

Project Instructions: EX-22-01, 2022 ROV and Mapping Shakedown (ROV and Mapping)

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Platform: NOAA Ship *Okeanos Explorer*
Project Number: EX-22-01
Project Title: 2022 ROV and Mapping Shakedown (ROV and Mapping)
Project Dates: February 17-26, 2022

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Captain Nicholas Chrobak
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NOAA Marine Operations Center — Atlantic
Dated: _____

I. Overview

A. Brief Summary and Project Period

February 17-26, 2022

Key West, Florida — Key West, Florida

EX-22-01, 2022 ROV and Mapping Shakedown (ROV and Mapping)

This document contains project instructions specific to EX-22-01. For the annual cross-expedition details, see the [“NOAA Ship Okeanos Explorer FY22 Field Season Instructions.”](#) This expedition will commence on February 17, 2022 in Key West, Florida, and conclude on February 26, 2022 in Key West, Florida. Operations will be conducted 24 hours per day and consist of remotely operated vehicle (ROV) dives, mapping operations (primarily overnight), and full shore-based participation via telepresence, with a focus on calibration and shakedown operations of all systems to ensure operational readiness for the 2022 field season.

Operations will include the use of the ship’s deepwater mapping systems (Kongsberg EM 304 multibeam sonar, EK60/EK80 split-beam sonars, Knudsen 3260 Chirp sub-bottom profiler, and Teledyne acoustic Doppler current profiler), expendable bathythermograph (XBTs) in support of multibeam sonar mapping operations, conductivity, temperature, depth profiler (CTD) casts, NOAA Ocean Exploration’s two-body ROV system (*Deep Discoverer* and *Seirios*), and a high-bandwidth satellite connection for continuous ship-to-shore communications. Operations will focus on exploring deep waters (greater than 250 m for ROV operations and greater than 200 m for mapping operations) in U.S. waters off the southern U.S. East Coast.

B. Days at Sea

Of the 10 days at sea (DAS) scheduled for this expedition, 10 DAS are funded by a NOAA Office of Oceanic and Atmospheric Research allocation. This project is estimated to exhibit a high operational tempo due to 24-hour operations, which include daily ROV dives, overnight mapping operations, CTD casts, and continuous shoreside participation via telepresence.

C. Operating Area

EX-22-01 is a ROV and mapping shakedown cruise focused on the operational readiness of the dual body ROV system *Seirios* and *Deep Discoverer* (D2) and calibration of the ship’s suite of acoustic sonars. Operations will occur in waters in the U.S. Southeastern Atlantic region between the mouth of the Gulf of Mexico into the Blake Plateau. Mapping and ROV operations will focus on exploring depths between 200 and 4,000 meters. **Figure 1** shows the general operating area for the expedition.

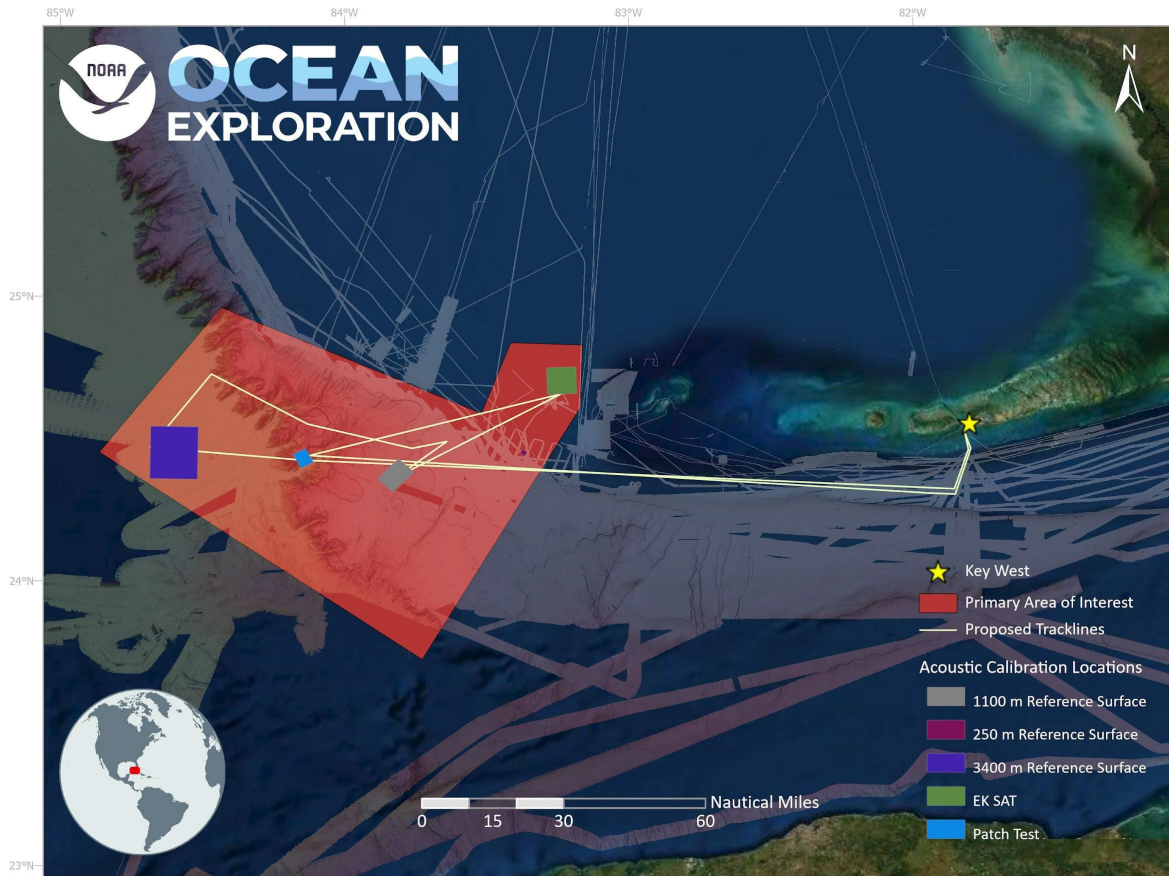


Figure 1. Map showing the general operating area of interest for EX-22-01 (red polygon) and general ship track (yellow line). Note that the expedition track is subject to change based on survey results, field conditions, and discretion of the commanding officer.

