

**Southeast Coastal Ocean Observing Regional Association (SECOORA):
Supporting Resilient Ecosystems, Communities and Economies**

Program Performance Report

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1) Progress and Accomplishments

Goal 1: Continue SECOORA’s region-wide governance and communication structure to engage users and stakeholders in coastal observing science

Milestone A: Maintain governance and management for the RA and RCOOS

Activities	Status
Effectively manage grants and contracts	Ongoing.
Ensure SECOORA’s operational & governance structure enables us to achieve our vision.	Ongoing. The SECOORA Membership Re-envisioning Committee was formed and met by teleconference on 12/5/17. The committee will meet monthly through April and present their recommendations on changes/improvements to Membership Benefits at the SECOORA Annual meeting in May 2018.
Maintain effective communication with US IOOS and the IOOS Association	Ongoing.
Expand and diversify funding.	Ongoing.
Update and maintain SECOORA’s RCOOS Plan.	SECOORA members and stakeholders provided input on new asset location requirements at the May 2017 Annual meeting. Those recommendations as well as information gained from the National HFR Plan, National Glider Network Whitepaper, and the 2016-2021 SECOORA IOOS proposal were used to write an addendum to the SECOORA 10-year Build out Plan. This addendum can be found with SECOORA’s certification documents: http://secoora.org/certification .

Milestone B: Engage users and other stakeholders to prioritize investments. Ongoing

Activities	Status
Improve web-based information system and web presence	SECOORA continues marketing and outreach activities via e-newsletters, e-mails, social-media and the website. From 6/1/17 to 11/30/17, we increased our subscription to the newsletter by 1, from 834 to 835; Facebook “likes” have grown 9% (from 356 to 388); and, Twitter “followers” have grown 12% (431 to 482). SECOORA shared approximately 65 Facebook posts and 76 Twitter “tweets”, referring a combined 301 sessions to the SECOORA website. During this period, 21 stories were published on the website (www.secoora.org/news). There was a 24% decrease in website sessions (56,910 to 32,579) and it is speculated the decrease is a result of broken links due to the website redesign. SECOORA continues its Hurricane Blog during the 2017 Hurricane season. 7 blogs were posted by SECOORA members or PIs, resulting in 383 views. SECOORA newsletters, stories and videos can be accessed via website , Facebook and Twitter .
Identify and promote opportunities for non-members to engage in SECOORA activities and initiatives.	SECOORA will host a second Data Challenge. Staff are currently drafting the Data Challenge RFP. This RFP will be open to undergraduate and graduate students as well as early career professionals. Anticipated RFP release is 12/18/17. SECOORA is continuing the Coastal Observing in your Community webinar series. During the reporting period 4 webinars were hosted. Non-members presented at and attended each webinar. Over 80 people registered to attend the webinars and each webinar was recorded and archived for future viewing. Upcoming events: At both the January Board meeting in Sarasota and the SECOORA Annual meeting on May 22-24, non-members will be invited to engage with SECOORA. Invitees will be asked to attend the event and even participate on panels that are planned.
Implement an effective outreach strategy.	SECOORA continues to implement an outreach strategy based on both the SECOORA Strategic Plan and Fundraising Strategy. SECOORA is actively fundraising for the establishment of the Vembu Subramanian Ocean Scholars Award. SECOORA has raised over 90% of the funds needed to enable a \$2,500 annual scholarship.
Support citizen science opportunities.	SECOORA is promoting the “What’s you Water Level?” app through the Coastal Observing in your Community webinar series (webinar scheduled for Dec. 19). The app was developed by Christine Buckel, NOAA NCCOS. This water level reporting application collects and aggregates reports of observed water levels submitted through citizen scientists. SECOORA staff are working with Christine Buckel to promote this citizen science effort.
Engage students in problem solving using ocean observing data.	Two students participated in the NOAA Hollings internships at USF CMS, Cheyenne Maio-Silva and Michaela Lawrence. They finished their internships 7/31/17. SECOORA, in partnership with the North Inlet – Winyah Bay NERR submitted a proposal to IOOS Program Office in November for a future NOAA Hollings intern.
Coordination of SOCAN activities	SOCAN continues to publish a monthly newsletter and participated on two CAN-wide calls. Coordinator, Leslie Wickes, conducted an NC Stakeholders engagement roundtable on 10-27-17. The workshop report is in progress. Axiom updated the original SOCAN website to match the format of the SECOORA site. "About Us" has been updated to reflect internal changes to committees. There is a framework for a new membership portal including a completed publication library. Axiom explored options for an interactive discussion board but decided doing so could render the site vulnerable to security issues. There is a new section underway to introduce acidification in the Southeast from the chemistry,

Activities	Status
	<p>ecosystem, and human impact perspectives; the chemistry page, including an interactive map of monitoring locations, is publically available.</p> <p>SOCAN researched and prioritized available OA related datasets, which were sent to Axiom. Axiom completed standardization and QA/QC processes and the data is ready to be uploaded to SECOORA DMAC system.</p> <p>The Sapelo Island Project is a partnership with Scott Noakes (UGA), Charlie Phillips (Sapelo Sea Farms), Ryan Ono (Ocean Conservancy) and SOCAN. Two proposals have been drafted: a non-technical proposal (by Leslie Wickes) that has been submitted to small non-profits for funding; and, an LOI was submitted for the Saltonstall-Kennedy Grant Program (PI Scott Noakes) to support testing of monitoring equipment under harsh conditions (e.g. turbidity, tidal flux) near Sapelo Sea Farms.</p>
Animal Telemetry Workshop (Joint SECOORA, CariCOOS, and US IOOS)	Complete (3/28-29/17). A draft workshop report is currently undergoing review.

