

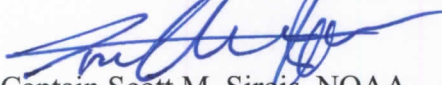


UNITED STATES DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration
NOAA Marine and Aviation Operations
Marine Operations Center
439 W. York Street
Norfolk, VA 23510-1114

August 3, 2017

MEMORANDUM FOR: Commander Eric Johnson, NOAA
Commanding Officer, NOAA Ship *Okeanos Explorer*

FROM: *for*  Captain Scott M. Sirois, NOAA
Commanding Officer, NOAA Marine Operations Center-Atlantic

SUBJECT: Project Instruction for EX-17-07
Musician Seamounts (Telepresence Mapping)

Attached is the final Project Instruction for EX-17-07, Musician Seamounts (Telepresence Mapping), which is scheduled aboard NOAA Ship *Okeanos Explorer* during the period of August 8 – August 31, 2017. Of the 24 DAS scheduled for this project, 24 DAS are funded by Line Office Allocation. This project is estimated to exhibit a Medium Operational Tempo. Acknowledge receipt of these instructions via e-mail to Opsmgr.MOA@noaa.gov at Marine Operations Center-Atlantic.

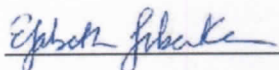






Ocean Exploration and Research

FINAL Project Instructions

Date Submitted: August 1, 2017
Platform: NOAA Ship *Okeanos Explorer*
Project Number: EX-17-07
Project Title: Musician Seamounts (Telepresence Mapping)
Project Dates: August 8 - 31, 2017

Prepared by:  **Dated:** August 1, 2017
Elizabeth Lobecker, NOAA
Expedition Coordinator
Office of Ocean Exploration & Research

Approved by:  **Dated:** August 1, 2017
Craig Russell
Program Manager
Office of Ocean Exploration & Research

Approved by:  **Dated:** AUGUST 4, 2017
For Captain Scott M. Sirois, NOAA
Commanding Officer
Marine Operations Center - Atlantic

I. Overview

A. Brief Summary and Project Period

This document contains project instructions for EX-17-07. Operations for this cruise include focused mapping operations and strategic mapping transits within the waters of Hawaii and in international waters in the vicinity of the Musician Seamounts chain, specifically up to ~650 nm north of Hawaii. The expedition will commence on August 8th in Honolulu and conclude on August 31, 2017 in Honolulu. Operations will include the use of the ship's deep water mapping systems (Kongsberg EM302 multibeam sonar, EK60 split-beam fisheries sonars, Acoustic Doppler Current Profilers (ADCPs), and Knudsen 3260 chirp sub-bottom profiler sonar), and the ship's high-bandwidth satellite connection for hourly data transfer, real-time ship to shore communications, real-time sonar control from shore, and real-time video streaming of sonar screens and ship's cameras.

NOAA's Office of Ocean Exploration and Research (OER) is the only federal organization dedicated to exploring our unknown ocean. OER works with partners to identify priority areas for exploration; support innovations in exploration tools and capabilities; and encourage the next generation of ocean explorers, scientists, and engineers. The publicly available data and information gained from our expeditions and the research we fund gives resource managers, the academic community, and the private sector the information they need to identify, understand, and manage ocean resources for this and future generations of Americans. NOAA Ship *Okeanos Explorer* is the only federal vessel dedicated to exploring our largely unknown ocean for the purpose of discovery and the advancement of knowledge about the deep ocean. America's future depends on understanding the ocean. We explore the ocean to make valuable scientific, economic, and cultural discoveries, and we explore because ocean health and resilience are vital to our economy and to our lives. Exploration supports NOAA mission priorities and national objectives by providing high-quality scientific information about the deep ocean to anyone who needs it.

In close collaboration with government agencies, academic institutions, and other partners, OER conducts deep-ocean exploration expeditions using advanced technologies on the *Okeanos Explorer*. From mapping and characterizing previously unseen seafloor to collecting and

disseminating information about ocean depths, this work helps to establish a foundation of information and fill data gaps. Data collected on the ship follow federal open-access data standards and are publicly available shortly after an expedition ends. This ensures the delivery of reliable scientific data needed to identify, understand, and manage key elements of the ocean environment.

NOAA Ship *Okeanos Explorer* systematically explores the ocean every day of every cruise to maximize public benefit from the ship's unique capabilities. With approximately 90-95% of the ocean unexplored, we pursue every opportunity to map, sample, explore, and survey at planned destinations as well as during transits; "Always Exploring" is a guiding principle. An integral element of *Okeanos Explorer's* "Always Exploring" model is the ship's seafloor and water column mapping capabilities. The sonars, or a subset of the sonars on board, will be operated at all times 24 hours per day throughout the cruise allowing for continued exploration and seabed, water column, and/or sub-bottom data collection and selected processing.

Objectives for the expedition include:

- Conduct preliminary seafloor mapping operations to contribute to geological understanding of remote areas of the Pacific Ocean.
- Conduct mapping operations to collect key data in preparation for EX-17-08 ROV dive planning and operations.
- Identify and characterize vulnerable marine habitats - particularly potential locations for high density deep sea coral and sponge communities.
- Characterize seamounts within and adjacent to the Prime Crust Zone (PCZ). The PCZ is the area of the Pacific with the highest expected concentration of deep sea minerals, including rare metals and rare earth elements.
- Collect information on the geologic history of Central Pacific Seamounts, including those that are or may be relevant to our understanding of plate tectonics and subduction zone biology and geology.
- Provide a foundation of publicly accessible data and information products to spur further exploration, research, and management activities.
- Murray Fracture Zone mapping: Across the Pacific, there are several very large, multi-segment fracture zones (FZs) that indicate the former existence of oceanic transform faults that existed for millions of years. These FZs underwent dramatic changes in segmentation as revealed by their structure. Mapping data provides a wealth of information about the structure of these TFs when they formed and the subsequent

evolution of their FZs, possibly including information about whether the FZs were weakly or strongly coupled. Weakly coupled FZs can indicate extensive serpentinization, which can alter the production and composition of magma at subduction zones. The suggested mapping data will result in a large swath of mapping data, which will allow a careful analysis of the FZ evolution.

- **Musician Seamounts - northern seamounts area mapping:** The interaction of plume with nearby mid-ocean ridges is still poorly understood after several decades of research. One feature of plume-ridge interaction is the formation of linear volcanic ridges (such as seen at the Galapagos) that extend between the plume location and the ridge. Two sets of ridge (of which the requested mapping area covers the northern set) are seen to extend from the Musicians to the East. Magnetic anomaly data suggest that these ridges may have formed near a mid-ocean ridge. Poor mapping data make these ridges difficult to characterize, however. For example, are they actually ridges or sets of distinct, aligned seamounts? Being able to analyze the seamount structure and shape can inform the type of formation environment of these seamounts.