D. Summary of Objectives

EX-22-01 operations will focus on the shakedown and operational readiness of ROV and acoustic mapping operations onboard *Okeanos Explorer* in U.S. waters off the southern East Coast, in deep water (greater than 250 m for ROV operations and greater than 200 m for mapping operations). In addition to engineering objectives related directly to the ROVs and mapping sonar calibrations, objectives will also include the preparedness of existing and new telepresence capabilities. Overnight operations will include mapping using the ship’s suite of sonars. While this cruise will focus mainly on shakedown objectives, when possible ROV and mapping operations will occur in priority areas for exploration and the wider science community.

Mission objectives for EX-22-01 include a variety of objectives focused on science, mapping, education, outreach, and data management. Overarching objectives that span the entire Fiscal

Year 2022 (FY22) field season are covered in the [“NOAA Ship Okeanos Explorer FY22 Field Season Instructions.”](#) Additional objectives specific to EX-22-01 follow:

1. Acoustic Mapping Objectives (details in Appendix A)

- a. Strategic Transit
 - Conduct strategic transits to operational areas and Key West, Florida to maximize data collection over previously unmapped areas where possible.
- b. EM 304 Multibeam Sonar Objectives
 - Confirm all previously surveyed vessel offsets are properly accounted for.
 - Confirm functionality of EM 304 and integration with all ancillary systems.
 - Ensure all software/firmware versions are up to date and functional.
 - Confirm triggering and synchronization settings.
 - Conduct impedance testing of the EM 304 while alongside.
 - Conduct GAMS calibration.
 - Conduct geometric calibration (“Patch Test”) of the system, including deep roll verification lines.
 - Collect backscatter normalization lines over the previously established reference areas on the Blake Plateau.
 - Conduct speed/noise tests to assess how vessel speed affects noise levels at the receive array.
 - Assess swath coverage via extinction testing while transiting off the continental shelf.
- c. EK60/80 Split-beam Sonar Objectives
 - Ensure all licenses, software, and firmware are up to date.
 - Confirm functionality and integration of all frequencies (18, 38, 70, 120, 200 kHz) with ancillary systems.
 - Calibrate each sonar via the automated calibration gear.
- d. Knudsen 3260 Sub-bottom Profiler Objectives
 - Confirm functionality and integration with all ancillary systems.
- e. Sound Speed Profiling Objectives
 - Conduct comparison casts between the Seabird 9/11Plus CTD, Deep Blue XBTs, and CastAway CTD, with a preferred minimum depth of 1000 m for CTD.
 - Assess functionality of newly refurbished XBT Autolauncher.
 - Test functionality of all XBT handheld launchers.
 - Compare Reson SVP 70 and Seabird 45 thermosalinograph surface sound speed data.
- f. Acoustic Doppler Profiler Objectives
 - Confirm functionality of both the 38 and 300 kHz systems.
- g. K-Sync Objectives
 - Evaluate existing settings to ensure optimization of the K-Sync and minimization of interference between sonars.

- h. Seapath 380 Objectives
 - Evaluate the installation of the Seapath 380 inertial measurement system.
 - Compare data from the Seapath and POS/MV systems.
- i. Miscellaneous
 - Train new expedition coordinator.
 - Update all mapping related standard operating procedures.
 - Complete EM 304 annual calibration report.
 - Complete 2022 mapping systems readiness report.
 - Complete EK60/80 calibration report

2. ROV Engineering Objectives

EX-22-01 objectives will focus primarily on the operational readiness of the ROVs. Detailed below are specific goals for this cruise as they relate to ROV engineering.

- a. Load and re-integrate ROVs *Deep Discover* and *Seirios*.
- b. Review ROV launch, recovery and emergency procedures with ROV team and ship's crew to facilitate training for new personnel and refresher training for experienced personnel.
- c. Complete a series of ROV dunk tests to practice launch and recovery evolutions.
- d. Run an ROV dive simulation to review launch and recovery operations including aftdeck controls, dynamic positioning system, and emergency recovery training as needed with new personnel and/or as requested by NOAA Ocean Exploration or Commanding Officer.
- e. Test the ultrashort baseline (USBL) positioning system dockside. Calibration is not needed this year.
- f. Conduct Pilot practice with the manipulator arms for sampling and temperature probing.
- g. Dive at progressively deeper depths starting at approximately 500 m and finishing as deep as possible in the region over the course of five or more dives.
- h. Test the ROV systems (including new transformers & new DVL) and conduct pilot training when diving on benthic exploration targets and on an archaeological target.
- i. Conduct ROV operations in the water column. Continue refining midwater imaging SOP with new lighting first tested during FY21 and potential use of ME20 low light camera.
- j. Continue refining Blueview Multibeam imaging sonar operation for obstacle avoidance and for potential data products (potential UCH imagery).

3. Video/Telepresence Engineering Objectives

- a. Test terrestrial and high-speed satellite links.
- b. Verify Global Foundation for Ocean Exploration (GFOE)-managed telepresence systems perform as expected.
- c. Test GFOE-managed telepresence systems with ISC for 10-bit HDR video if WOWZA update goes through.

- d. Test all subsea video equipment on Deep Discoverer and Seirios and ensure their proper integration into the video system. Ensure proper field of view and angles for all newly installed cameras.
- e. Test all shipboard video equipment (hangar, deck cameras, wire camera, etc.) and ensure their proper integration into the video system.

4. Data Management Objectives

- a. Provide a foundation of publicly-accessible data and information products to spur further exploration, research, and management activities.
- b. Follow underwater cultural heritage (UCH) SOPs for any archeological sites that may be documented and explored during the expedition.
- c. Test remote access to onboard sample data management computer systems.
- d. Verify GFOE-managed data systems perform as expected.
- e. Update Standard Operating Procedures (SOPs) to reflect GFOE-managed network changes.
- f. Install and test the Ocean Networks Canada server, and subsequently test new data visualizations available through SeaTube V3.
- g. Prepare file manifest with checksums for data transfers to shore.
- h. Complete sensor reports for each dive.
- i. Test, troubleshoot, and evaluate new live ship operations ArcOnline map.

5. Science Objectives

- a. Dive on underexplored areas within the U.S. Southeast region.
- b. Test ArcOnline access and utility for field use on ROV cruises.
- c. Continue to test the quality of the ethanol now stored in the new ejectable O2 Deck container before and after each ROV cruise.
- d. Use Ethanol Test guide (Appendix E) for detailed instructions on how to test the ethanol, to calculate the measurements, and record the results.

6. Remote Science and Exploration Command Center Objectives

- a. Test new technologies to enhance shoreside participant situational awareness during dives including SeaTube sensor visualization.
- b. Continue to test remote access to sample data management systems and workflow.
- c. As the primary engineering objectives allow, enable participants on shore to engage remotely.