Milestone C: Maintain and Operate DMAC (SECOORA and Axiom Data Science, LLC): Ongoing.

Activities	Status
IOOS DMAC standards compliance and implementation Data Management, Products, and Services	<p>Ongoing. Responsible contractor: Axiom Data Science, LLC. We follow the IOOS recommended standards based services and requirements to ingest, manage, and provide access to all our funded data streams (in-situ, remotely sensed and numerical models). See portal.secoora.org. Improvements over this period include:</p> <ul style="list-style-type: none"> • Maintenance and enhancement of the Active Storms and Historic Storms layers for Hurricanes Harvey, Irma, and Maria. Axiom continues to improve upon this popular layer in preparation for the 2018 hurricane season. • Maintain IOOS compliant services and applications for integration with national products: <ul style="list-style-type: none"> ○ Upgraded THREDDS to 4.6.10 - http://thredds.secoora.org ○ Upgraded ERDDAP to 1.80 - http://erddap.secoora.org ○ Updated SECOORA ISO WAF - https://thredds.secoora.org/iso • Updated the sensor map on the home page by adding or removing stations; displaying real-time conditions on mouse hover; and providing a status message for inactive stations. • Developed and documented a test ERDDAP API instance for external users and systems to programmatically interact with real-time SECOORA data served through the HPC cache. This API emulates the SOS style requests/response services in addition to several higher-level methods which allow users access summary analytics and advanced packaging of data for downloading. • Support the SECOORA Glider System for the management of four real-time gliders. The SECOORA glider data was updated on the portal and submitted to the DAC. • The SECOORA glider operators and Axiom have contacted IOOS and Rutgers staff to highlight the need to resolve issues with submission of the corrected delayed mode glider data to the DAC. Additionally, a request for the DAC to host wave glider data has also been made.

Activities	Status
Maintenance of DMAC infrastructure (hardware and software)	<p>Ongoing. Responsible contractor: Axiom Data Science, LLC. During this period, Axiom ensured that the SECOORA Data System was healthy, secure and monitored; provided technical support to system problems; and, mapped out future upgrade strategies.</p> <p>Axiom is also in the process of redesigning the back-end systems handling sensor data. The next-generation system will facilitate management of multiple overlapping time-series generations (e.g. raw data, provider quality controlled data, revised data) and include support for QARTOD checks.</p>
Establishment and release of new SECOORA content website	<p>Ongoing. Responsible contractor: Axiom Data Science, LLC. SECOORA Data Portal, Beta version 2.3 was launched: http://dev.axiomdatascience.com/?portal_id=47#. This version includes real-time data and glider data visualizations. Version 2.3 gives users access to new features as well as a revamped design, including:</p> <ul style="list-style-type: none"> • advanced data charting, discovery, and sharing capabilities • enhanced sensor search and indexing • data view feature to create and share selected sensors and model extractions to spotlight certain environmental events or geographic locations • new charting abilities, including data comparisons, time binning, and climatology and anomaly options for longer time series data • state saving to retain user configurations or share data views, charts, or location with others.
Address 10 requirements on the NOAA IOOS Contribute Data page https://ioos.noaa.gov/data/contribute-data/	<p>SECOORA, with Axiom Data Science, is working towards meeting all 10 data management and core capabilities requirements for contributing data to NOAA IOOS. See Appendix A for detailed responses for each requirement.</p>

Goal 2: Maintain existing core observation investments in the region

Milestone A: Maintain HF Radars distributed throughout the region: Ongoing. See Appendix B for damages sustained during Hurricanes Irma and Maria at HFR locations.

Institution/Contractor	Status
University of South Florida (UFS) (Weisberg, Merz)- Support four CODAR radar arrays on the West Florida Shelf	<p>USF continues to operate and maintain 3 CODAR system HF Radar sites (Naples, Venice and Redington Shores) and 2 WERA HF Radar sites (Venice and Ft. DeSoto Park). The planned fourth CODAR has not been deployed and parts for this fourth station are being used as spares for existing CODARs.</p>
University of Georgia (UGA), Skidaway Institute of Oceanography (SkIO) (Savidge) - Support two WERA radar arrays on St. Catherine's and Jekyll Island, GA	<p>SkIO WERA continue to be operated and maintained on St. Catherine's and Jekyll Islands, with data provided to SECOORA and the national HFRnet archive.</p> <p>New installation: Data from the four new WERA radars on the Outer Banks, NC will be made available to SECOORA and the HFR DAC. These stations are funded by NSF and were installed in spring 2017 by SkIO. These HFRs operate at 13.5MHz and provide extensive coverage of the northern SECOORA footprint. Automated QC process development is ongoing, and should be finalized by December 2017.</p>
University of Miami (Shay) - Support three WERA radar arrays at Crandon, Virginia Key and Dania Beach	<p>Hurricane damage assessments: Virginia Beach Park is still closed and power has not yet been restored. The area still has debris. All the HFR cables at this site were severed from the radar and several antennae were down all of which has to be replaced. UM personnel are awaiting authorization from the park manager.</p> <p>Dania Beach site (John Lloyd Park and Navy Facility). The Navy Facility, where the</p>