Operations for this cruise will include 24 hour mapping, and continuous telepresence-based remote participation in mapping operations. Multibeam and splitbeam mapping operations will be conducted 24 hours a day throughout the cruise. Sub-bottom profile mapping will be conducted 24 hours a day at the discretion of the CO. XBT and Underway CTD sound velocity casts in support of multibeam sonar mapping operations will be conducted at an interval defined by prevailing oceanographic conditions, but not to exceed 6 hours. All mapping data will be fully processed according to standard procedures and will be archived with the National Centers for Environmental Information (NCEI).

The transit routes between port and the operating areas will maximize mapping of discrete geologic features including seamounts and ridges with little or no existing modern sonar data coverage. The routes were chosen based on the most recent version of the global bathymetric compilation dataset compiled by J.J. Becker et al (http://topex.ucsd.edu/sandwell/publications/124_MG_Becker.pdf).

This expedition will be the seventh cruise to test telepresence enabled mapping operations on *Okeanos Explorer*. *Okeanos* is a leader in this mode of mapping cruise operation, and continues to see rewards and success and potential for development.

The Expedition Coordinator (Elizabeth Lobecker) for the cruise will be based on shore at the

Exploration Command Center (ECC) at University of New Hampshire Center for Coastal and Ocean Mapping/Joint Hydrographic Center (UNH CCOM/JHC) with regular and ongoing communications with the ship (OPS, CO) and onboard mapping lead (Amanda Bittinger).

The screens of the mapping acquisition systems (EM 302, EK 60, SBP etc.) will be broadcast 24 hours per day, and will be monitored by both onboard and onshore mapping scientists. A specially configured laptop has been prepared for remote access to all the sonar acquisition and data processing machines from shore. This setup will continue to be tested for its reliability and feasibility of controlling the mapping data acquisition and data management from shore. The raw data from all sonars will be transmitted to shore and further processing will be completed on shore. Automated bathymetric gridding will occur on the ship in order for the onboard team to monitor and ensure adequate seabed coverage. The onboard mapping lead will be the primary liaison between ship and OER operations and will attend all the shipboard daily meetings and provide daily situation reports (SITREPS) to the broader OER *Okeanos* operational team.

As telepresence mapping protocols continue to develop during this type of telepresence enabled mapping expedition, possibilities open for OER to conduct operations with nimble teams of mapping personnel onboard and most of data acquisition, processing and quality checks of mapping data being completed on shore. Value gained from this model will continue to expand as the model is tested. Initial predicted benefits include: reduction in travel costs to the ship, participation of a larger number of mapping trainees in expeditions, cruise participation from individuals who are unable to sail, enhanced rapid data processing and archival techniques, enhanced onshore partnership development opportunities, enhanced rapid data report creation, and expanded possibilities for utilizing multiple ECCs during mapping missions.

The onboard ship and mapping team will be provided with all information necessary to successfully conduct the mapping mission should the telepresence component experience significant challenges, such as lack of connectivity due to VSAT or network challenges.

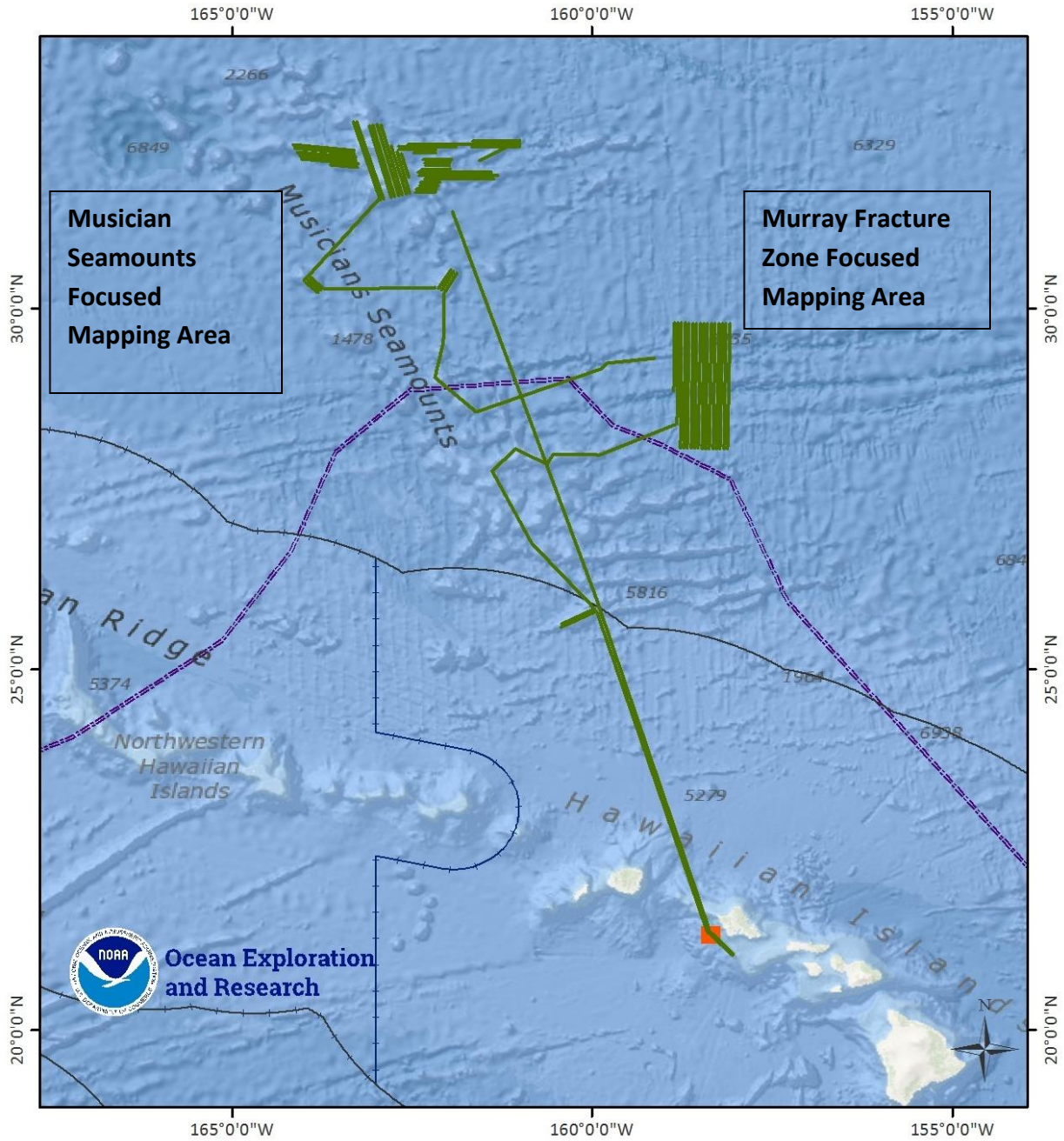
B. Days at Sea (DAS)

Of the 24 DAS scheduled for this project, 0 DAS are funded by an OMAO allocation, 0 DAS are funded by an NOS Line Office Allocation, 0 DAS are Program Funded, and 24 DAS are funded by an OAR Line Office Allocation. This project is estimated to exhibit a Medium Operational Tempo due to 24 hour mapping operations.