7. Ship Objectives

- a. Continue to build familiarity with Okeanos Explorer's Dynamic Positioning System.

- b. Conduct wardroom specific Aft Conn training, focusing on deployment and recovery of the ROV as well as emergency procedures for loss of ship’s propulsion during an ROV dive.
- c. Conduct deck department specific training focusing on deployment and recovery of the ROV.
- d. Review the ethanol emergency procedures with the science party.
- e. Practice & discuss a Man Over Board scenario drill during ROV recovery.
- f. Practice & discuss emergency ROV recovery drill.

E. Participating Institutions

- NOAA Center for Coastal Fisheries and Habitat Research, 101 Pivers Island Road, Beaufort, NC 28516

See “[NOAA Ship Okeanos Explorer FY22 Field Season Instructions](#)” for institutions that consistently participate throughout the field season.

F. Personnel (Mission Party)

Mission personnel (see **Table 1**) will arrive in Key West, Florida between February 13 and February 14, 2022 to prepare and conduct alongside operations. Mission personnel will join the ship on February 14, 2022, after a RAPID negative COVID-19 test (as stated in the most current OMAO guidance on COVID protocols - see Section 4; protocols are subject to change). Mission personnel will then be aboard for the duration of the expedition (February 17-26, 2022).

Table 1. Seagoing mission personnel: This list is tentative until travel is booked. Any deviations will be communicated to the operations officer.

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
1	Galvez, Kimberly	Expedition Coordinator	02/08	03/01	F	NOAA Ocean Exploration (FW ¹)	USA
2	Candio, Sam	Mapping Lead	02/08	03/01	M	NOAA Ocean Exploration (FW ¹)	USA
3	Morrow, Thomas	Mapping Expedition Coordinator in Training	02/08	03/01	M	NOAA Ocean Exploration (FW ¹)	USA

4	Rabenold, Christa	O&E Web Coordinator	02/14	03/01	F	NOAA Ocean Exploration (UCAR)	USA
5	Jerram, Kevin	Mapping Watch Lead	02/14	03/01	M	UCAR	USA
6	McLetchie, Karl	ROV Lead	02/08	03/01	M	GFOE	USA
7	Unema, Levi	ROV Engineer	02/08	03/01	M	GFOE	USA
8	Ritter, Chris	ROV Engineer	02/08	03/01	M	GFOE	USA
9	Mefford, Jon	ROV Engineer	02/08	03/01	M	GFOE	USA
10	Aragon, Fernando	ROV Engineer	02/08	03/01	M	GFOE	USA
11	O'Brien, Andrew	ROV Engineer	02/08	03/01	M	GFOE	USA
12	Durbin, Mark	ROV Engineer	02/08	03/01	M	GFOE	USA
13	Meyers, Jim	ROV Engineer	02/08	03/01	M	GFOE	USA
14	Lister, Andy	ROV Engineer	02/08	03/01	M	GFOE	USA
15	Mohr, Bobby	ROV Engineer	02/08	03/01	M	GFOE	USA
16	Albano, Trish	Internship Program Coordinator	02/14	03/01	F	NOAA Ocean Exploration (NMSF ²)	USA
17	Howard, Art	Video Editor	02/08	03/01	M	GFOE	USA
18	Bailey, Caitlin	Video Editor	02/08	03/01	F	GFOE	USA
19	Brian, Roland	Video Engineer	02/08	03/01	M	GFOE	USA
20	Spalding, Evan	Engineering Intern	02/08	03/01	M	GFOE	USA
21	Allen, Jonathan	Engineering Intern	02/08	03/01	M	GFOE	USA
22	Lienesch, Anna	Sample Data Manager	02/13	03/01	F	NCEI	USA

1. Foreign National Guests (FNGs) Access to OMAO Facilities and Platforms

Foreign national access to *Okeanos Explorer* or other federal facilities will not be required for this expedition.

G. Administrative

1. Points of Contact

Table 2. Points of contact

Operations	Name, Title	Office	Address	Phone/Fax	Email
Marine Operations Center, Atlantic	CAPT Nicholas Chrobak, Commanding Officer	Marine Operations Center, Atlantic	439 West York Street Norfolk, VA 23510-1145	(757) 441-6776/ (757) 441-6495	co.moc.atlantic@noaa.gov
Marine Operations Center, Atlantic	LCDR Jim Europe, Chief of Operations	Marine Operations Center, Atlantic	439 West York Street Norfolk, VA 23510-1145	(757) 441-6842/ (757) 441-6776	Chiefops.MOA@noaa.gov
NOAA Ship Okeanos Explorer (primary)	CDR Colin Little, Commanding Officer	NOAA Ship Okeanos Explorer	NOAA Ship Okeanos Explorer 47 Chandler Street Newport, RI 02841	(401) 439-7848	CO.Explorer@noaa.gov
NOAA Ship Okeanos Explorer (primary)	LT Bryan Pestone, NOAA Operations Officer	NOAA Ship Okeanos Explorer	NOAA Ship Okeanos Explorer 47 Chandler Street Newport, RI 02841	(808) 659-9179 x221	ops.explorer@noaa.gov
Mission (primary)	Kimberly Galvez, Expedition Coordinator	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(305) 951-6956	kimberly.galvez@noaa.gov
Mission (primary)	Samuel Candio, Mapping Lead	NOAA Ocean Exploration	24 Colovos Road Durham, NH 03824	(732) 546-2232	samuel.candio@noaa.gov
Mission (other)	Kasey Cantwell, Operations Chief	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(301) 717-7776	kasey.cantwell@noaa.gov
Mission (other)	Rachel Medley, Chief, Expeditions and Exploration Division	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(301) 789-3075	rachel.medley@noaa.gov
Mission (other)	Gene Fisher,	NOAA Ocean	1315 East-West	(301)	gene.fisher

	Director (Acting)	Exploration	Highway, Silver Spring, MD 20910	452-7366	@noaa.gov
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2. Diplomatic Clearances

None required.

3. Shipments

The *Okeanos Explorer* operations officer should be notified of any shipments to the ship. Send an email describing the shipment (including size and number of items) to

OPS.Explorer@noaa.gov.