Institution/Contractor	Status
	<p>container with the radar and computer are located, is open and power is restored. John Lloyd Park where the antennas and the cables are located remains in poor condition due to extensive beach erosion. Park personnel must complete their work before any HFR infrastructure can be replaced.</p> <p>Crandon Park site is almost restored. Once power is restored at the concession area, UM personnel will assess damages to the radar and computer units. Personnel have already determined that the cables and antennae will need to be replaced.</p> <p>The submission of the DEP permit application for the North Key Largo HFR installation has been put on hold until restoration of the current sites is complete.</p>
University of NC - Chapel Hill (UNCCH) (Seim) - Support three CODAR radar arrays on the Outer Banks of NC	<p>UNCCH operates CORE, HATY, and DUCK. Note that one of NSF-funded PEACH project WERA system belonging to SkIO (PI Savidge) is co-located with HATY and is sharing communications infrastructure. Downtime at HATY are CORE are related to outages associated with Hurricane Maria. The HATY site suffered significant erosion as a result of the storms.</p> <p>Research/Testing: Code to implement the QC on codar radials described in Haines, Seim and Muglia (JTech, 2017) is now available at https://github.com/nccoos/qccodar. To date the code is being tested by groups at Old Dominion University and at Scripps.</p>
University of South Carolina (Voulgaris) - Support two WERA arrays on Fort Caswell, NC and Georgetown, SC	<p>The operation of CSW and GTN continued without any significant down time during this reporting period.</p> <p>Research/Testing: Testing of potential future antenna designs was carried out by a SEOE graduate student (Douglas Cahl) using a SDR radio (RFSPACE cloud IQ). Three different antenna designs were tested: (1) the original design from Helzel, (2) a shorter antenna with no radials, and (3) a shorter antenna with no radials with an attached amplifier from LIRA (low cost radar from the University of Hawaii). Data were collected on 9/11/2017. The data are currently being analyzed and will be shared with SECOORA in early 2018.</p>

Milestone B: Maintain in-situ stations along the Carolina and West Florida Shelf (WFS) coasts: Ongoing. See Appendix C for damages sustained during Hurricane Irma at mooring locations.

Institution/Contractor	Status
USF (Weisberg) - Coastal Ocean Monitoring and Prediction System (COMPS) moorings	<p>Operations: Three real time surface moorings (C10, C12 and C13) and two non-real-time subsurface (C11 and C15) moorings were maintained. USF has experienced some data loss due to the following issues: 1) met sensor failures (relative humidity and barometric pressure); and, 2) parting of the inductive cable resulting in a loss of real-time CTD data. New met sensors have been purchased and USF is in the process of integrating them into the mooring telemetry system for testing and eventual deployment. USF technicians are experimenting with anti-chafing materials to extend the life of the inductive cables.</p>
USF (Luther) - Coastal tidal & meteorological stations	<p>Operations: The Clam Bayou site in-water sensors were removed temporarily in late April for renovations to the dock. The datum for the water level gauge was re-established on 6/27/17. The Big Carlos Pass site decoder issues for the GOES data stream have been resolved and the water level and wind data are being posted to the web site. This site was in the path of Hurricane Irma, recording winds in excess of 100 knots.</p>

Institution/Contractor	Status
	<p>Research/Testing: M. Luther, S. Meyers, and J. Scudder are working with St. Petersburg and Pinellas County water management staff to develop predictive tools based on short-term climate forecasts to help mitigate future wastewater releases into Tampa Bay and surrounding waters. Water quality data from Clam Bayou is used to assess the impacts of the recent wastewater releases on dissolved oxygen, chlorophyll, and turbidity. USF team members are working with city staff from St. Petersburg and from Gulfport to quantify the occurrence of low DO events and to distinguish naturally occurring from wastewater related events.</p>
<p>University of North Carolina - Wilmington (UNCW) (Leonard) - UNCW mooring network</p>	<p>Operations: The LEJ3Wave buoy required calibration due to observed anomalies in low frequency wave energy. The buoy was recovered on 8/31/2017. Due to poor sea conditions, the buoy could not be redeployed until the Nov. turnaround cruise. The LEJ3 Met buoy broke free on 10/29/17. GPS watch circle notifications alerted technicians and they tracked the buoy as it drifted approximately 25 nm west of its moored location. The buoy was recovered on 10/31.</p> <p>The Onslow Bay fall maintenance cruise occurred on 11/13-11/16/17. During this cruise, ILM2, ILM3, LEJ3 and LEJ3Wave were redeployed. The ILM3 and LEJ3 buoys were deployed with RF radio modems in addition to Iridium telemetry. The RF radios will allow technicians to communicate wirelessly with the datalogger and sensors from a nearby vessel, easing troubleshooting. The ILM3 buoy was deployed with the latest GPS enabled Gill anemometer. Also, the R/V Savannah stopped by FRP2 buoy as it needed to be brought onboard for repairs due to a boat collision.</p> <p>Research/Testing: UNCW is providing assistance to FACT network members (Smithsonian Environmental Research Center (SERC), Florida Wildlife Commission, and Georgia DNR) by placing VEMCO acoustic receivers (provided by SERC) on ILM2, ILM3, and LEJ3 and the OB27 bottom frame. The first receiver was deployed at OB27 on 10/11/17. LEJ3, ILM3, and ILM2 buoys were deployed in Nov. with the acoustic receivers attached. UNCW will change batteries and download data from the receivers every six months.</p>

Milestone C: Maintain the sensors on NOAA GRNMS buoy: Ongoing.