C. Operating Area

24-hour per day mapping operations will focus as several locations in the vicinity of the Musicians Seamounts chain. Mapping operations will focus in depths generally between 250 and 6,000 meters.





- EX-17-07 Planned Cruise Track
- Papahānaumokuākea Marine National Monument
- U.S. Maritime Boundary
- Prime Crust Zone
- S28 Search Area

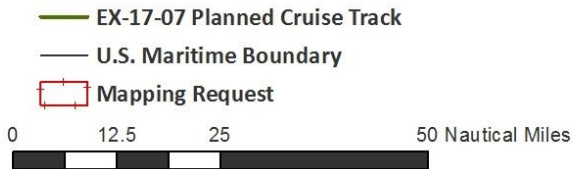
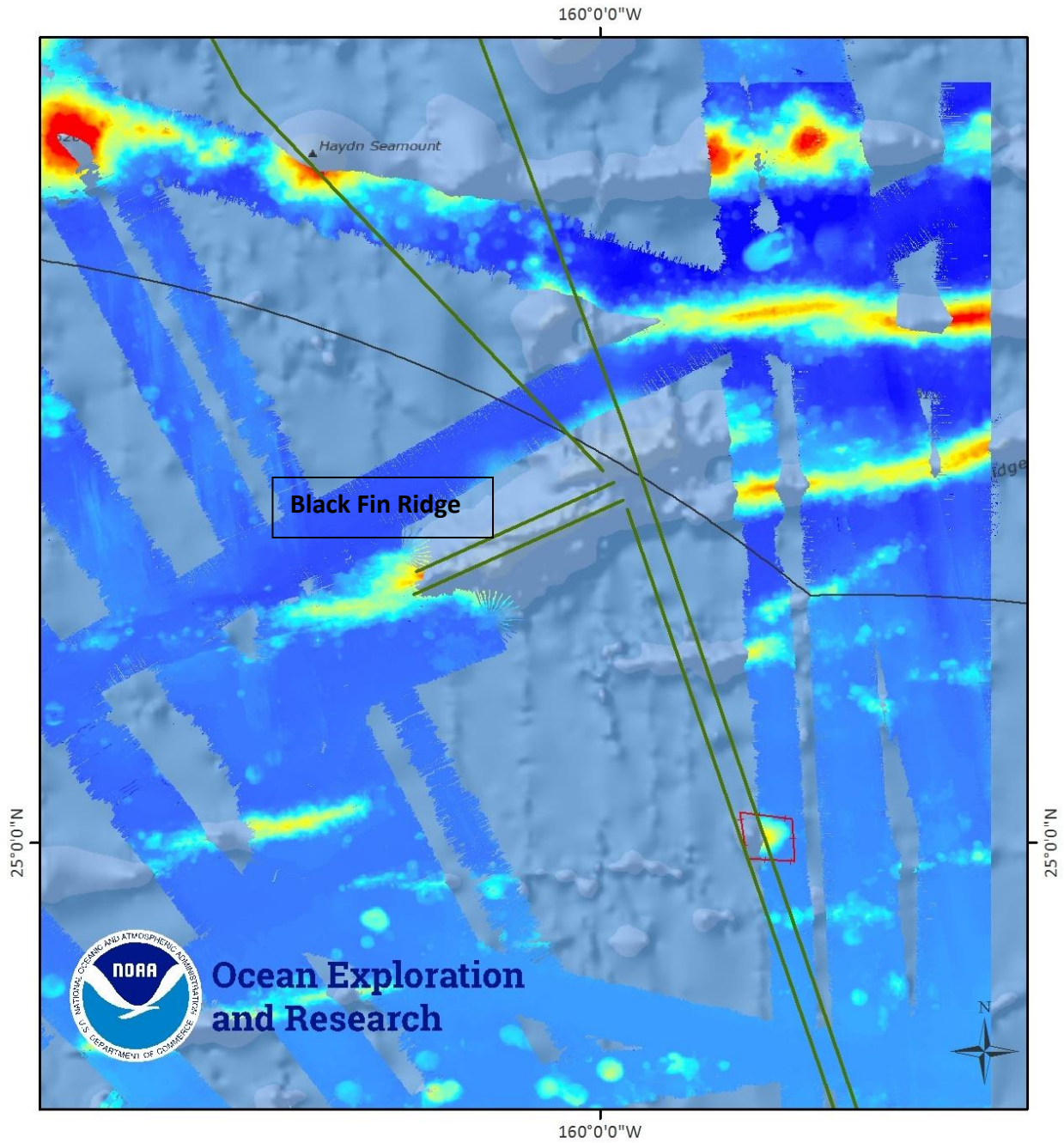


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 Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, HERE, Geonames.org, and other contributors

Figure 1 (above):Map indicating the overall operating area of *Okeanos Explorer* for EX-17-07. Existing publicly available bathymetry coverage for key mapping areas downloaded from National Centers for Environmental Information shown in background.