For shipments to arrive while in port in Key West, Florida, at the start of the expedition, **shipments should arrive no later than Friday, February 11th, 2022**, and be shipped to the following address:

NOAA Ship Okeanos Explorer
ATT: Name or Department
33 E. Quay Road
Key West, Florida 33040

For shipments to arrive while in port in Key West, Florida, after the expedition, **shipments should arrive no later than Wednesday, March 2nd, 2022**, and should be shipped to the following address:

NOAA Ship Okeanos Explorer
ATT: Name or Department
33 E. Quay Road
Key West, Florida 33040

4. Dietary Restrictions

During EX-22-01 the mission team has:

- 2 vegetarians
- 1 vegan
- 1 individual who cannot eat shellfish or pork

5. COVID-19 Contingency Plan for Scientific Party

In accordance with the "[OMAO COVID-19 Protocols](#)" effective November 24, 2021, shelter-in-place is no longer required for sailing. All sailing personnel are required to follow guidelines written within the documentation. Section 3.3 of the OMAO Protocols requires all

sailing personnel to be COVID-19 cleared for sailing using a Rapid Molecular Test (a copy of section 3.3 is below).

3.3 Testing Strategy. To be cleared for sailing an individual must be tested prior to sailing, as follows:

- The same day of sailing or the night before using 1 Rapid Molecular Test.
- In the event of unanticipated delays, repeat testing may be necessary depending on how long the delay will be. (Additional molecular tests would need to be sent asap). To be reviewed on a case by case basis if timing exceeds 24-48 hours from the original test. All personnel are required to be at the ship for the scheduled testing event.

Any mission personnel who test positive will be disqualified from sailing, and backup personnel will be activated as mission objectives and priorities dictate.

If any mission personnel test positive for COVID-19 during any required testing as dictated by OMAO:

- NOAA Marine Health Services will notify the individuals who test positive that they are not cleared to board the ship. NOAA Ocean Exploration will reimburse the individual for 5 days of shelter-in-place lodging to complete their isolation and for a COVID-19 test to confirm they are negative prior to returning home.
- The expedition coordinator will be notified of any mission personnel who are not cleared to sail.
- The expedition coordinator will notify the NOAA Ocean Exploration operations chief.
- The expedition coordinator will determine, in consultation with the ship's commanding officer, NOAA Ocean Exploration's operations chief, and appropriate parties, whether the mission will continue without the uncleared personnel.

If any mission personnel develop COVID-19-like symptoms while underway, OMAO protocols will be strictly followed. The expedition coordinator (or designee if they are unable to fulfill this role) will remain the primary point of contact for all mission personnel. Additional support with onshore logistics for impacted mission personnel will be provided by:

LTJG Christopher "J" Dunn, NOAA
Expeditions Operations Leader, Expeditions and Exploration Division
NOAA Office of Ocean Exploration and Research
215 South Ferry Road
Narragansett, RI 02882
Desk: (401) 874-6478
Cell: (262) 995-3410

II. Operations

The expedition coordinator is responsible for ensuring mission personnel are trained in planned operations and are knowledgeable about expedition objectives and priorities. The commanding officer is responsible for ensuring all operations conform to the ship’s accepted practices and procedures.

A. Project Itinerary

Table 4 summarizes the expedition itinerary. All times and dates are subject to prevailing conditions and the discretion of the commanding officer. Locations are approximate. Final ROV dive sites will be delivered to the bridge at night for the next day’s ROV dive.

Additional items may be added to the itinerary as expedition plans are further developed.

Table 3. Expedition itinerary: This is an approximate itinerary and is subject to change based on objective completion, weather, and logistical needs. This Project Itinerary was built prior to logistical delay and required rescheduling on mobilization time. Plans are being developed directly with the ship regarding achieving the goals laid out herein in the available time. Staging and alongside work is detailed in **Table 4**. See **Table 5** for ROV dive details.

Date	Activities
02/08 - 02/14	Mission personnel begin to arrive on ship. Underway preparations and training. Mobilization for ROVs and Mapping. Staging and alongside work is detailed in Table 5. Mission personnel will need laptop computers added to the wireless network. High voltage and hydraulics needed by ROV team to roll <i>Deep Discoverer</i> out of hanger and conduct pre-expedition testing. ROV team may also need an operator for crane and A-frame operations to dunk <i>Deep Discoverer and Seirios</i> overboard. A dunk test is currently planned. GFOE personnel may also need to place a transponder overboard and ping the USBL. Potential for dockside testing of sonars.
02/14	Mission personnel receive COVID tests & move aboard the ship. Vessel familiarization meeting (~45 min) with mission personnel that have not sailed on <i>Okeanos Explorer</i> within last year. If not achieved previously, ROV dunk test today. ROV launch and recovery practice. Staging and alongside work detailed in Table 5. Vessel familiarization meeting (~45 min) with mission personnel that have not sailed with EX within the last year. Pre-project meeting to be held with the ship in combination with daily operations meeting. Emergency recovery practice and walkthrough of USBL calibration on June 12. Welcome aboard briefings and drills.
02/15	Alternative time for the Vessel familiarization meeting (~45 min) with mission personnel that have not sailed on <i>Okeanos Explorer</i> within last year. Depart Key West, Florida in the morning. Welcome aboard briefings and drills. A GAMS test and initial sonar testing will occur as the ship heads southwest to the patch test location. ADCP calibration may occur while transiting to the patch test location.
02/16	Perform CTD prior to Patch Test. Conduct patch test. If time allows, castaway CTD cast and conduct daytime EK calibration operations (may require aid from ship’s force), overnight

	mapping system testing.
02/17	Castaway CTD cast and conduct daytime EK calibration operations (may require aid from ship's force), overnight mapping system testing. EK calibration operations may need to be extended to other operation days due to changes in environmental or technical factors that prevent a successful calibration.
02/18	Dive 1 (8 hrs), overnight mapping.
02/19	Dive 2 (8 hrs), overnight mapping.
02/20	Dive 3 (8 hrs), overnight mapping.
02/21	Dive 4 (8 hrs), overnight mapping.
02/22	Dive 5 (8 hrs), overnight mapping.
02/23	Dive 6 (8 hrs), overnight mapping.
02/24	Dive 7 (8 hrs), overnight mapping.
02/25	Dive 8 (8 hrs), overnight mapping and transit towards Key West, Florida.
02/26	Arrive in Key West, Florida.

B. Staging and Destaging

A large amount of work will be needed to stage the mission equipment before EX-22-01 (**Table 4**). For maximum efficiency of time, this staging will be coordinated with the ship's crew.