Institution/Contractor	Status
<p>UGA (Noakes) and University of Delaware (UDEL) (Cai) - Support to NOAA's Ocean Acidification Program NDBC Gray's Reef National Marine Sanctuary (GRNMS) NDBC ID #41008 buoy</p>	<p>Operations (UGA): On 6/1/2017 a team from the UGA and NOAA GRNMS visited the GRNMS buoy on the RV Joe Ferguson. All components of the MAPCO2 system were scheduled for replacement (electronics package, battery pack, equilibrator, iridium antenna and span gas). While onsite, it was determined that the replacement equilibrator had been damaged during shipping. The existing equilibrator was removed from the buoy, cleaned, inspected and replaced. Divers replaced the SAMI-pH and Seabird water quality sonde mounted under the buoy. At this time, 8 water samples were collected at the buoy. Each sample was immediately spiked with HgCl₂, put on ice, and shipped to UDEL for analysis.</p> <p>In late July, the MAPCO2 system completely failed. PMEL shipped a new electronics package, battery pack, and iridium antenna to UGA. On 8/10, the electronics, battery pack, and iridium were replaced. All systems are back to normal operation. In addition to repairing the MAPCO2 system on 8/10, 6 water samples were collected at the buoy. Each sample was immediately spiked with HgCl₂, put on ice, and shipped to the UDEL for analysis.</p> <p>Research (UDEL): UDEL team members did not travel to GA for the scheduled</p>

Institution/Contractor	Status
	cruise to obtain ground-truth samples in July due to the Gray's Reef mooring failure. UDEL did continue the validation process through water sample collection (discrete samples for dissolved inorganic carbon and total alkalinity) in June and August as part of the ongoing validation project.

Goal 3: Begin to address geographic gaps in observations

Milestone A: Establish a regional glider observatory in the South Atlantic Bight (SAB): Ongoing.

Institution/Contractor	Status
UGA SkIO (Edwards) North Carolina State University (NCSU) (He) UNCCH (Seim) USF (Lembke) Georgia Institute of Technology (Zhang)	<p>Operations: The SECOORA regional glider observatory is a collective effort and two glider deployments were attempted during the reporting period. Each deployment failed due to environmental issues and hardware failure. Both gliders were recovered, and the glider team is addressing hardware issues.</p> <p>Three SECOORA glider deployments are planned for late winter/early spring 2018.</p> <p>Hurricane lessons learned: Deployed gliders are usually safe in-water during hurricane conditions; but, Hurricane Irma caused significant power and network outages for the glider observatory's dockserver operations centers (SkIO and USF). In advance of Irma's landfall, the SECOORA glider observatory discovered a new way to redirect the glider's calls and data transfer from the primary dockserver to another institution in real time and at no cost beyond normal satellite time. Texas A&M scientist Steve DiMarco opened his dockserver to the SkIO fleet, and TAMU technician Karen Dreger provided invaluable assistance in making SFMC operations available to the SECOORA guest pilots. The process of transferring calls within a provider network is new to the glider community, and is a valuable tool for disaster planning at the intra-RA level. GCOOS and SECOORA have promoted this success story to IOOS, and shared this success in the story of the day to all NOAA employees in October. The process will be documented and shared among UG2 glider community through forum posts, and posts to the Teledyne Webb forum.</p> <p>Research/Testing: SkIO has developed and automated data visualization products to aid piloting. The codes detect which gliders are operational, automatically convert binary data into ASCII, make plots of engineering and science data, and publish them to a website within minutes of glider data transmission. These codes have been modified to accept data from local and remote dockservers, including Webb's new Slocum Fleet Management Control software.</p>

Milestone B: Install a new coastal water quality and meteorological station in Charleston Harbor, SC: Ongoing.

Institution/Contractor	Status
South Carolina Department of Natural Resources (Sanger)	<p>The Charleston Harbor water quality monitoring site is operational. During the reporting period, the deployment tube was installed, two YSI EXO2 instruments were purchased, and water quality data collection was initiated on 11/1/2017 for water temperature, conductivity/salinity, dissolved oxygen, pH, turbidity, and water depth. Standards for calibrating the chlorophyll fluorescence and fluorescence of dissolved organic matter (FDOM, a proxy for total dissolved organic carbon) will be prepared for collection of these two additional parameters. A request has been submitted to the NERR Data Management Committee for consideration as a secondary NERR water quality monitoring location with telemetry. If approved then the telemetry equipment will be deployed and the data will be available in near real time.</p> <p>All NEPA documentation related to this site were submitted to NOAA prior to site operation. It was determined that this activity is fully covered by the analysis within the U.S. IOOS Programmatic Environmental Assessment and the U.S. IOOS issued a Finding of No Significant Impact.</p>

Goal 4: Continue delivery of operational model forecasts and products to serve priority users

Milestone A: Enhance and operate a Coupled Marine Environmental Assessment and Prediction System for the SE: Ongoing.

