
	8	94	0	0	0	6	94	100	5
	9	97	0	0	0	3	97	100	5
	12	94	0	0	0	6	94	100	5
	13	0	0	0	0	100	0	100	0
	14	0	0	0	0	100	0	100	0
	18	86	0	0	0	14	86	100	5
	19	32	0	0	0	68	32	100	3
	21	91	0	0	0	9	91	100	5
	22	24	0	0	0	76	24	100	2
	25	0	0	0	0	100	0	100	0
	28	37	0	0	0	63	37	100	3
	29	14	0	0	0	86	14	100	2
	30	22	0	0	0	78	22	100	2
	34	30	0	0	0	70	30	100	3
	35	7	0	0	0	93	7	100	2
	36	0	0	0	0	100	0	100	0
	41	56	0	0	0	44	56	100	4
	42	43	0	0	0	57	43	100	3
	44	27	0	0	0	73	27	100	3
	46	23	0	0	0	77	23	100	2
	47	0	0	0	0	100	0	100	0
	48	0	0	0	16	84	0	100	0
H	1	39	0	0	0	61	39	100	3
	7	85	0	0	0	15	85	100	5
	8	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	10	0	0	0	0	100	0	100	0
	11	0	0	0	0	100	0	100	0
	14	7	0	0	0	93	7	100	2
	17	3	0	0	0	97	3	100	1
	19	0	0	0	0	100	0	100	0
	20	0	0	0	0	100	0	100	0
	21	8	0	0	0	92	8	100	2
	25	14	0	0	0	86	14	100	2
	26	2	0	0	0	98	2	100	1
	29	18	0	0	0	82	18	100	2
	31	26	0	0	0	74	26	100	3
	32	22	0	0	0	78	22	100	2
I	1	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	10	0	0	0	0	100	0	100	0
	11	91	0	0	0	9	91	100	5
	12	46	0	0	0	54	46	100	3
	16	0	0	0	0	100	0	100	0
	17	0	0	0	0	100	0	100	0
	19	36	0	0	0	64	36	100	3
	20	6	0	0	0	94	6	100	2
	21	0	0	0	0	100	0	100	0
	23	0	0	0	0	100	0	100	0
	24	0	0	0	0	100	0	100	0
	26	0	0	0	0	100	0	100	0

	28	0	0	0	0	100	0	100	0
	29	0	0	0	0	100	0	100	0
	30	0	0	0	0	100	0	100	0
	31	0	0	0	0	100	0	100	0
	38	0	0	0	0	100	0	100	0
	39	0	0	0	0	100	0	100	0
	40	0	0	0	0	100	0	100	0
J	1	0	0	0	0	100	0	100	0
	3	97	0	0	0	3	97	100	5
	6	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	10	0	0	0	0	100	0	100	0
	11	0	0	0	0	100	0	100	0
	13	0	0	0	0	100	0	100	0
	14	0	0	0	4	96	0	100	0
	15	0	0	0	0	100	0	100	0
	17	38	0	0	0	62	38	100	3
	18	46	0	0	0	54	46	100	3
	20	17	0	0	0	83	17	100	2
	23	0	0	0	0	100	0	100	0
	28	0	0	0	0	100	0	100	0
	29	0	0	0	0	100	0	100	0
	30	0	0	0	0	100	0	100	0
	31	0	0	0	0	100	0	100	0
	32	0	0	0	0	100	0	100	0
K	1	0	0	0	0	100	0	100	0
	2	26	0	0	0	74	26	100	3
	4	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
L	1	0	0	0	4	96	0	100	0
	3	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	8	31	0	0	0	69	31	100	3
	12	23	0	0	0	77	23	100	2
	13	11	0	0	0	89	11	100	2
	16	0	0	0	0	100	0	100	0
	17	4	0	0	0	96	4	100	1
	18	0	0	0	0	100	0	100	0
M	1	10	0	0	0	90	10	100	2
	4	17	0	0	0	83	17	100	2
	5	15	0	0	0	85	15	100	2
	8	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	12	0	0	0	0	100	0	100	0
	13	0	0	0	0	100	0	100	0
	16	0	0	0	0	100	0	100	0
	17	0	0	0	0	100	0	100	0
	20	0	0	0	0	100	0	100	0
	21	0	0	0	0	100	0	100	0
	23	0	0	0	0	100	0	100	0
N	1	52	0	0	0	48	52	100	4
	2	70	0	0	0	30	70	100	4
	3	98	0	0	1	1	98	100	5