Alongside activities planned for EX-22-01 in Key West, Florida. A living version (and most up-to-date) of this table is upkept, shared with the ship, and can be found here:

https://docs.google.com/spreadsheets/d/1lrfF1x1IUWj4jmYdPUzffKehew9YRxVts1sGRixy21w/e_dit#gid=121065251

Table 4. Staging and alongside itinerary: This is an approximate itinerary and is subject to change based on objective completion, weather, and logistical needs. This Project Itinerary was built prior to logistical delay and required rescheduling on mobilization time. Plans are being developed directly with the ship regarding achieving the goals laid out herein in the available time.

	In Port Day #	Mapping/OER Prep	ROV Mobilization Prep (EX2201)	Ship Operations
02/08/2022 Tuesday	1	Personnel arrive	Personnel arrive	Arrived into Key West, Monday the 7th
			ROVs + Container arrival 8am	Ship's force needed
			ROVs + Container load on to EX	Crane and forklift support needed
			Mobilization/ reintegration of D2 and Sierios	Crane support needed
			0.68 cable termination	CB needed

	In Port Day #	Mapping/OER Prep	ROV Mobilization Prep (EX2201)	Ship Operations
			Winch pull test	CB needed, potential engineering support for winch power
			Ping USBL over the side	Port Permission Needed
02/09/2022 Wednesday	2	Personnel arrive	Mobilization/ reintegration of D2 and Sierios	
		Review ethanol procedures	ROV Deck Power (low voltage) testing	
		Sample data management remote access preparations	Winch pull test (backup)	CB needed, potential engineering support for winch power
		Ping sonars	Ping USBL over the side (backup)	Port Permission Needed
02/10/2022 Thursday	3	Personnel arrive	Deck power test of all ROV sensors	
		Sample data management remote access preparations		
		Ping sonars		
02/11/2022 Friday	4	Sample data management remote access preparations	ROV High voltage testing	Potential engineering support needed
		Ping sonars	D2 & Seirios In Water Test plus D2 buoyancy check	Engineering & Deck Crew support needed
		Change of Command (13:30) **Assume 1/2 work support from ship/ early start**		
02/12/2022 Saturday	5	Review ethanol procedures	D2 & Seirios In Water Test plus D2 buoyancy check (backup)	Crane/a-frame operator support needed
		Sample data management remote access preparations	Practice launch and recovery (backup)	Officers & Deck crew needed (officers just at beginning)
		Ping sonars		
02/13/2022 Sunday	6	Sample data management remote access preparations	D2 & Seirios In Water Test plus D2 buoyancy check (backup)	Crane/a-frame operator support needed

	In Port Day #	Mapping/OER Prep	ROV Mobilization Prep (EX2201)	Ship Operations
		Potential to ping sonars	Practice launch and recovery (backup)	Officers & Deck crew needed (officers just at beginning)
		Balance of personnel arrive		
02/14/2022 Monday	7	All sailing personnel move aboard (with Rapid Molecular Test)	D2 emergency recovery walk through and practice. (D2 is released from crane in water and then hooked)	Dedicated time needed from Officers & Deck crew (officers just at beginning)
		Pre-cruise preparations and checklists	Practice launch and recovery	Dedicated time needed from Officers & Deck crew (officers just at beginning)
		load stores		
02/15/2022 Tuesday	8		EX departs Key West	EX departs Key West
			DP Drift Test, Launch ,& Recovery Walkthrough/Practice	Officers Needed

Minimal de-mobilization is expected. Reserving the use of the ship's deck force and cranes in case of unforeseen circumstances is requested.

C. Operations to Be Conducted

1. ROV Dives

Listed dives (**Table 5**) are subject to change due to changes in environmental, technical, and/or mechanical factors. For the most up-to-date information on dive sites a living document can be found here:

<https://docs.google.com/spreadsheets/d/1W-A3JjHF05KXh45gn-wCNVH782tGw5Zm3Z1kgLFb498/edit#gid=323269705>

Table 5. List of planned ROV dive sites for EX-22-01: Note, this is an approximate itinerary and is subject to change based on community input, survey results, field conditions, and discretion of the commanding officer. The position information for each dive is tentative until the dive planning call, which is held one day before each scheduled ROV dive.

Dive #	Date	Location	Latitude	Longitude	Depth (m)	Dive Focus
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1	02/18	Sediment Fluvial Fan	24.48561 N	083.63340 W	538	Benthic
2	02/19	Step Terrace	24.46458 N	083.76245 W	1040	Benthic
3	02/20	West FL Canyon Top	24.54675 N	084.13596 W	1949	Benthic
4	02/21	Southern Abyssal Plain	24.46396 N	084.66861 W	3437	Benthic
5	02/22	Northern Abyssal Plain	25.00573 N	084.89296 W	3363	Benthic & Midwater
6	02/23	Canyon Crevasse	25.12898 N	084.69980 W	3123	Benthic
7	02/24	Toe of FL Escarpment	24.73081 N	084.46263 W	3169	Benthic
8	02/25	Western Agassiz Valley Meander	24.07050 N	082.75645 W	787	Benthic

2. CTD Casts

A CTD cast is needed for the patch test (listed in Acoustic Mapping Objectives). See Appendix A for more information on Mapping Operations.

Table 6. List of planned CTD casts for EX-22-01: Note, this is an approximate itinerary and is subject to change based on community input, survey results, field conditions, and discretion of the commanding officer.

Cast #	Date	Location	Latitude	Longitude	Depth (m)	Duration (hrs)
1	2/16	Patch Test Site	24.439513'N	84.1112112'W	1,159	3

3. Telepresence/Outreach Events

- a. Three live video feeds will be used throughout the expedition to provide situational awareness for onshore personnel.
- b. Currently, there are no live interactions planned for this expedition.

4. In-Port Events

- a. No in port public events are planned for this expedition.

5. Special/Unusual Operations or Requests

There are no special or unusual operations or requests for this expedition.

D. SCUBA Dive Plan

All SCUBA dives are to be conducted in accordance with the requirements and regulations of the [NOAA Diving Program](#) and require the approval of the ship's commanding officer. No SCUBA science dives are planned during EX-22-01, but the ship may plan training, safety drills, or maintenance dives.

E. Applicable Restrictions

Not applicable.

III. Hazardous Materials

A. Policy and Compliance

See the "[NOAA Ship Okeanos Explorer FY22 Field Season Instructions](#)."

B. Inventory

Table 7. Inventory of hazardous materials that will be aboard for EX-22-01.