Institution/Contractor	Status
NCSU (He) - Support and enhance SABGOM model	<p>Ongoing. The NCSU team has been maintaining and upgrading the SABGOM and CNAPS ocean prediction systems on a 24/7 basis, providing time- and space-continuous regional marine environment predictions on user-interactive web portals. The team is working with other SECOORA PIs on model coupling, model skill assessments, long-term analysis, and generation of several value-added products. The team is also implementing and testing both variational data assimilation and Kalman filter methods in their regional ocean predictions</p>

Milestone B: Operate the WFS FVCOM ocean model: Ongoing.

Institution/Contractor	Status
USF (Weisberg)	<p>FVCOM is a prognostic, unstructured-grid, finite-volume, free-surface, 3-D primitive equation coastal ocean circulation model, and is run in a nowcast/forecast mode. The model also includes the period for Hurricane Irma in hindcast. Results are available via SECOORA data portal.</p>

Milestone C: Provide an early warning system for swimming beach and shellfish harvesting waters: Ongoing.

Institution/Contractor	Status
USC (Porter)	The project team focused the water quality modeling efforts on the Charleston Harbor watershed and adjacent swimming beaches and shellfish harvesting waters. Historical datasets (rainfall, water temperature, wind, tide, salinity data, etc.) were pulled from the USGS/SCDHEC, near real-time USGS/NOS gauges, sites, met stations, etc., and Nexrad rainfall data. These data were coupled with <i>Enterococcus</i> concentrations provided by the Charleston Waterkeeper to produce predictive models. Near real-time data now feed directly into 20 daily forecast models from five study sites (Brittlebank Park, Folly Beach, and three sites along Shem Creek) in the Charleston area.

Milestone D: Optimize and enhance the SECOORA Marine Weather Portal (MWP): Ongoing.

Institution/Contractor	Status
UNCW (Dorton)	The MWP is now hosted on the SECOORA website: http://mwp.secoora.org/ . The MWP project team (Dorton and Galvarino) visited the Tampa Bay Area NWS office in July 2017 to provide an overview of SECOORA and the MWP to forecasters. The NWS staff provided feedback on the site and identified additional products (NWS Active Threats and Impacts layer and NWS Storm Surge Flooding) which were added to the MWP in August. Both new layers performed well (i.e. remained updated and available) during the active 2017 hurricane season.

Milestone E: Python Data Analysis Tools for Oceanographic Services: Ongoing.

Institution/Contractor	Status
Independent Contractor (Filipe Pires Alvarenga Fernandes, Oceanographer, Brazil)	<p>Activities are summarized for the three areas of work:</p> <ol style="list-style-type: none"> 1. Assist in development of IOOS.us Documentation and Demonstration sub pages <ol style="list-style-type: none"> a. A new a notebook for Hurricane Irma was added. It integrated data from the National Hurricane Center, satellite temperature imagery, and SOS buoy data to create an updated GIS map for the hurricane path. b. two more notebooks were added to the gallery: an r-erddap library tour and a BagIt usage example. c. The webpage was updated to fix the IFrame displays and the Continuous Integration infrastructure was modernized to ensure all notebooks are runnable since the IOOS environment no longer supporting Python 2.7. The webpage theme was updated to improve the user experience while navigating. 2. Support current and continue developing software packages <ol style="list-style-type: none"> a. The <i>compliance-checker</i> package and its plugins, <i>cc-plugin-glider</i>, <i>cc-plugin-ugrid</i>, <i>cc-plugin-sgrid</i>, and <i>cc-plugin-ncei</i>, are now configured so that all downstream plugins are tested against both the stable and latest version of <i>compliance-checker</i> and <i>compliance-checker</i> also tests itself against the stable version of the plugins. 3. Ensure software deployment via conda-forge packages <ol style="list-style-type: none"> a. Three new packages were added to <i>conda-forg</i>: <i>cgsn_parsers</i>, <i>cgsn_processing</i>, and <i>erddapy</i>

Milestone F: Special Projects Ongoing

Institution/Contractor	Status
Total Water Initiative (Fathom Science, LLC)	Ongoing: Fathom Science, LLC has been working with RPS/ASA and NOS leadership to port a prototype operational ocean prediction system to the Amazon cloud computing infrastructure. The effort will support NOAA's Total Water Initiative , which calls for a boundary-spanning partnership across multiple sectors to predict and deliver water information.
Data 61 & USGS (Signell)	All features outlined in the statement of work have been completed and developed into Terria JS. This includes the display of WMS layers from climate, atmospheric, and ocean model products served by sci-wms, ncWMS, and ncWMS2. Widgets were added so that users are able to specify the WMS extension parameters. The critical WMS parameters have also been added.
NOS Web Camera Applications Testbed (SECOORA and Surfline)	Ongoing: Surfline coordinated with SECOORA stakeholders to identify five target locations for the WebCAT project: Cape Hatteras, NC, Myrtle Beach, SC, St. Augustine, FL, Miami, FL, and Tampa Bay, FL. Three cams have been deployed in this reporting period: Cape Hatteras, 40th St. Miami, and St. Augustine. These cams are live and viewable on Surfline. In addition to the live data streams, Surfline is saving the archived streams for the three deployed cams on Amazon Web Services cloud computing, and has sent Axiom file formatting details that will ultimately enable Axiom to provide SECOORA stakeholders the streams for analysis. Code that will allow these streams to be embedded onto the SECOORA data portal are under development and expected to be delivered to Axiom in December 2017.