	7	0	0	0	0	100	0	100	0
	8	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	10	0	0	0	0	100	0	100	0
	14	27	0	0	0	73	27	100	3
	16	0	0	0	0	100	0	100	0
	17	0	0	0	0	100	0	100	0
	22	0	0	0	0	100	0	100	0
	26	0	0	0	0	100	0	100	0
	27	4	0	0	0	96	4	100	1
	28	0	0	0	4	96	0	100	0
	31	0	0	0	0	100	0	100	0
O	2	0	0	0	97	3	0	100	0
	3	0	0	0	87	13	0	100	0
	6	0	0	0	16	84	0	100	0
	7	4	0	0	8	88	4	100	1
	8	8	0	0	0	92	8	100	2
	11	0	0	0	5	95	0	100	0
	14	0	0	0	0	100	0	100	0
	17	0	0	0	0	100	0	100	0
P	1	1	0	0	0	99	1	100	0.5
	2	0	0	0	0	100	0	100	0
	5	19	0	0	0	81	19	100	2
Q	1	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	9	0	0	0	0	100	0	100	0
	11	0	0	0	0	100	0	100	0
	13	0	0	0	0	100	0	100	0
R	1	0	0	0	0	100	0	100	0
	5	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	8	0	0	0	0	100	0	100	0
Total	303								
Avg Coverage		24.69637	0	0	0.9339934	74.36963696	24.69636964		1.770627

BED 15 - 0.12 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	1	0	0	0	16	84	0	100	0
	3	0	0	0	11	89	0	100	0
	5	0	0	0	6	94	0	100	0
	6	0	0	0	74	26	0	100	0
B	1	0	0	0	34	66	0	100	0
	3	0	0	0	20	80	0	100	0
	5	0	0	0	22	78	0	100	0
	7	0	0	0	70	30	0	100	0
	11	0	6	0	4	90	6	100	2
	12	0	4	0	6	90	4	100	1
C	1	0	0	0	83	17	0	100	0
	5	0	0	0	27	73	0	100	0
	6	0	7	0	15	78	7	100	2
	7	0	3	0	6	91	3	100	1
	9	0	2	0	0	98	2	100	1
	10	0	13	0	0	87	13	100	2
	13	0	17	0	0	83	17	100	2
	15	0	15	0	0	85	15	100	2
	17	0	19	0	0	81	19	100	2
	21	11	11	0	44	34	22	100	2
	22	0	2	0	76	22	2	100	1
D	2	0	0	0	88	12	0	100	0
	5	0	0	0	20	80	0	100	0
	6	0	3	0	5	92	3	100	1
	7	0	14	0	0	86	14	100	2
	9	0	7	0	15	78	7	100	2
	14	0	19	0	0	81	19	100	2
	15	0	9	0	0	91	9	100	2
	16	0	8	0	62	30	8	100	2
	20	0	8	0	80	12	8	100	2
	21	0	0	0	81	19	0	100	0
	22	0	0	0	90	10	0	100	0
	25	0	0	0	90	10	0	100	0
	26	0	0	0	75	25	0	100	0
	27	0	0	0	100	0	0	100	0
	30	0	0	0	94	6	0	100	0
	32	0	0	0	82	18	0	100	0
	33	0	0	0	98	2	0	100	0
E	2	0	0	0	64	36	0	100	0
	3	0	0	0	74	26	0	100	0
	6	0	0	0	74	26	0	100	0
	7	0	0	0	66	34	0	100	0
	9	0	0	0	65	35	0	100	0
	12	4	0	0	33	63	4	100	1
	13	2	0	0	0	98	2	100	1
	16	28	0	0	15	57	28	100	3
	17	9	0	0	19	72	9	100	2
	21	0	0	0	10	90	0	100	0
	23	24	0	0	32	44	24	100	2
	24	22	0	0	0	78	22	100	2
Total	50								