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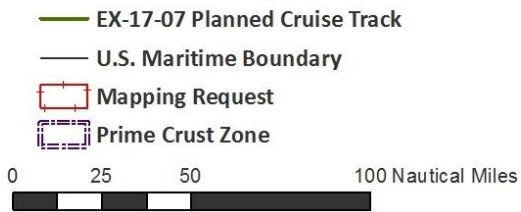
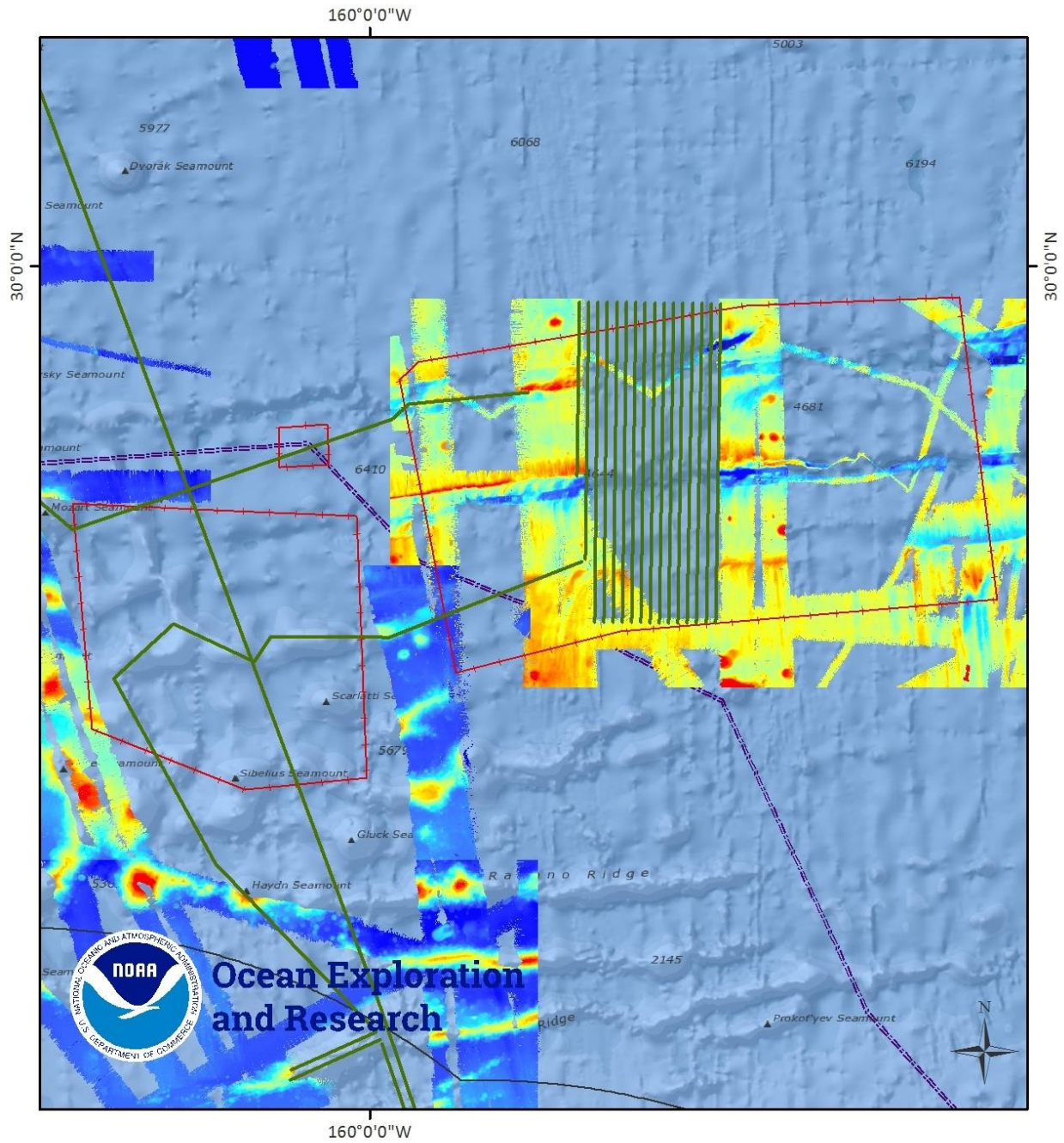


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Figure 2 (above):Map indicating two survey lines at Blackfin Ridge. The green line indicates the generalized cruise track, the red polygons indicate priority areas for focused mapping surveys. Existing publicly available bathymetry from National Centers for Environmental Information shown in background.

A pair of survey lines will be run along the previously unmapped ridgeline of Blackfin Ridge.



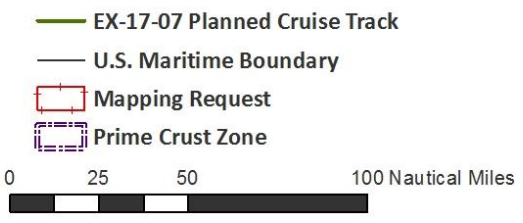
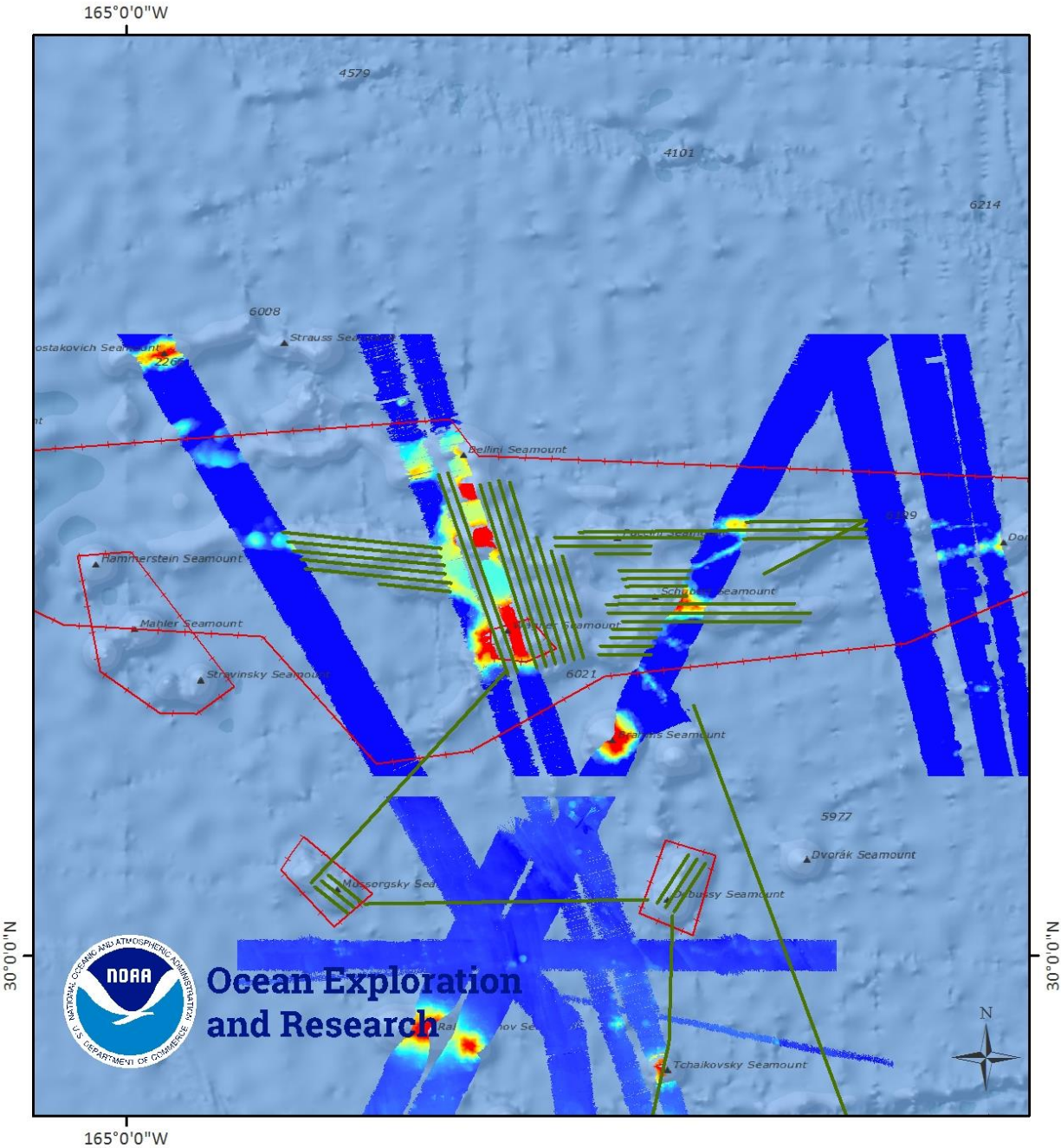


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 Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, HERE, Geonames.org, and other contributors

Figure 3 (above):Map indicating the mapping area at the Murray Fracture Zone and nearby Musicians Seamounts. The green line indicates the generalized cruise track, the red polygons indicate priority areas for focused mapping surveys. Existing publicly available bathymetry from National Centers for Environmental Information shown in background.