2) Scope of Work

Scope of work is as described in the [Year 2 descope proposal](#).

3) Personnel and Organizational Structure

SECOORA hired Jennifer Dorton as the a new RCOOS manager. Jennifer started work on 9/1/2017. A current list of SECOORA Members and Board is available on our [website](#). The next SECOORA board meeting is scheduled for 1/25-26/2018 and it will be held at Mote Marine Lab in Sarasota, FL.

4) Budget Analysis

SECOORA's October 31, 2017 financial report for Year 1 funds shows a budget balance remaining of approximately \$500k. SECOORA's October 31, 2017 financial report for Year 2 funds shows a budget balance remaining of approximately \$2.7M. We are within budget and on track with spending. SECOORA continues to receive invoices regularly from our sub-awardees and we process them at one of two bi-monthly administration meetings. All invoices are paid within forty-five days. SECOORA continues to draw from ASAP monthly. As a reminder SECOORA pays out its monthly operational costs (i.e. payroll, etc.) and then conducts the ASAP draws in the middle of the following month for both the preceding month's operation expenses and the sub-awardee invoices.

Appendix A – IOOS Data Management and Data Sharing Requirements

1. [Open Data Sharing](#)

The SECOORA Data System provides data resources in a one stop data portal, free to the public, with data assets originating from federal and state agencies, local municipalities, academic institutions, research organizations, private companies, non-profit organizations, and community observers.

During this 6-month period, the Florida Atlantic University Wave Gliders datasets has been ingested into the SECOORA data portal. The Wave Gliders do not function as profiling gliders; therefore, Axiom is working to visualize the FAU wave glider data and will share the visualizations with FAU for feedback.

Challenges: Axiom implemented Research Workspace (RW) in the SECOORA region in July/August 2017. UNCW was the first SECOORA funded team to use RW and they provided feedback to Axiom on the ease of use for future RW improvements. RW will facilitate and streamline necessary long-term data submittal activities and will improve compliant metadata generation for assets. During the next progress reporting period, UNCW will use RW to submit non real-time datasets. RW will rollout SECOORA-wide in January 2018. Some initial push-back from the PIs is anticipated; however, Axiom staff will be available to assist with RW use and will provide hands on training at the May 2018 SECOORA members meeting.

2. [Data management planning and coordination](#)

Data management is an increasingly important aspect of IOOS activities. Data management plans and the coordination of activities between Regions and the IOOS Program Office ensure that data are maintained in easily accessible formats that are archived for long-term storage.

The [SECOORA Data Management Plan](#) provides the approach to the necessary implementation, describing how data are ingested, managed and distributed from the source to public dissemination.

The primary processes involved with data management and flow include data ingestion, standards and format, metadata and discovery, quality control, stewardship and preservation, access and dissemination, archival and security. SECOORA officially became RICE certified by NOAA in 2017. As part of this process, the SECOORA Data Management plan was completed (April 2017) and the plan will be updated routinely (minimum 5 years) as needed to meet new requirements from the IOOS DMAC.

3. [Provision of data to the Global Telecommunication System \(GTS\)](#)

SECOORA has maintained their commitment to provide data to the GTS though NDBC. In some instances, the data is flowing from the SECOORA funded data provider (i.e. UNCW, USF COMPS buoys). The Big Carlos Pass station will be submitted to NDBC directly by SECOORA. Finally, CDIP moorings within the region are reported to the GTS by the CDIP program.

Challenge: SECOORA is working with PIs to determine if it would be beneficial for Axiom to take over NDBC submissions for all PIs. Right now much of the work to submit to NDBC is duplicated at each research program and bringing it under the SECOORA DMAC structure could make it more efficient.

4. [Data access services](#)

All data and products are registered in the IOOS Catalog. SECOORA offers six access points:

1. *Thematic Realtime Environmental Distributed Data Services (THREDDS)* - SECOORA provides THREDDS access points for raster (gridded) data stored in NetCDF format. Axiom upgraded THREDDS to 4.6.10 - <http://thredds.secoora.org> and updated SECOORA ISO WAF - <https://thredds.secoora.org/iso>.
2. *Open-source Project for a Network Data Access Protocol (OPeNDAP)* - SECOORA provides OPeNDAP access points for raster (gridded) and time-series data.