Avg Coverage		2	3.34	0	38.92	55.74	5.34		0.84

BED 16 - 0.17 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	1	0	0	0	42	58	0	100	0
	5	0	0	0	76	24	0	100	0
	6	0	0	0	36	64	0	100	0
	8	3	0	0	13	84	3	100	1
	9	0	0	0	11	89	0	100	0
B	1	0	0	0	11	89	0	100	0
	3	0	0	0	0	100	0	100	0
	5	5	0	0	0	95	5	100	2
	8	12	0	0	29	59	12	100	2
	9	0	0	0	34	66	0	100	0
	10	0	0	0	72	28	0	100	0
C	1	0	0	0	4	96	0	100	0
	5	0	0	0	5	95	0	100	0
	6	41	0	0	0	59	41	100	3
	7	0	0	0	4	96	0	100	0
	10	0	0	0	68	32	0	100	0
	14	6	0	0	41	53	6	100	2
	16	5	0	0	92	3	5	100	2
	17	0	0	0	51	49	0	100	0
D	1	0	0	0	13	87	0	100	0
	3	0	0	0	0	100	0	100	0
	7	34	0	0	31	35	34	100	3
	9	18	0	0	43	39	18	100	2
	10	6	0	0	52	42	6	100	2
	14	10	0	0	26	64	10	100	2
	15	29	0	0	22	49	29	100	3
	16	67	0	0	23	10	67	100	4
E	1	0	0	0	15	85	0	100	0
	3	0	0	0	35	65	0	100	0
	4	0	0	0	0	100	0	100	0
	8	21	0	0	76	3	21	100	2
	9	11	0	0	21	68	11	100	2
	10	82	0	0	17	1	82	100	5
	13	11	0	0	41	48	11	100	2
	14	34	0	0	39	27	34	100	3
	17	29	0	0	36	35	29	100	3
F	1	0	0	0	0	100	0	100	0
	3	0	0	0	32	68	0	100	0
	5	92	0	0	0	8	92	100	5
	7	3	0	0	40	57	3	100	1
	9	0	0	0	78	22	0	100	0
	11	3	0	0	25	72	3	100	1
	13	21	0	0	56	23	21	100	2
	14	0	0	0	81	19	0	100	0
	16	0	0	0	81	19	0	100	0
G	1	12	0	0	51	37	12	100	2
	4	0	0	0	19	81	0	100	0
	6	0	0	0	30	70	0	100	0
	7	25	0	0	26	49	25	100	3
	10	52	0	0	47	1	52	100	4
	11	19	0	0	39	42	19	100	2

	13	25	0	0	44	31	25	100	3
	14	54	0	0	36	10	54	100	4
	18	0	0	0	100	0	0	100	0
H	1	15	0	0	54	31	15	100	2
	2	23	0	0	8	69	23	100	2
	4	12	0	0	72	16	12	100	2
	7	0	0	0	86	14	0	100	0
	8	14	0	0	58	28	14	100	2
	10	0	0	0	62	38	0	100	0
	11	0	0	0	41	59	0	100	0
Total	61								
Avg Coverage		13.01639	0	0	36.803279	50.18032787	13.01639344		1.333333

BED 17 - 0.01 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	3	0	0	11	76	13	11	100	2
	6	0	0	7	91	2	7	100	2
Total	2								
Avg Coverage		0	0	9	83.5	7.5	9	100	2

BED 18 - 0.01 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	2	0	50	0	15	35	50	100	4
	4	0	38	0	4	58	38	100	3
	5	0	22	0	0	78	22	100	2
Total	3								
Avg Coverage		0	36.66667	0	6.3333333	57	36.66666667		3

BED 19 - 0.01 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	3	0	1	0	0	99	1	100	0.5
Total	1								
Avg Coverage		0	1	0	0	99	1		0.5

BED 20 - 0.42 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
1	1	0	0	0	0	100	0	100	0
	2	0	0	0	0	100	0	100	0
	3	84	0	0	0	16	84	100	5
	6	100	0	0	0	0	100	100	5
	9	96	0	0	0	4	96	100	5
	11	89	0	0	0	11	89	100	5
	13	92	0	0	0	8	92	100	5
	17	80	0	0	0	20	80	100	5
	18	0	0	0	0	100	0	100	0
	21	86	0	0	0	14	86	100	5
	24	96	0	0	0	4	96	100	5
	26	18	0	0	0	82	18	100	2
	30	9	0	0	0	91	9	100	2
	33	41	0	0	0	59	41	100	3
	36	29	0	0	0	71	29	100	3
	37	39	0	0	0	61	39	100	3
	39	9	0	0	0	91	9	100	2
	42	89	0	0	0	11	89	100	5
	45	100	0	0	0	88	100	188	5
	46	92	0	0	0	8	92	100	5
	49	88	0	0	0	12	88	100	5
	52	100	0	0	0	0	100	100	5
	55	92	0	0	0	8	92	100	5
	56	99	0	0	0	1	99	100	5
	57	98	0	0	0	2	98	100	5
	68	94	0	0	0	6	94	100	5
	70	86	0	0	0	14	86	100	5
2	1	14	0	0	0	86	14	100	2
	3	82	0	0	0	18	82	100	5
	5	86	0	0	0	14	86	100	5
	8	93	0	0	0	7	93	100	5
	9	91	0	0	0	9	91	100	5
	16	93	0	0	0	7	93	100	5
	17	88	0	0	0	12	88	100	5
	19	97	0	0	0	3	97	100	5
	21	77	0	0	0	23	77	100	5
	23	44	0	0	0	56	44	100	3
	25	99	0	0	0	1	99	100	5
	29	91	0	0	0	9	91	100	5
	31	94	0	0	0	6	94	100	5
	33	97	0	0	0	3	97	100	5
	34	100	0	0	0	0	100	100	5
	37	100	0	0	0	0	100	100	5
	38	99	0	0	0	1	99	100	5
	40	95	0	0	0	5	95	100	5
	41	94	0	0	0	6	94	100	5
	42	98	0	0	0	2	98	100	5
	45	99	0	0	0	1	99	100	5