The Murray Fracture Zone survey area is shown above in Figure 3. The central area indicated in the red rectangle is the first priority in this area.





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 Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, HERE, Geonames.org, and other contributors

Figure 4 (above): Map indicating northernmost focused mapping areas at Musicians Seamounts. The green line indicates the generalized cruise track, the red polygons indicate priority areas for focused mapping surveys. Existing publicly available bathymetry from National Centers for Environmental Information shown in background.

The northern survey area encompasses a large grouping of seamounts within the Musician Seamounts chain. The goal is to map the targeted seamounts to a maximum depth of 4500 meters in preparation for ROV dives during EX-17-08.

EX-17-07 Generalized Cruise Track	
Latitude (Degrees Decimal Minutes)	Longitude (Degrees Decimal Minutes)
21 1.949N	158 3.069W
21 21.903N	158 24.055W
21 27.245N	158 26.566W
25 46.642N	159 56.177W
25 52.094N	159 59.578W
26 45.240N	160 50.389W
27 45.468N	161 23.604W
28 3.284N	161 4.100W
27 50.965N	160 38.009W
27 59.169N	160 32.365W
27 58.910N	159 53.660W
28 23.673N	158 50.891W
29 18.832N	159 8.528W
29 14.946N	159 47.501W
29 9.982N	159 52.886W
28 34.034N	161 37.171W
29 2.785N	162 11.028W
29 32.057N	162 4.489W
30 12.808N	162 3.488W
30 17.972N	162 11.360W
30 16.800N	163 42.965W
30 23.674N	164 0.455W
31 31.948N	162 57.460W

31 20.845N	161 56.673W
25 58.695N	159 56.799W
21 27.936N	158 24.327W
21 21.952N	158 23.029W
21 2.725N	158 2.482W

Table 1: EX-17-07 generalized cruise track waypoints.

D. Summary of Objectives

August 8 - 31, Honolulu, HI to Honolulu HI, focused seamount mapping at Musician Seamounts.

EX-17-07 operations will occur in the U.S. EEZ and primarily in international water.

Mission objectives for EX-17-07 include a combination of mapping/operational, science, education, outreach, and data management objectives:

1. Onboard Mapping
 - a. Conduct 24 hr/day mapping operations for the entirety of the cruise using EM 302 multibeam, EK 60 suite, and subbottom profiler sonars.
 - b. Execute mapping line plans as defined by onshore personnel, with adjustments made in the field to obtain complete coverage as necessary. All line plans are currently set to 5 kilometer line spacing.
 - c. Collect high resolution mapping data from sonars in priority areas as dictated by operational needs as well as science and management community needs.
 - d. Collect XBT/ UnderwayCTD (if system operational) casts as mapping data quality requires.
 - e. Utilize Qimera realtime gridding functionality.
 - f. Create daily standard bathymetry mapping products.
 - g. Ensure all raw data from all sonars is transferred to shoreside repository hourly using automated scripts.
 - h. Collect sun photometer measurements as part of Exploration Project of Opportunity (EPO).
 - i. Average survey speeds of 8-9 kts will be utilized.
 - j. Transit speeds of 9-11 kts will be utilized.
 - k. Host two Explorers-in-Training who were trained onshore during EX-17-04 at the UNH Center for Coastal and Ocean Mapping.



2. Onshore mapping
 - a. Train three Explorers-in-Training at the UNH CCOM/JHC in preparation for them to sail on a later mapping cruise in FY18.
 - b. Conduct detailed bathymetric data processing.
 - c. Write mapping data report.
 - d. Generate tracklines of all sonar data types.
 - e. Generate cruise map.
 - f. Generate cruise statistics.
 - g. Process subbottom, EK60, multibeam bottom backscatter and water column backscatter data according to SOPs.
 - h. Shoreside operation of sonar computers on the ship using desktop access through NOAA OMAO supplied laptop.
 - i. Test telepresence mapping workflow with OER physical scientists at UNH.
 - j. Support onboard watchstanders by monitoring data collection from shore in realtime
 - k. Provide data acquisition and processing troubleshooting from shore
 - l. Possibly collaborate with GECBO students based at CCOM.
3. Data Management
 - a. Provide a foundation of publicly accessible data and information products to spur further exploration, research, and management activities;
 - b. Use daily bathymetric mapping products and SCS mailers to update Okeanos Atlas for onshore situational awareness.
4. Science
 - a. Explore the diversity and distribution of benthic habitats – including bottom fish habitats, deep sea and precious coral communities and hydrothermal vents.
 - i. Collect data on: habitat size and extent
 - b. Collect geophysical data at sites to aid the understanding of the geologic history of Pacific seamounts.
 - c. Build capacity in the scientific community and public in telepresence-based mapping exploration.
 - d. Successfully conduct operations in conjunction with shore-based Exploration Command Centers and remote science team participants.
5. Remote Science/Exploration Command Centers
 - a. Provide operational support and training to scientists and managers to enable remote participation in at-sea operations.
 - b. Facilitate outreach and engagement activities and events at the ECCs.
 - c. Test and refine ship-to-shore communications procedures that engage multiple



- ECCs and other remote participants.
 - d. Test and refine operating procedures and products.
6. Outreach
- a. Onshore EC and EiTs participate in various UNH outreach activities based in the UNH ECC including TBD
7. Ship
- a. Possibly conduct full depth test CTD cast to confirm all sensors functional including altimeter.
 - b. Conduct ship safety drills including man overboard and maneuvering.
 - c. Continue to refine SOPs for the new VSAT.
 - d. Provide a high quality stable internet connection with the new VSAT.
 - e. Provide stable and reliable VoIP telecommunications.
 - f. Continue to train new Survey Technician and familiarize him with *Okeanos* Operations and his/her responsibilities.

E. Participating Institutions

- National Oceanic and Atmospheric Administration (NOAA), Office of Ocean Exploration and Research (OER)—1315 East-West Hwy, Silver Spring, MD 20910 USA
- NOAA, National Oceanographic Data Center, National Coastal Data Development Center, Stennis Space Center MS, 39529 USA
- University Corporation for Atmospheric Research Joint Office for Science Support (JOSS), PO Box 3000 Boulder, CO 80307 USA
- University of Hawai'i at Manoa- 2500 Campus Rd, Honolulu, HI 96822
- University of New Hampshire (UNH) Center for Coastal and Ocean Mapping (CCOM) Jere A. Chase Ocean Engineering Lab, 24 Colovos Rd, Durham, NH 03824 USA
- Global Foundation for Ocean Exploration, P.O. Box 417, Mystic, CT 06355
- NOAA National Marine Fisheries Service, Pacific Islands Regional Office, 1845 Wasp Blvd, Honolulu, HI 96818
- NOAA National Marine Fisheries Service, Pacific Islands Fisheries Science Center, 1845 Wasp Blvd, Honolulu, HI 96818

F. Personnel (Mission Party)

Table 2: Full list of shore based and sea going mission party members and their affiliations