Item	Use	Approximate Locations
95% UPS denatured ethanol (248 gal)	Sample preservation	02 Deck, port side ethanol storage container
Formaldehyde (2 gal) to be buffered into 10% buffered formalin	Sample preservation	Wet lab, under the chemical hood
Bleach (1 qt)	Sterilization and sample preservation	Wet lab cabinet under sink
Magnesium chloride (500 g)	Sample preservation	Wet lab under hood
Sodium phosphate (1 kg)	Sample preservation	Wet lab under hood
AquaShield	Underwater lubricant	ROV workshop fire cabinet, pit
Dow Corning 4	Electrical insulating compound	ROV workshop fire cabinet, pit
Fluid film spray	Silicone lubricant	ROV workshop fire cabinet
Isopropanol alcohol (2 gal)	Solvent	ROV workshop fire cabinet
Scotchkote	Electrical insulating compound	ROV workshop fire cabinet
3M silicone spray	Silicone lubricant	ROV workshop fire cabinet
Synthetic AW hydraulic oil, ISO-22	Amsoil (AWG-05)	Hanger, pit, vehicles
Tap Magic cutting fluid	Cutting/machining lubricant	ROV workshop fire cabinet

Tap Magic heavyweight cutting fluid	Cutting/machining lubricant	ROV workshop fire cabinet
Tuff Coat M	Marine lubricant	Winch room
Dow Corning Molykote 111	Valve lubricant and sealant	ROV workshop Fire cabinet, pit
WD40	Lubricant	ROV workshop fire cabinet
Loktite	Bolt adhesive	ROV workshop fire cabinet
Shell Diala S2	Vitrea	Hanger, vehicles
Por-15	Paint kit	ROV workshop fire cabinet
Aeroshell 41	Hydraulic fluid	Hanger, ROV Deep Discoverer
Ultratane	Butane fuel	ROV workshop fire cabinet
Rust-oleum	Protective enamel	ROV workshop fire cabinet
Flux-Off	Soldering flux remover	ROV workshop fire cabinet
Propane	Torch fuel	ROV workshop fire cabinet
Adhesive Pliobond 25	General adhesive	Tool room
AP 120 Metal Prep	Degreaser/cleaner for metal surfaces	Pit
Butane fuel	Torch refill	Tool room
PVC cement	Adhesive for PFV plastic piping	Tool room
Phosphoric acid	Ferrous metal rust removal	Tool room
Pipetite paste	Plumbing sealant	Tool room/pit
Spindle oil 10, ROS PT	Lubricant/compensation oil	Tool room
DC557	Silicon grease	Tool room/pit
Tether potting catalyst	Two part epoxy catalyst	Pit
Tether potting compound	Two part epoxy ingredient	Pit
ThermaPlex bearing grease	Lubricant	Pit
Tritech Seaking	Compensator oil for sonar head	Pit

IV. Equipment

A detailed list of equipment provided by the ship and NOAA Ocean Exploration can be found in the [“NOAA Ship Okeanos Explorer FY22 Field Season Instructions.”](#) There are no specific changes relative to this expedition.

Appendix A. Additional Information (USBL Calibration and Elaboration of Procedures/Objectives for Mapping)

- Documentation of USBL calibration standard operating procedures can be found here:
https://drive.google.com/file/d/1J5MzV0Tc7Qolhr5I_Ft009fD_quA3Umh/view?usp=sharing

1. GAMS Test

The GNSS Azimuth Measurement System (GAMS) test is used to ensure precise positioning of the POS MV's GPS antennas. The ship will need to perform at least 15 minutes of either S-Turns or Figure 8s at the fastest speeds deemed acceptable by the ship. Faster speeds promote quicker convergence on the GAMS solution.

2. Patch Test

The geometric calibration or 'Patch Test' is used to determine angular offsets between the multibeam and the POS MV. To conduct the patch test the ship will need to drive specific lines, in a specific order, and at specific speeds which will be communicated by the Mapping Watch to the Bridge. A likely patch test scheme that will be performed this year is shown in Figure A1.

EX1902 EM302 Calibration
Pascagoula Dome

Speed: 6 kts
Line length: 8 km (4.3 nm)
Line duration: ~45 min + turns

XBTs will be required before first Pitch and Roll lines

Additional processing time may be required between lines

After calibration, some or all lines may need to be run again for verification of the initial result

Order of calibration lines:

1. Pitch: A→B then B→A
2. Roll: C→D then D→C
3. Heading 1: E→F (alternative: F→E)
4. Heading 2: G→H (alternative: H→G)

		Lat DEG	Lat MIN	Lon DEG	Lon MIN
Pitch Line (A→B then B→A)	A	29	1.67	-88	1.74
	B	28	57.34	-88	1.69
Roll Line (C→D then D→C)	C	29	1.97	-87	57.24
	D	28	57.71	-87	56.34
Heading Line 1 (E→F OR F→E)	E	29	1.66	-88	2.42
	F	28	57.33	-88	2.37
Heading Line 2 (G→H OR H→G)	G	29	1.67	-88	1.06
	H	28	57.34	-88	1.02

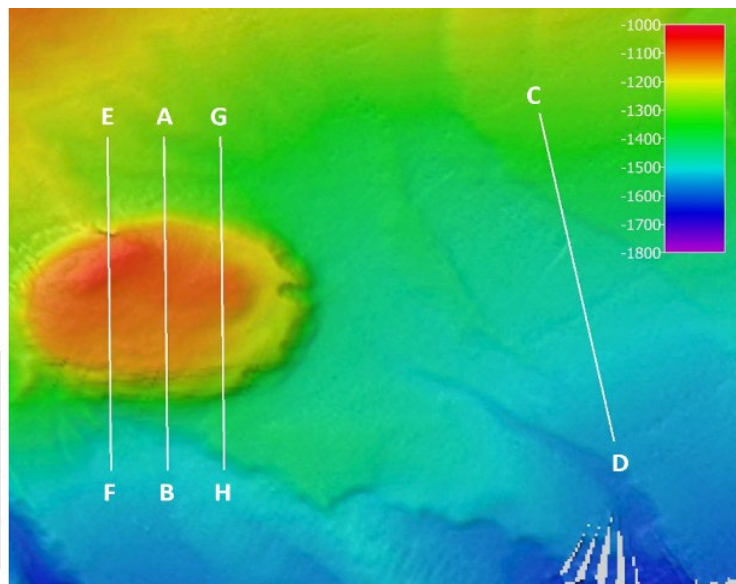


Figure A1: Schematic and map of likely patch test lines for the EM 304 SAT

3. Reference Survey

A reference survey will be conducted to test the performance of the new EM 304. The design for this survey is as follows (language provided by Kongsberg):

The area used for the sea trials should consist [of] at least partly of a relatively flat bottom and partly of a significant slope as required for a calibration. In case this is not possible, the calibration of the various sensors must be run in separate areas while the final assessment survey should be run in the flat part used for roll calibration. The depth should then ideally be in the 1000-2000 m range (not critical).