	46	89	0	0	0	11	89	100	5
	50	98	0	0	0	2	98	100	5
	53	92	0	0	0	8	92	100	5
	54	91	0	0	0	9	91	100	5
3	2	92	0	0	0	8	92	100	5
	4	96	0	0	0	4	96	100	5
	6	97	0	0	0	3	97	100	5
	8	99	0	0	0	1	99	100	5
	10	100	0	0	0	0	100	100	5
	12	100	0	0	0	0	100	100	5
	16	98	0	0	0	2	98	100	5
4	2	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	6	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	9	67	0	0	0	33	67	100	4
	11	90	0	0	0	10	90	100	5
	15	92	0	0	0	8	92	100	5
	16	98	0	0	0	2	98	100	5
	19	88	0	0	4	8	88	100	5
	20	0	0	0	14	86	0	100	0
	21	0	0	0	28	72	0	100	0
	22	0	0	0	54	46	0	100	0
	24	0	0	0	44	56	0	100	0
	26	0	0	0	23	77	0	100	0
	31	0	0	0	14	86	0	100	0
	32	0	0	0	22	78	0	100	0
	36	0	0	0	16	84	0	100	0
	37	0	0	0	8	92	0	100	0
	39	0	0	0	4	96	0	100	0
	41	0	0	0	5	95	0	100	0
	43	0	0	0	19	81	0	100	0
	44	0	0	0	21	79	0	100	0
	46	0	0	0	6	94	0	100	0
	47	0	0	0	2	98	0	100	0
5	1	0	0	0	0	100	0	100	0
	2	4	0	0	0	96	4	100	0.5
	5	75	0	0	0	25	75	100	4
	6	0	0	0	12	88	0	100	0
	7	18	0	0	0	82	18	100	2
	8	86	0	0	0	14	86	100	5
	9	72	0	0	0	28	72	100	5
	16	86	0	0	0	14	86	100	5
	18	63	0	0	0	37	63	100	4
	19	0	0	0	0	100	0	100	0
	20	92	0	0	0	8	92	100	5
	21	91	0	0	0	9	91	100	5
	22	89	0	0	0	11	89	100	5
Total	96								
Avg Coverage		**60.41667**	**0**	**0**	**3.08333333**	**37.41666667**	**60.41666667**		**3.380208**

BED 26A - 0.01 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	1	96	0	0	0	4	96	100	5
	5	100	0	0	0	0	100	100	5
	7	53	0	0	0	47	53	100	4
Total	3								
Avg Coverage		83	0	0	0	17	83		4.666667

AREA 26B - 0.01 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalga	Bare subst	Total Seag	Total Cove	Braun Blanquet Density Score
B	2	0	0	0	0	100	0	100	0
	5	8	0	0	0	92	8	100	2
	6	0	0	0	0	100	0	100	0
Total	3								
Avg Coverage		2.666667	0	0	0	97.33333	2.666667		0.666667