Nationality	Affiliation	Gender	Date Disembark	Date Aboard	Location during cruise	Title	Name (First, Last)	#
ONBOARD MAPPING TEAM								
USA	UCAR	F	9/1	8/6	Ship	Onboard Mapping Lead	Amanda Bittinger	1
USA	UCAR	M	9/1	8/6	Ship	Onboard Mapping Watch Lead	Dan Freitas	2
USA	UCAR	F	9/1	8/7	Ship	Explorer in Training / Watchstander	Elizabeth "Claudia" Thompson	3
USA	UCAR	M	9/1	8/6	Ship	Explorer in Training / Watchstander	Brandon O'Brien	4
ONSHORE MAPPING TEAM								
		n/a	n/a	n/a	UNH CCOM/JH C ECC	Expedition Coordinator	Elizabeth 'Meme' Lobecker	1
		n/a	n/a	n/a	UNH CCOM/JH C ECC	Mapping Lead	Derek Sowers	2
		n/a	n/a	n/a	UNH CCOM/JH C ECC	Explorer in Training	Kelsey Lane	3
		n/a	n/a	n/a	UNH CCOM/JH C ECC	Explorer in Training / EPP Intern	Laura Almodóvar	4
		n/a	n/a	n/a	UNH CCOM/JH	Explorer in Training	TBD	5



G. Administrative

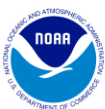
1. Points of Contact:

Ship Operations

Chief, Operations Division, Atlantic (MOA)	Marine Operations Center, Atlantic (MOA)
LT Joe Carrier, NOAA	439 West York Street
Telephone: (757) 441-6842	Norfolk, VA 23510-1145
E-mail: Chiefops.MOA@noaa.gov	Telephone: (757) 441-6776
	Fax: (757) 441-6495

Mission Operations

CDR Eric Johnson, NOAA	EElizabeth 'Meme' Lobecker
Commanding Officer	Mapping Manager
NOAA Ship <i>Okeanos Explorer</i>	NOAA Office of Ocean Exploration
Phone: (401) 378-8284	and Research (ERT)
Email: CO.Explorer@noaa.gov	O: (603) 862-1475
	C: (240) 429-7023
LT Aaron Colohan, NOAA	E-mail: elizabeth.lobecker@noaa.gov
Operations Officer	
NOAA Ship <i>Okeanos Explorer</i>	
Phone: (808) 659-9197 (Ship's Iridium)	



E-mail: Ops.Explorer@noaa.gov

Other Mission Contacts

CDR William Mowitt, Deputy Director

NOAA Ocean Exploration & Research

Phone: (301) 734-1023

E-mail: William.Mowitt@noaa.gov

Craig Russell

Program Manager

NOAA Ocean Exploration & Research

Phone: (206) 526-4803 / (206) 518-1068

E-mail: Craig.Russell@noaa.gov

Alan Leonardi, Director

NOAA Ocean Exploration & Research

Phone: 301-734-1016/ Cell: 202-631-1790

E-mail: alan.leonardi@noaa.gov

Vessel Shipping Address

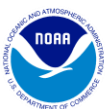
Shipments: Send an email to the *Okeanos Explorer* Operations Officer at OPS.Explorer@noaa.gov indicating the size and number of items being shipped.

Items sent to Honolulu should arrive at the following address prior to COB 8/4/17.

NOAA Ship *Okeanos Explorer*

c/o LT Aaron Colohan

1845 Wasp Blvd, Honolulu, HI 96818



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2. Diplomatic Clearances

N/A. All data collection to occur in U.S. or international waters.

3. Licenses and Permits

The expedition is being planned and conducted by NOAA as an agency of the U.S. Federal government.

Pursuant to the National Environmental Policy Act (NEPA), NOAA OER 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. NOAA's Administrative Order (NAO) 216-6A Companion Manual describes the agency's specific procedures for NEPA compliance. Among these is the need to review all proposed NOAA-supported field projects for their environmental effects. A categorical exclusion (CE) worksheet has been completed for this survey, in accordance with Section 4 of the Companion Manual. This worksheet describes EX1707 and explains how it is consistent with one or more of the CE categories listed/described in Appendix E of the Companion Manual. The completed worksheet also summarizes the review conducted to determine that no extraordinary circumstances exist that would preclude the use of a CE or require preparation of an environmental assessment or environmental impact statement.

Informal consultation was initiated under Section 7 of the Endangered Species Act (ESA), requesting NOAA Fisheries' Protected Resources Division concurrence with our biological evaluation determining that 2016 Marianas Expedition and all other planned *Okeanos Explorer* operations during the 2016-17 field season, may affect, but are not likely to adversely affect, ESA-listed marine species. The informal consultation was completed on February 3, 2016 when NOAA OER received a signed letter from the Regional Administrator of NMFS Pacific Islands Regional Office, stating that NMFS concurs with OER's determination that conducting proposed *Okeanos Explorer* cruises are not likely to adversely affect ESA-listed marine species. Documentation is provided in appendix of this PI.

OER has completed consultation with NOAA's Habitat Conservation Division on potential

impacts of our operations to Essential Fish Habitat (EFH). They concurred that our operations would not adversely affect EFH provided adherence to our proposed procedures and their guidance stated in the letter. Documentation is provided in appendix of this PI.



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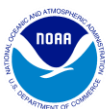
II. Operations

The Expedition Coordinator is responsible for ensuring the scientific staff are trained in planned operations and are knowledgeable of project objectives, priorities and environmental compliance procedures. The Commanding Officer is responsible for ensuring all operations conform to the ship's accepted practices and procedures.

A. Project Itinerary

(All times and dates are subject to prevailing conditions and the discretion of the Commanding Officer)

Activities	Approx Survey Time (hrs)	Date
Onboard mission personnel arrive to ship (flight dependent)		8/6
Depart port 0900 from Ford Island pier for Navy Fuel Dock, take on fuel, commence mapping at sea buoy		8/8
Transit mapping over S28 wreck target	-	8/8
Transit to Blackfin Ridge	35 hours	8/8-8/9
Blackfin Ridge survey	6 hours	8/9
Transit to Murray Fracture Zone and nearby seamounts	14 hours	8/9-8/10
Focused mapping at Murray Fracture Zone (Fig 4)	8 days	8/10-8/17
Mapping of over Mozart, Liszt, Debussy, and Mussorgsky Seamounts en route to northern Musician Seamounts area	2 days	8/17-8/20



Focused mapping at large Musician Seamount group (Fig 6)	8-9 days	8/20-8/28
Transit south from Musicians Seamount mapping area to Honolulu (~680 nm distance estimate, 3 days @ 9 kts)	3 days	8/28-8/31
Transit mapping over S28 wreck target		8/31
Arrive sea buoy Pearl Harbor, Honolulu 0800		8/31

Table 4: Detailed Cruise Itinerary. This is an approximate itinerary and is subject to change based on survey results, field conditions, and discretion of the CO.

B. Staging and Destaging

Minimal staging and destaging is expected as all mission equipment will be onboard already, and the following cruise is another telepresence-enabled ROV cruise.