Five parallel lines should be run with line spacing equal to about one quarter of the achieved coverage in the actual area. Neighboring lines should be run in opposite directions. The line length should be in the order of twice the achieved coverage. A sixth line should be run perpendicular to and across the five previous lines.

4. Speed-Noise Test

The speed-noise test will be used to determine the noise-floor for the new EM 304 topside unit. To perform this test, passive acoustic data will be collected at specific speeds (likely speeds desired (in kts) are: 0, 2, 4, 6, 8, 10, max), maintained for approximately 10 minutes.

5. EK Calibrations

Calibration can be conducted while drifting freely for roughly 8-10 hours in an area with low vessel traffic, no navigational hazards, lack of fishing gear and sonar, minimal currents and wind, with a depth of at least 50 m. EK calibration work is planned to take place during daylight hours only, for up to 3 days. For a successful calibration to occur, the ship shall be drifting continuously without the need for repositioning in relatively calm conditions with under 10 knots of wind and under 0.5 knot of current. Visiting OER personnel will provide technical oversight of the calibration process but might request support from deck to ensure the proper placement of the calibration sphere below the hull of the ship. During calibration all systems (e.g. multibeam, sonars, ACDPs, etc.) that emit noise should be secured and shipboard noise producing activities should be limited (e.g. needle gunning etc.).

A Castaway CTD cast will occur (hand-deployed) prior to each day of EK calibrations.

6. Backscatter Normalization

Repeated, reciprocal lines will be run in two different locations and depths while adjusting parameters on the EM 304 to identify and resolve intensity issues between sectors. These lines will overlap those run by FUGRO in 2019, and will aid in establishing a backscatter reference area to help standardize data in the region.

Appendix B. Data Management Plan

Okeanos Explorer Mission EX2201 Data Management Plan

Report Date: 2022-01-14

1. General Description of Data to be Managed

1.1 Name and Purpose of the Data Collection Project:

EX-22-01, 2022 ROV and Mapping Shakedown (ROV and Mapping)

EX-22-01 is a ROV and mapping shakedown cruise focused on the operational readiness of the dual body ROV system *Seirios* and *Deep Discoverer* (D2) and calibration of the ship's suite of acoustic sonars. Operations will occur in waters in the U.S. Southeastern Atlantic region between the mouth of the Gulf of Mexico into the Blake Plateau. Mapping and ROV operations will focus on exploring depths between 200 and 4,000 meters.

1.2 Summary Description of the data to be collected:

Operations will include the use of the ship's deepwater mapping systems (Kongsberg EM 304 multibeam sonar, EK60/EK80 split-beam sonars, Knudsen 3260 Chirp sub-bottom profiler, and Teledyne acoustic Doppler current profiler), expendable bathythermograph (XBTs) in support of multibeam sonar mapping operations, conductivity, temperature, depth profiler (CTD) casts, NOAA Ocean Exploration's two-body ROV system (*Deep Discoverer* and *Seirios*), and a high-bandwidth satellite connection for continuous ship-to-shore communications.

1.3 Keywords or phrases that could be used to discover the data:

bathymetric gaps, benthic habitats, Blake Plateau, Cape Canaveral, chemosynthetic communities, CTD, deep-sea coral and sponge communities, deep-water habitats, EM304, essential fish habitats, EFH, expedition, exploration, explorer, fish habitats, habitat areas of particular concern, HAPC, Key, mapping survey, marine education, multibeam, multibeam backscatter, multibeam sonar, multi-beam sonar, noaa, noaa fleet, ocean, ocean discovery, ocean education, ocean exploration, ocean exploration and research, ocean literacy, ocean research, oceans, OER, okeanos, okeanos explorer, R337, Rhode Island, science, scientific computing system, scientific mission, scientific research, SCS, sea, Seabed 2030, shakedown, single beam sonar, singlebeam sonar, single-beam sonar, site characterization, sonar anomalies, split beam sonar, stewardship, sub-bottom profile, systematic exploration, technology, undersea, underwater, U.S. Southeastern Atlantic, water column backscatter

1.4 If this mission is part of a series of missions, what is the series name?

Okeanos ROV Cruises

1.5 Planned or Actual Temporal Coverage of the data:

Start Date: 2022-02-15 and End Date: 2022-02-26

1.6 Actual or Planned Geographic Coverage of the data:

Northernmost Boundary: 33 and Southernmost Boundary: 23.8
Westernmost Boundary: -85 and Easternmost Boundary: -76

1.7 What data types will be created or captured and submitted for archive?

Bottom Backscatter, Cruise Plan, Cruise Summary, Dive Summary Reports, EK60 Split Beam Data, EK80 Split Beam Data, Highlight Images, Launch and Recovery Locations, Multibeam (image), Multibeam (processed), Multibeam (product), Multibeam (raw), Navigational Data, Raw Video (digital), Sample Analysis Reports, SCS Output (compressed), SCS Output (native), Seafloor Imagery, Sound Velocity Profile, Sub-Bottom Profile data, Temperature data, Water Column Backscatter, XBT (raw)

1.8 What platforms will be employed?

NOAA Ship Okeanos Explorer

2 Points of Contact for this Data Producing Project

Overall POC: Dr. Kimberly Galvez, kimberly.galvez@noaa.gov
Title: Expedition Coordinator
Affiliation: NOAA Office of Ocean Exploration and Research
Phone: 305-951-6956

3 Points of Contact for Managing the Data

Data POC: Megan Cromwell
Data POC Title: Stewardship Data Management
Data POC Email: megan.cromwell@noaa.gov

4 Resources

4.1 Have resources for management of these data been identified?

Yes

4.2 Approximate percentage of the budget devoted to data management. (specify % or unknown)

Unknown

5 Data Lineage and Quality

5.1 What is the processing workflow from collection to public release?

SCS data shall be delivered in its native format to NCEI-MD (oceanographic archive); the data are then converted to an archive-ready, documented, and compressed NetCDF3 format which is made available for download through the Ocean Exploration Digital Atlas; water column profile data and navigation data will be delivered in ASCII format to NCEI-MD; EM304 and EK60/80 output data and metadata along with water column profiles used for calibration will be delivered to NCEI-CO (geophysical archive). Video data are received via

hard-drive and are loaded into NCEI storage and made discoverable and accessible via the Ocean Exploration Video Portal.