BED 28 - 1.21 AC									
Transect #	Quadrat #	Hd	Hj	Hw	Macroalgae	Bare substrate	Total Seagrass	Total Cover	Braun Blanquet Density Score
A	1	0	0	0	0	100	0	100	0
	3	0	0	0	0	100	0	100	0
	7	0	0	0	0	100	0	100	0
	8	0	0	0	0	100	0	100	0
B	1	0	0	0	0	100	0	100	0
	2	1	0	0	0	99	1	100	0.5
	7	26	0	0	0	74	26	100	3
	8	0	0	0	1	99	0	100	0
	10	7	0	0	0	93	7	100	2
	11	0	0	0	0	100	0	100	0
C	1	0	0	0	0	100	0	100	0
	4	0	0	0	11	89	0	100	0
	8	19	0	0	0	81	19	100	2
	9	1	0	0	3	96	1	100	0.5
	10	0	0	0	0	100	0	100	0
	13	0	0	0	0	100	0	100	0
	15	0	0	0	0	100	0	100	0
	18	0	0	0	0	100	0	100	0
D	2	13	0	0	1	86	13	100	2
	4	0	0	0	0	100	0	100	0
	6	37	0	0	0	63	37	100	3
	7	8	0	0	0	92	8	100	2
	8	0	0	0	0	100	0	100	0
	12	0	0	0	0	100	0	100	0
	14	0	0	0	0	100	0	100	0
	18	12	0	0	0	88	12	100	2
	19	15	0	0	0	85	15	100	2
E	1	16	0	0	0	84	16	100	2
	3	42	0	0	0	58	42	100	3
	6	8	0	0	0	92	8	100	2
	7	39	0	0	0	61	39	100	3
	9	12	0	0	0	88	12	100	2
	9	0	0	0	0	100	0	100	0
	13	0	0	0	0	100	0	100	0
	14	0	0	0	0	100	0	100	0
	17	30	0	0	0	70	30	100	3
	19	9	0	0	0	91	9	100	2
	21	7	0	0	0	93	7	100	2
	22	16	0	0	0	84	16	100	2
	25	0	0	0	0	100	0	100	0
	28	0	0	0	0	100	0	100	0
	31	0	0	0	0	100	0	100	0
F	1	3	0	0	8	89	3	100	1
	5	24	0	0	7	69	24	100	2
	8	13	0	0	0	87	13	100	2
	10	33	0	0	0	67	33	100	3
	13	0	0	0	0	100	0	100	0
	16	21	0	0	0	79	21	100	2
	20	92	0	0	0	8	92	100	5
	22	84	0	0	0	16	84	100	5
	26	0	0	0	0	100	0	100	0

	27	0	0	0	0	100	0	100	0
	28	24	0	0	0	76	24	100	2
	31	36	0	0	0	64	36	100	3
	32	27	0	0	0	73	27	100	3
	33	14	0	0	0	86	14	100	2
	37	70	0	0	0	30	70	100	4
	38	6	0	0	0	94	6	100	1
	40	7	0	0	0	93	7	100	1
G	1	88	0	0	0	12	88	100	5
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	8	83	0	0	0	17	83	100	5
	9	76	0	0	0	24	76	100	5
	11	86	0	0	0	14	86	100	5
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	15	100	0	0	0	0	100	100	5
	17	81	0	0	0	19	81	100	5
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	22	82	0	0	0	18	82	100	5
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	42	0	0	26	2	72	26	100	3
	44	0	0	10	0	90	10	100	2
	47	0	0	0	0	100	0	100	0
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H	1	8	0	0	12	80	8	100	2
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	43	0	0	0	94	6	0	100	0
	46	0	0	0	6	94	0	100	0
V	1	0	0	0	53	47	0	100	0
	3	0	0	0	79	21	0	100	0
	4	0	0	0	61	39	0	100	0
	7	0	0	0	39	61	0	100	0
	9	0	0	0	33	67	0	100	0
	10	0	0	0	41	59	0	100	0
	14	0	0	0	19	81	0	100	0
	15	0	0	0	8	92	0	100	0
	17	0	0	0	9	91	0	100	0
	18	0	0	0	11	89	0	100	0
	19	0	0	0	9	91	0	100	0
	20	0	0	0	3	97	0	100	0
	22	0	0	0	17	83	0	100	0
	23	0	0	0	26	74	0	100	0
	25	0	0	0	8	92	0	100	0
	27	0	0	0	29	71	0	100	0
	28	0	0	0	37	63	0	100	0
	31	0	0	0	11	89	0	100	0
	32	0	0	0	7	93	0	100	0
	33	0	0	0	5	95	0	100	0
	34	0	0	0	16	84	0	100	0
	37	0	0	0	6	94	0	100	0
	39	0	0	0	7	93	0	100	0
	40	0	0	0	0	100	0	100	0
	41	0	0	0	7	93	0	100	0
	42	0	0	0	0	100	0	100	0
	43	0	0	0	0	100	0	100	0
W	1	0	0	0	83	17	0	100	0
	3	0	0	0	88	12	0	100	0
	6	0	0	0	75	25	0	100	0
	8	0	0	0	96	4	0	100	0
	12	0	0	0	97	3	0	100	0
	13	0	0	0	83	17	0	100	0
	17	0	0	0	26	74	0	100	0
	18	0	0	0	12	88	0	100	0
	22	0	0	0	12	88	0	100	0
	24	0	0	0	23	77	0	100	0
	28	3	0	0	18	79	3	100	1
	29	0	0	0	9	91	0	100	0
	31	0	0	0	27	73	0	100	0
	32	0	0	0	23	77	0	100	0
	34	0	0	0	33	67	0	100	0
	36	0	0	0	42	58	0	100	0
	38	0	0	0	87	13	0	100	0
	40	0	0	0	93	7	0	100	0
	42	0	0	0	91	9	0	100	0
	43	0	0	0	95	5	0	100	0
X	1	0	0	0	89	11	0	100	0