C. Operations to be Conducted

1. Telepresence / Outreach Events
 - a. Two live video feeds will be used throughout the cruise to provide situational awareness for onshore personnel.
2. In-Port Events
 - a. There are no in-port events planned for this cruise.

D. SCUBA Dive Plan

All 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.

E. Applicable Restrictions

Sonar Operations

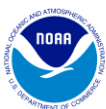
EM 302, EK 60, ADCP, and sub-bottom profiler data acquisition is planned for this cruise. All data acquisition will be conducted in accordance with established standard operating

procedures under the direction of the mapping team lead. These operating procedures will include protection measures when operating in the vicinity of marine mammals, sea turtles or Endangered Species Act-listed species as described in appendices of this document. The final decision to operate and collect 24-hour sub-bottom profiler data will be at the discretion of the Commanding Officer.

III. Equipment

A. Equipment and capabilities provided by the ship

- 2 working small boats in seaworthy and reliable working condition for mission operations and fast rescue
- ~~NOAA OER 6000 m *Deep Discoverer* ROV~~
- ~~NOAA *Seirios* Camera Platform~~
- Kongsberg Simrad EM302 Multibeam Echosounder (MBES)
- Kongsberg Simrad EK60 Deepwater Echosounders and GPTs (18, 70, 120, 200 kHz)
- Knudsen Chirp 3260 Sub-bottom profiler (SBP)
- Teledyne RDI Workhorse Mariner (300 kHz) ADCP
- Teledyne RDI Ocean Surveyor (38 kHz) ADCP
- Teledyne Underway CTD
- LHM Sippican XBT Mark21 System (Deep Blue probes)
- AOML Automated XBT Launcher (Deep Blue probes)
- Seabird SBE 911 Plus CTD
- Seabird SBE 32 Carousel and 24 2.5 L Niskin Bottles
- Light Scattering Sensor (LSS)
- Oxidation – Reduction Potential (ORP)
- Dissolved Oxygen (DO) sensor
- Altimeter Sensor and battery pack
- MarineStar GPS
- POS/MV



- Seabird SBE-45 (Micro TSG)
- Kongsberg Dynamic Positioning-1 System
- Netshares mapping storage system
- IVS Fledermaus Software suite
- SIS Software
- Hypack Software
- Scientific Computing System (SCS)
- ECDIS
- Met/Wx Sensor Package
- Telepresence System
- VSAT High-Speed link (Comtech 9 Mbps ship to shore; 2 Mbps shore to ship)
- Cruise Information Management System (CIMS)
- Three VoIP telephone lines

B. Equipment and capabilities provided by the scientists

- Microtops II Ozone Monitor Sunphotometer and handheld GPS required for NASA Marine Aerosols Network supplementary project.

IV. Hazardous Materials

A. Policy and Compliance

The Expedition Coordinator is responsible for complying with FEC 07 Hazardous Materials and Hazardous Waste Management Requirements for Visiting Scientific Parties (or the OMAO procedure that supersedes it). The Expedition Coordinator and Science Team Lead will be responsible for transporting all samples and HAZMAT on and off the ship. By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and quantity, MSDS, appropriate spill cleanup materials (neutralizing agents, buffers, or absorbents) in amounts adequate to address spills of a size equal to the amount of chemical brought aboard, and chemical safety and spill response procedures. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

Per OMAO procedure, the scientific party will include with their project instructions and provide to the CO of the respective ship 30 days before departure:

- List of chemicals by name with anticipated quantity
- List of spill response materials, including neutralizing agents, buffers, and absorbents
- Chemical safety and spill response procedures, such as excerpts of the program’s Chemical Hygiene Plan or SOPs relevant for shipboard laboratories
- For bulk quantities of chemicals in excess of 50 gallons total or in containers larger than 10 gallons each, notify ship’s Operations Officer regarding quantity, packaging and chemical to verify safe stowage is available as soon as chemical quantities are known.

Upon embarkation and prior to loading hazardous materials aboard the vessel, the scientific party will provide to the CO or their designee:

- An inventory list showing actual amount of hazardous material brought aboard
- An MSDS for each material
- Confirmation that neutralizing agents and spill equipment were brought aboard sufficient to contain and cleanup all of the hazardous material brought aboard by the program
- Confirmation that chemical safety and spill response procedures were brought aboard

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory showing that all chemicals were removed from the vessel. The CO’s designee will maintain a log to track scientific party hazardous materials. MSDS will be made available to the ship’s complement, in compliance with Hazard Communication Laws.

Scientific parties are expected to manage and respond to spills of scientific hazardous materials. Overboard discharge of hazardous materials is not permitted aboard NOAA ships.

B. Inventory

Approx. locations	Use	Item
Wetlab, under the chemical hood removed from ship for EX1707	Sample preservation	95% Denatured Ethanol (35 gallons)
Wetlab, under the chemical hood removed from ship for EX1707	Sample preservation	10% Buffered Formalin (1 gallon)
Wetlab, under the chemical hood	Sample preservation (genetics)	Chaos Buffer (250 ml) (4 M guanidine thiocyanate, 0.5% N-lauroylsarcosine, 25 mM Tris pH

		8.0, 0.1 M beta-mercaptoethanol)
ROV Workshop Fire Cabinet, Pit	Underwater Lubricant	Aqua Shield
ROV Workshop Fire Cabinet, Pit	Electrical insulating compound	Dow Corning 4
ROV Workshop Fire Cabinet	Silicone Lubricant	Fluid Film Spray
ROV Workshop Fire cabinet	Solvent	Isopropanol Alcohol (35 gallons)
ROV Workshop Fire cabinet	Electrical insulating compound	Scotchkote
ROV Workshop Fire cabinet	Silicone Lubricant	3M Silicone Spray
Hanger, Pit, Vehicles	Amsoil (AWG-05)	Synthetic AW Hydraulic Oil, ISO-22
ROV Workshop Fire cabinet	Cutting/Machining Lubricant	Tap Magic Cutting Fluid
ROV Workshop Fire cabinet	Cutting/Machining Lubricant	Tap Magic Heavyweight Cutting Fluid
Winch room	Marine Lubricant	Tuff Coat M
ROV Workshop Fire cabinet, Pit	Valve Lubricant and Sealant	Dow Corning Molykote 316, 111
ROV Workshop Fire cabinet	Lubricant	WD40
ROV Workshop Fire cabinet	Bolt adhesive	Loktite
Hanger, Vehicles	Vitrea	Mineral Oil
ROV Workshop Fire cabinet	Paint Kit	Por-15
Hanger, ROV D2	Hydraulic Fluid	Univis HVI 13
ROV Workshop fire cabinet	Butane fuel	Ultratane
ROV Workshop fire cabinet	Protective Enamel	Rust-oleum
ROV Workshop fire cabinet	Soldering Flux remover	Flux-Off
ROV Workshop fire cabinet	Torch Fuel	Propane
Tool Room	General adhesive	Adhesive Pliobond 25
Pit	Degreaser/cleaner for metal surfaces	AP 120 Metal Prep



Tool Room	Torch refill	Butane Fuel
Tool Room	Adhesive for PVC plastic piping	PVC Cement
Tool Room	Ferrous metal rust removal	Phosporic Acid
Too Room/Pit	Plumbing sealant	Pipetite Paste
Tool Room	Lubricant/compensation oil	Spindle Oil 10, ROS PT
Tool Room / Pit	Silicon grease	DC557
Pit	Two part epoxy catalyst	Tether Potting Catalyst
Pit	Two party epoxy ingredient	Tether Potting Compound
Pit	Lubricant	ThermaPlex Bearing Grease
Pit	Compensator oil for sonar head	Tritech Seaking

C. Chemical safety and spill response procedures

All safety and spill response procedures will be handled according to OMAO guidelines and following the manufacturers MSDS which has been provided to the ship's ECO.