5.2 What quality control procedures will be employed?

Quality control procedures for the data from the Kongsberg EM304 is handled at UNH CCOM/JHC. Raw (level-0) bathymetry files are cleaned/edited into new data files (level-1) and converted to a variety of products (level-2). Data from sensors monitored through the SCS are archived in their native format and are not quality controlled. Data from CTD casts and XBT firings are archived in their native format.

6 Data Documentation

6.1 Does the metadata comply with the Data Documentation Directive?

Yes

6.1.1 If metadata are non-existent or non-compliant, please explain:

Not Applicable

6.2 Where will the metadata be hosted?

Organization: An ISO format collection-level metadata record will be generated during pre-cruise planning and published in the NOAA OneStop catalog and an OER Web Accessible Folder (WAF) hosted for public discovery and access at:

URL: <https://data.noaa.gov/waf/NOAA/NESDIS/ncei/oer/iso/>

Metadata Standard: ISO 19115-2 Geographic Information with Extensions for Imagery and Gridded Data will be the metadata standard employed.

6.3 Process for producing and maintaining metadata:

Metadata will be generated via xml editors or metadata generation tools.

7 Data Access

7.1 Do the data comply with the Data Access Directive?

Yes

7.1.1 If the data will not be available to the public, or with limitations, provide a valid reason.

Not Applicable

7.1.2 If there are limitations, describe how data are protected from unauthorized access.

Account access to mission systems are maintained and controlled by the Program. Data access prior to public accessibility is documented through the use of Data Request forms and standard operating procedures.

7.2 Name and URL of organization or facility providing data access.

Organization: NOAA National Centers for Environmental Information (NCEI)

URL: <https://www.ncei.noaa.gov>

7.3 Approximate delay between data collection and dissemination. By what authority?

Hold time: Data are considered immediately publicly accessible as soon as possible after the mission, unless there are documented restrictions.

Hold authority: not applicable

7.4 Prepare a Data Access Statement

No data access constraints, unless data are protected under the National Historic Preservation Act of 1966.

8 Data Preservation and Protection

8.1 Actual or planned long-term data archive location:

Data from this mission will be preserved and stewarded through the NOAA National Centers for Environmental Information. Refer to the Okeanos Explorer Data Management Plan at NOAA's EDMC DMP Repository for detailed descriptions of the processes, procedures, and partners involved in this collaborative effort.

8.2 If no archive planned, why?

Not Applicable

8.3 If any delay between data collection and submission to an archive facility, please explain.

The EM304 output data is a new format not currently read by NCEI archive systems. The new file format is being added to the system capability. There will be an unknown delay for the archive of these .kml files. All other data will be archived within 60-90 days of receipt.

8.4 How will data be protected from accidental or malicious modification or deletion?

Data management standard operating procedures minimizing accidental or malicious modification or deletion are in place aboard the Okeanos Explorer and will be enforced.

8.5 Prepare a Data Use Statement

Data use shall be credited to NOAA Office of Ocean Exploration and Research.

Appendix C. Licenses, Permits, and Environmental Compliance

Pursuant to the National Environmental Policy Act (NEPA), NOAA Ocean Exploration is required to include in its planning and decision-making processes appropriate and careful consideration of the potential environmental consequences of actions it proposes to fund, authorize, and/or conduct. The companion manual for NOAA Administrative Order 216-6A describes the agency's specific procedures for NEPA compliance.

An environmental review memorandum was completed for NOAA Ocean Exploration expeditions on NOAA Ship *Okeanos Explorer* in 2022 in accordance with Section 4 of the companion manual in the form of a categorical exclusion worksheet. Based on this review, a categorical exclusion was determined to be the appropriate level of NEPA analysis necessary, as no extraordinary circumstances exist that require the preparation of an environmental assessment or environmental impact statement. This document is on file with NOAA Ocean Exploration and can be provided upon request. NOAA Ocean Exploration is preparing a programmatic environmental assessment to cover future expeditions.

See the "[NOAA Ship Okeanos Explorer FY22 Field Season Instructions](#)" for additional information regarding environmental compliance that applies to the entire field season (e.g., Endangered Species Act Section 7 consultation and potential impacts to essential fish habitat).

Appendix D. Emergency Contact Data Sheet

Mission personnel sailing aboard NOAA Ship *Okeanos Explorer* must fill out a [Sailing Contact Form](#) that collects emergency contact information for each person. This information is available to the operations officer to fulfill safety requirements to sail. Appendix E. Ethanol Testing

To ensure the quality of the ethanol stored aboard NOAA Ship *Okeanos Explorer*, NOAA Ocean Exploration has developed an [OER Ethanol Test Guide](#). This guide provides step-by-step instructions on how to test the ethanol stored in the ejectable ethanol storage barrel on the 02 Deck. This guide also provides a built in calculator to plug in the measurements and get a definitive result. Finally, this guide is a log of the current and previous results of the ethanol testing.



February 19, 2022

MEMORANDUM FOR: CAPT Nicholas Chrobak, NOAA
Commanding Officer, Marine Operations Atlantic

FROM: CDR Colin Little
Commanding Officer, NOAA Ship *Okeanos Explorer*

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Kasey Cantwell
Operations Chief, NOAA Ocean Exploration

SUBJECT: EX-22-01 Project Instruction Amendment: Change in DAS
and Port of Call due to COVID-19 Contingency and Potable
Water Tank Evaluation

This serves as documentation of the change of departure port, sailing dates, and available days at sea (DAS) for EX-22-01, “2022 ROV and Mapping Shakedown (ROV and Mapping).” EX-22-01 will now depart from Singing River, Pascagoula and be executed with 9 DAS from February 23, 2022 to March 3, 2022. EX-22-01 will conclude in Key West, FL as scheduled.

During COVID-19 testing for NOAA Ship *Okeanos Explorer* for ship’s ORT, five individuals of the ship’s crew tested positive for COVID-19, delaying getting underway for ORT and 2021 ROV & Mapping Shakedown (EX-22-01).

Additional delays for this project came from concerns of contaminated water from the potable water tank. In order to minimize the days at sea lost, NOAA Ship *Okeanos Explorer* returned to Pascagoula, MS after the ship’s Operational Readiness Training.

The updated ports of call and operational areas for this expedition are shown in the map below.





OCEAN EXPLORATION



Singing River, MS

Key West, FL

- ★ Ports
- Proposed Tracklines
- Proposed Dive Sites
- Acoustic Calibration Areas
- U.S. EEZ > 200 m

0 100 200 Nautical Miles