	3	0	0	0	91	9	0	100	0
	6	0	0	0	84	16	0	100	0
	9	0	0	0	91	9	0	100	0
	12	0	0	0	83	17	0	100	0
	13	0	0	0	79	21	0	100	0
	15	0	0	0	71	29	0	100	0
	18	0	0	0	67	33	0	100	0
	19	0	0	0	22	78	0	100	0
	20	0	0	0	8	92	0	100	0
	22	0	0	0	9	91	0	100	0
	26	0	0	0	18	82	0	100	0
	29	0	0	0	38	62	0	100	0
	30	0	0	0	33	67	0	100	0
	31	0	0	0	25	75	0	100	0
	32	0	0	0	21	79	0	100	0
	35	0	0	0	53	47	0	100	0
	37	0	0	0	87	13	0	100	0
	39	0	0	0	82	18	0	100	0
	41	0	0	0	62	38	0	100	0
	42	0	0	0	91	9	0	100	0
Y	1	0	0	0	81	19	0	100	0
	2	0	0	0	88	12	0	100	0
	6	0	0	0	86	14	0	100	0
	7	0	0	0	79	21	0	100	0
	8	0	0	0	63	37	0	100	0
	10	0	0	0	42	58	0	100	0
	11	0	0	0	37	63	0	100	0
	13	0	0	0	27	73	0	100	0
	15	0	0	0	41	59	0	100	0
	16	0	0	0	28	72	0	100	0
	17	0	0	0	21	79	0	100	0
	18	0	0	0	33	67	0	100	0
	21	0	0	0	18	82	0	100	0
	22	0	0	0	44	56	0	100	0
	26	0	0	0	81	19	0	100	0
	27	0	0	0	49	51	0	100	0
	28	0	0	0	46	54	0	100	0
	29	0	0	0	59	41	0	100	0
	30	0	0	0	67	33	0	100	0
	31	0	0	0	32	68	0	100	0
	32	0	0	0	55	45	0	100	0
	37	0	0	0	78	22	0	100	0
	38	0	0	0	58	42	0	100	0
	39	0	0	0	86	14	0	100	0
	40	0	0	0	0	100	0	100	0
Z	1	0	0	0	98	2	0	100	0
	3	3	1	0	84	12	4	100	1
	5	0	0	0	93	7	0	100	0
	7	1	0	0	90	9	1	100	0.5
	8	2	0	0	91	7	2	100	1
	14	10	3	0	54	33	13	100	2
	15	46	10	0	13	31	56	100	4
	18	14	30	0	15	41	44	100	3
	21	22	14	0	21	43	36	100	3
	22	8	23	0	12	57	31	100	3
	26	18	2	0	14	66	20	100	2

	27	9	3	0	24	64	12	100	2
	29	0	3	0	32	65	3	100	1
Total	556								
Avg Coverage		13.4237	0.985637	0.423698	26.763016	58.40394973	14.83303411		1.022442

APPENDIX 2. FIELD NOTES

Location Port Everglades Date 9/21/21

Project / Client ACOE

SES	Thomas	weather 81°
	Dave	Rainy/Cloudy
	Alison	
	Tyler	
GLE	Natalia Millan	

700 Left Dock
900 Arrived at project site
Dropped transect line Area 2
(T,D) 2 Divers in water 40 mins
945 Dropped transect line Area 3
1020 (T,D) 2 Divers in water 30 mins
1100 (T,D) 2 Divers in water 15 mins
1140 Dropped transect line Area 4
1155 2 Divers in, out 12:10 = 15 min (TOM, Tyler)
1215 2 Divers in, out 12:40 = 25 min (TOM, Tyler)
1315 2 Divers in (Dave, Tyler), out 1330 = 15 min
1335 Back to Dock
1430 At Dock
Unload