3. Web Map Service (WMS) - SECOORA provides WMS access points for point, vector, and polygon information, as well as raster (gridded) data.
4. Web Feature Service (WFS) - SECOORA provides WFS access points for point, vector, and polygon information, as well as time-series and raster (gridded) data.
5. Environmental Research Division's Data Access Program (ERDDAP) - SECOORA primarily uses this service to facilitate device-level downloads (e.g., tabular data). Axiom upgraded ERDDAP to 1.80 - <http://erddap.secoora.org>
6. File Downloads - SECOORA often provides data as downloadable files. These files are mostly served in the standard shared data file formats above, or in the case of project-specific data, in their native file formats.

5. [Catalog registration](#)

SECOORA maintains a WAF (<https://thredds.secoora.org/iso>), which is harvested by the IOOS Catalog. All data and products are registered in the IOOS catalog.

6. [Common data formats](#)

SECOORA offers data in IOOS compliant formats through the use of ncSOS, THREDDS and ERDDAP.

SECOORA provides nearly all data in four open, standardized forms:

1. *Network Common Data Form (NetCDF)* - a self-describing, machine-independent data format that SECOORA uses primarily for raster (gridded) data. Some data stored as unstructured grids use this format as well.
2. *Comma Separated Values (CSV)* - a human-readable ASCII format that is nearly universally accepted by spreadsheet and programming languages. SECOORA uses CSV formats to allow users to download (1) time-series extractions from raster data, and (2) GIS vector and polygon information (e.g., boundaries).
3. *Shapefile* - an open geographic information system format for point, vector, and polygon data. SECOORA allows users to download shapefiles of static GIS layers such as boundaries, biologic distributions, etc.
4. *Portable Network Graphics (PNG)* - PNG is a lossless, image format provided as an alternative to shapefiles in the SECOORA catalog. PNGs are limited in use as they are pre-projected, pre-scaled, and pre-sized images of data layers. However, SECOORA provides PNG files as example WMS requests, which are useful to users who cannot access GIS services and who do not understand how to manipulate WMS requests.

7. [Metadata standards](#)

All IOOS data providers are expected to ensure relevant metadata is produced, accessible and compliant with IOOS conventions, and to participate as appropriate in the development of such conventions. Descriptive information about datasets, sensors, platforms, models, analysis methods, quality-control procedures is essential for the long-term usability and reuse of information.

SECOORA requires standards-compliant metadata for project-level data (SECOORA or IOOS-funded projects). Though SECOORA does not require specific metadata standards for ingesting other types of data, most modern data submittals are accompanied by standard ISO/FGDC metadata records.

RW is the SECOORA web-based data management application. RW is being phased in within SECOORA and it will be used to assemble, store, and share data by researchers or SECOORA partners. RW provides users with a web-based interface that allows researchers to create *projects* to represent particular scientific studies or focuses of research within a larger effort. Standard, discovery-level ISO 19115-2 and 19115-10 compliant metadata can be generated for both projects and individual datasets.

Many historical datasets come with informal metadata documentation that is variable in terms of completion and detail required by modern standards. Some data sets are only accompanied with narrative information. In these cases, SECOORA plans to work with the data provider to create more up-to-date metadata records and share the data within RW so that it can be ingested into the SECOORA data portal.

Challenge: It may be challenging to get historical data, available from non-SECOORA funded researchers, input into RW. SECOORA and Axiom staff will encourage and assist these researchers in an effort to encourage them to share their historical data through RW. Axiom and SECOORA will do their best to make these valuable data resources available with as much documentation as possible.

8. [Storage and archiving](#)

SECOORA ingested data is stored in a secure, professionally managed external facility and currently has total storage space for over 1.8 petabytes of data. Those resources are geo-replicated between Portland, Oregon and Providence, Rhode Island. All aggregated data is stored indefinitely beyond the life of each individual project. Real-time sensor feeds will become historical sensor feeds one-month after collection. The only assets that are not kept indefinitely in storage are webcam images.

As a federally funded program, SECOORA is required to submit data it generates to a national archive center. SECOORA is working with the National Centers for Environmental Information (NCEI) to assist with the [archival](#) of appropriate data types accepted by NCEI. SECOORA maintains an NCEI archive WAF at <http://ncei.axiomdatascience.com/secoora/> which is regularly harvested by NCEI.

The bulk of the data assets managed by SECOORA are non-real-time, nonfederal assets, sometimes from small data originators, and often from distinct research projects or large, integrated ecological research programs. These data may not fall under the purview of the NCEI. Accordingly, SECOORA plans to archive these data in the DataONE network through RW.

9. [Ontologies, vocabularies, common identifiers](#)

SECOORA makes use of IOOS ontologies, vocabularies and common identifiers as needed.

10. Consideration for Long-term Operations

The SECOORA Data System hosts several integrated data management tools to ease data access, storage, and sharing by its users including the Research Workspace and its metadata editor, and the SECOORA Portal and catalog system.

The SECOORA RW, the web-based data management application, will be used to assemble, store, and share data by researchers or SECOORA partners.

RW includes an integrated metadata editor to support the documentation of data and facilitate its accuracy and reuse. Content collected in the RW metadata editor uses fields from the ISO 19115 suite of standards for geospatial metadata, which is the FGDC endorsed successor to the CSDGM, extended to describe taxonomic classification for biological datasets. Standard, discovery-level ISO 19115-2 compliant metadata can be generated for both projects and individual datasets.