* 6 tanks used / dropped off 6

Location Port Everglades Date 9/22/21

Project / Client ACOE

SES	Thomas	weather 78°
	Dave	Partly cloudy
	Alison	
	Tyler	
GLE	Natalia Millan	

600 Left Dock
700 Arrived at project site
Dropped transect line Area 4
750 2 Divers in (TOM, DAVE)
out 9:05 = 75 min
930 2 Divers in (TOM, Dave)
Dropped transect line Area 5
out at 10:30 = 60 min
10:50 Dropped line Area 5
2 Divers in (TOM, DAVE)
out at 12:45 = 115 min
13:00 Dock. to switch tanks.
1407 Dropped line Area 5
2 Divers in (TOM, DAVE)
out @ 1505 = 58 min

* 6 tanks used / dropped off 4

Location Port Everglades Date 9/23/21

Project / Client ACOE

SES	Tom	Weather 75°
	Dave	Clear/Sunny
	Tyler	
	Alison	
GLE	Natalia Millan	

600 Left Dock

715 Arrived at project site

730 Dropped line Area 5
2 Divers in (Tom, Dave)
out at 9:10 = 100 min

Note: Renumber transect T #4

925 2 Divers in (Tom, Dave)
out at 1115 = 110 min

1140 2 Divers in (Tom, Dave)
out at 1155 = 15 min

Note: Skip 7,8,9 (Areas in Jetties)

1230 Dropped line Area 11, 2 Divers in
out at 13:15 = 45 min (Tom, Dave)

Note: No pic T.C #21, 22 - STRAYED
came up against wall

1315 Dock to switch tanks

1415 Dropped line Area 12
2 Divers in (Tom, Dave) = 90 min
Out @ 345pm

Location Date

Project / Client

* 8 tanks used / 8 tanks dropped off

Location Port Everglades Date 9/24/21

Project / Client ACOE

SES	Tom	Weather 87°
	Dave	clear / sunny
	Tyler	
	Alison	
GLE	Natalia	

600 Left Dock
715 Dropped line Area 11
730 2 Divers in (Tom, Dave)
830 out at 9:20 = 110 min
1000 2 Divers in (Tom, Dave)
out at 1030 = 30 min
7, 8, 9, 10, 11
1040 Dropped line Area 13
1050 2 Divers in (Tom, Dave)
out at 11:55 = 65 min
1225 2 Divers in (Tom, Dave)
out at 1336 = 71 min
1340 Dock to switch tanks
1415 2 Divers in (Tom, Dave) area 13
out @ 1450 = 35 min
end @ transect H
* 8 tanks used / dropped off 8

Location Port Everglades Date 9/25/21

Project / Client ACOE

SES	Tom	Weather 86°
	Dave	clear / sunny
	Tyler	
	Alison	
GLE	Natalia	

600 Left Dock
720 Dropped line Area 13
735 2 Divers in (Tom, Dave)
out at 900 = 85 min
920 2 Divers in (Tom, Dave)
out at 11:55 = 155 min
Finished R Area 13
Moved to Area 14
1225 2 Divers in (Tom, Dave)
Dropped line in Area 14
155 To Dock = 90 min
Storm

* 6 tanks used / dropped off 6

Location Port Everglades Date 9/26/21

Project / Client ACOE

SES	Tom	Weather 89°
	Dave	clear/sunny
	Tyler	
	Alison	
GLE	Natalia	
630	Left Dock	
730	Dropped line Area 13	
	2 Divers in (Tom, Dave)	
	out at 915 = 105 min	
930	2 Divers in (Tom, Dave)	
	out at 1100 = 90 min	
1120	2 Divers in (Tom, Dave)	
	out at 1150 = 30 min	
	Area 13 completed	
1200	2 Divers in (Tom, Dave)	
1305	Area 14	
	out at 1305 = 65 min	
1305	Dock to switch tanks	
1500	2 Divers in (Tom, Dave) area 14 complete	
	out @ 1612 = 72 min	
1620	Done for the Day	

* 8 tanks used / dropped off 6

Location Port Everglades Date 9/27/21

Project / Client ACOE

SES	Tom	Weather 87°
	Dave	clear/sunny
	Tyler	
	Alison	
GLE	Natalia	
630	Left Dock	
730	Dropped line Area 14	
	2 Divers in (Tom, Dave)	
820	completed Area 14	
	out at 10:02 = 152 min	
	Completed areas 15, 16, 17, 18, 19	
1100	2 Divers in (Tom, Dave)	
	out at 11:05 = 5 min	
	Atkins A, B completed.	
1315	2 Divers in (Tom, Dave)	
	AREA 28 = 105 min	
1525	Out @ 1500 change tanks	
1525	2 Divers in (Tom, Dave)	
	Area 28 end @	
	end @ 1608 = 43 min	

* 8 tanks used / dropped off 6

Location Port Everglades Date 9/28/21

Project / Client ACOE

SES	Tom	Weather
	Dave	clear / sunny
	Tyler	
	Alison	
GLE	Natalia	

630 Left Dock
730 Arrived project area
740 2 Divers in (Tom, Dave)
out at 10:10 = 150 min
1024 2 Divers in (Tom, Dave)
out at 1200 = 96 min
1215 2 Divers in (Tom, Dave)
out at 1230 = 15 min
Back to Dock
Empty boat, clean equipment.

* 4 tanks used

Location Date

Project / Client

Location Port Everglades Date 10/19/21

Project / Client ACOE

Personnel Tom Brumfield
Dave Yow
Tyler Duplaga
Nelsen Esser
Natalia Millan

Weather Partly. sunny 84°

730	Left Dock Gas
830	Arrived at project site
850	Two divers in (Tyler, Tom) [redacted] Out at 9:45 Tom 1,600 Tyler 1,400 air
[redacted] 955	Two divers in (Tyler, Tom) Out at 10:10
1015	Two divers in (Tyler, Tom) Out at 10:30
1048	Two divers in (Tom, Dave) out at 1105
1115	Two divers in (Tom, Dave) out at 1320
14:25	Two divers in (Nelsen, Dave) out at 15:24

★ Dropped off 4 tanks

Location Port Everglades Date 10/20/21

Project / Client ACOE

Personnel Tom Brumfield
DAVE YOW
TYLER DUPLAGA
NELSEN ESSER
Natalia Millan

WEATHER SUNNY 84°

7:30 LEFT DOCK

8:15 ARRIVED AT SITE

8:35 DIVERS IN (T.D, T.B)

OUT @ 10:35 (T.B 1000, T.D 1000)

11:00AM 2 DIVERS IN (N.E, D.Y)
out at 12:41 D.Y 70, N.E 1400

1430 2 Divers in (Tom, Tyler)
out at 1535

★ Dropped off 6 tanks
1 tank was full, couldn't use

54

Location Port Everglades Date 10/21/21

Project / Client ACOE

Personnel Tom Brimfield
Dave Yow
Tyler Duplaga
Nelsen Esser
Natalia Millan

Weather 86° partly cloudy/sunny

730 Left Dock
815 Arrived project site
840 2 Divers in the water
(Dave, Tyler)
815 out of water
[redacted] 2 Divers in water
850 (Dave, Tyler) out at 10:00
1005 Back in water
10:35 out
1055 2 Divers in water
(TOM, Nelsen)
Out at 11:30
11:45 Back in the water
out at 12:30
12:45 Back in the water
out at 13:10

55

Location POA B.6 Date 10/20/21

Project / Client ACOE

[redacted]

Personel: T.D
T.B
N.E
D.Y

WEATHER - CLOUDY 84

7:30: LEFT DOCK
8:16: ARRIVED
8:32: DIVERS IN (T.B, D.Y)
9:25: DIVERS OUT

[redacted] 9:39 (TB, TD) [redacted]
10:45 out (TB, TD)
11:10 in (TB, DY)
12:22 out (TB, DY)
strong thunderstorms ended work day at 13:30

Location Port Everglades Date 10/23/21

Project / Client ACOE

Personnel Tom Brumfield
David Yoo
Nelsen Esse
Tyler Duplaga
Natalia Milan

735 GH dock
820 Arrived at project site
845 Tom B + TD entered water
950 Divers out of water
1025 Dave Y + Nelsen E enter water
1105 Dave Y + Nelsen E out of water
1215 back at dock

Location

Date

Project / Client

APPENDIX 3. PHOTOGRAPHS

Due to the large number of photographs for this assessment, photographs have been provided separately on the attached thumb drive on the inside cover of the report.