Appendix B: HFR damage estimates post Hurricanes Irma and Maria

Lead Org	Station Name	State	Location	Station Type	POC	Status Post-Irma & Maria	Total Cost to Repair/Replace
UNC Chapel Hill	HATY	NC	Cape Hatteras, NC	HFR - CODAR	Harvey Seim	Partially operational	\$ 18,887.92
UNC Chapel Hill	DUCK	NC	Duck, NC	HFR - CODAR	Harvey Seim	Operational	\$ -
UNC Chapel Hill	CORE	NC	Core Banks, NC	HFR - CODAR	Harvey Seim	Operational	\$ -
USC	CSW	NC	Caswell Beach, NC	HFR - WERA	George Voulgaris	Operational, needs repairs	\$ 3,606.61
USC	GTN	SC	Georgetown, SC	HFR - WERA	George Voulgaris	Operational, needs repairs	\$ 18,522.17
SkIO	CAT	GA	St. Catherine's GA	HFR - WERA	Dana Savidge	Operational, needs repairs	\$ 6,692.86
SkIO	JEK	GA	Jekyll Island, GA	HFR - WERA	Dana Savidge	Non-operational	\$ 48,885.92
Univ. of Miami	STF	FL	Dania Beach, FL	HFR - WERA	Nick Shay	Non-operational	\$ 172,760.91
Univ. of Miami	VIR	FL	Virginia Key, FL	HFR - WERA	Nick Shay	Non-operational	\$ 252,760.92
Univ. of Miami	CDN	FL	Crandon, FL	HFR - WERA	Nick Shay	Non-operational	\$ 252,760.91
USF	RDSR	FL	Reddington Shores, FL	HFR - CODAR	Cliff Merz / Robert Weisberg	Operational, repairs needed	\$ 29,581.22
USF	FDS	FL	Ft. DeSoto, FL	HFR - WERA	Cliff Merz / Robert Weisberg	Operational	\$ -
USF	VEN	FL	Venice, FL	HFR - WERA	Cliff Merz / Robert Weisberg	Operational	\$ -
USF	VENI	FL	Venice, FL	HFR - CODAR	Cliff Merz / Robert Weisberg	Operational, repairs needed	\$ 25,597.04
USF	NAPL	FL	Naples, FL	HFR - CODAR	Cliff Merz / Robert Weisberg	Operational	\$ -

Appendix C: Mooring damage estimates post Hurricanes Irma and Maria

Lead Org	Station Name	State	Latitude	Longitude	Station Type	POC	Status Post-Irma & Maria	Total Cost to Repair/Replac
UNCW	LEJ3	NC	34.2073 N	-76.9488 W	Buoy	Lynn Leonard	Fully Operational	\$ -
UNCW	LEJ3Wave	NC	34.2073 N	-76.9488 W	Waverider Buoy	Lynn Leonard	Operational	\$ -
UNCW	ILM3	NC	33.9877 N	-77.3617 W	Buoy	Lynn Leonard	Fully Operational	\$ -
UNCW	ILM2	NC	34.1445 N	-77.7183 W	Buoy	Lynn Leonard	Fully Operational	\$ -
UNCW	ILM2Wave	NC	34.1445 N	-77.7183 W	Waverider Buoy	Lynn Leonard	Fully Operational	\$ -
UNCW	SUN2	NC	33.8373 N	-78.4768 W	Buoy	Lynn Leonard	Partially Operational	\$ 2,825.37
UNCW	SUN2 Wave	NC	33.8373 N	-78.4768 W	Buoy	Lynn Leonard	Partially Operational	\$ 9,877.56
UNCW	CAP2	SC	32.8033 N	-79.6238 W	Buoy	Lynn Leonard	Partially Operational	\$ 3,493.62
UNCW	FRP2	SC	32.2745 N	-80.4187 W	Buoy	Lynn Leonard	Partially Operational; cables and potentially solar panels damaged	\$ 2,602.61
UGA	OA sensors on mooring 41008	GA	31.4000 N	-80.8681 W	Buoy	Scott Noakes	Operational	\$ -
USF	C10	FL	27.1730 N	-82.9240 W	Buoy	Robert Weisberg	Partially Operational	\$ 41,449.96
USF	C12	FL	27.5050 N	-83.7410 W	Buoy	Robert Weisberg	Partially Operational	\$ 44,937.60
USF	C13	FL	26.0100 N	-83.0860 W	Buoy	Robert Weisberg	Partially Operational	\$ 51,449.97
USF	Shell Point	FL	30.0580 N	-84.2900 W	Shorebased Tower	Mark Luther	Operational	\$ -
USF	Aripeka	FL	28.4330 N	-82.6670 W	Shorebased Tower	Mark Luther	Operational	\$ -
USF	Fred Howard Park	FL	28.1530 N	-82.8010 W	Shorebased Tower	Mark Luther	Operational	\$ -
USF	Clam Bayou	FL	27.7360 N	-82.6860 W	Shorebased Tower	Mark Luther	Partially Operational	\$ 9,514.86
USF	Big Carlos Pass	FL	26.4040 N	-81.8810 W	Shorebased Tower	Mark Luther	Partially Operational	\$ 14,048.17