D. Radioactive Materials

NOT APPLICABLE TO THIS CRUISE

V. Additional Projects

A. Exploration Projects of Opportunity

NASA Maritime Aerosol Network

During the cruise the marine aerosol layer observations will be collected for the NASA Maritime Aerosol Network (MAN). Observations will be made by mission personnel (as time allows) with a sun photometer instrument provided by the NASA MAN program. Resulting data will be delivered to the NASA MAN primary investigator Alexander Smirnov by the expedition coordinator. All collected data will be archived and publically available at:

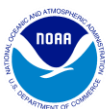
http://aeronet.gsfc.nasa.gov/new_web/maritime_aerosol_network.html

Equipment resides on the ship and is stewarded by the Expedition Coordinator.

See Appendix for full Survey of Opportunity Form.

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned.



VI. Disposition of Data and Reports

A. Data Responsibilities

All data acquired on *Okeanos Explorer* will be provided to the public archives without proprietary rights. All data management activities shall be executed in accordance with [NAO 212-15, Management of Environmental and Geospatial Data and Information](#)

Ship Responsibilities

The Commanding Officer is responsible for all data collected for missions until those data have been transferred to mission party designees. Data transfers will be documented on NOAA Form 61-29. Reporting and sending copies of project data to NESDIS (ROSCOP form) is the responsibility of OER.

NOAA OER Responsibilities

The Expedition Coordinator will work with the *Okeanos Explorer* Operations Officer to ensure data pipeline protocols are followed for final archive of all data acquired on *Okeanos Explorer* without proprietary rights. See Appendix section for detailed data management plans.

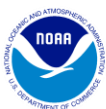
Deliverables

1. At sea
 - a. Daily plans of the Day (POD)
 - b. Daily situation reports (SITREPS)
 - c. Daily summary bathymetry data files
 - d. Raw sonar files (EM 302, EK 60, Subbottom, ADCP)
 - e. Refined SOPs for all pertinent operational activities
 - f. Assessments of all activities
2. Science
 - a. Multibeam raw and processed data (see Appendix section for the formal cruise data management plan)
 - b. XBT raw and processed data

- c. EK 60 raw data
- d. Knudsen 3260 sub-bottom profiler raw data
- e. ADCP raw data
- f. Mapping data report

Archive

OER and *Okeanos Explorer* will work together to ensure documentation and stewardship of acquired data sets in accordance with NAO 212-15. The Cruise Information Management System is the primary tool used to accomplish this activity.



VII. Meetings, Vessel Familiarization, and Project Evaluations

A. Shipboard Meetings

A safety brief and overview of POD will occur on the Bridge each morning at 0800. As necessary and no less than every third day, daily Operations Briefing meetings will be held at a time convenient for OPS officer and onboard mapping lead to review the current day, and define operations, associated requirements, and staffing needs for the following day. A Plan of the Day (POD) will be posted each evening for the next day in specified locations throughout the ship. Daily Situation Reports (SITREPS) will be posted as well and shared daily through e-mail.

1. Pre-Cruise Meeting:

The Expedition Coordinator and Commanding Officer will conduct a meeting of pertinent members of the scientific party and ship's crew to discuss required equipment, planned operations, concerns, and establish mitigation strategies for all concerns. This meeting shall be conducted before the beginning of the project with sufficient time to allow for preparation of the ship and project personnel. The ship's Operations Officer usually is delegated to assist the Expedition Coordinator in arranging this meeting.

2. Vessel Familiarization Meeting:

The Commanding Officer is responsible for ensuring scientific personnel are familiarized with applicable sections of the standing orders and vessel protocols; e.g., meals, watches, etiquette, drills, etc. A vessel familiarization meeting shall be conducted in the first 24 hours of the project's start and is normally presented by the ship's Operations Officer.

3. Post-Cruise Meeting:

The Commanding Officer is responsible for conducting a meeting no earlier than 24 hours before or seven days after the completion of a project to discuss the overall project outcomes. During this meeting the following will be discussed; concerns regarding safety and efficiency; challenges encountered and suggestions for future improvements (all mitigation ideas will be

documented for future projects); as well as successes during the project. This meeting shall be attended by ship's officers, applicable crew, the Expedition Coordinator, and representatives of the scientific party and is normally arranged by the Operations Officer and Expedition Coordinator.

4. Project Evaluation Report:

Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Chief Scientist. The form is available at <https://sites.google.com/a/noaa.gov/omao-intranet-dev/operations/marine/customer-satisfaction-survey> and provides a "Submit" button at the end of the form. It is also located at https://docs.google.com/a/noaa.gov/forms/d/1a5hCCkgIwaSII4DmrHPudAehQ9HqhRqY3J_FXqbJp9g/viewform. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the ships, specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least twenty-one days prior to the survey (e.g., Expedition Coordinator is allergic to fin fish).

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Expedition Coordinator. The Expedition Coordinator and Operations Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current makeup of the ship's complement. The Expedition Coordinator is responsible for ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen return; and for the return of any room keys which were issued. The Expedition Coordinator is also responsible for the cleanliness

of the laboratory spaces and the storage areas utilized by the scientific party, both during the cruise and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Expedition Coordinator will ensure that all non-NOAA or non-Federal scientists aboard also have proper orders. It is the responsibility of the Expedition Coordinator to ensure that the entire scientific party has a mechanism in place to provide lodging and food and to be reimbursed for these costs in the event that the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled project.

All persons boarding NOAA vessels give implied consent to comply with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to inspection or search at any time. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 7, 1999 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, NF 57-10-01 (3-14)) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Chief Scientist or the NOAA website <http://www.corporateservices.noaa.gov/noaaforms/eforms/nf57-10-01.pdf>.

All NHSQs submitted after March 1, 2014 must be accompanied by [NOAA Form \(NF\) 57-10-02](#)- Tuberculosis Screening Document in compliance with [OMAO Policy 1008](#) (Tuberculosis Protection Program).

The completed forms should be sent to the Regional Director of Health Services at the applicable Marine Operations Center. The NHSQ and Tuberculosis Screening Document should reach the Health Services Office no later than 4 weeks prior to the start of the project to allow time for the participant to obtain and submit additional information should health services require it, before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of either form. Ensure to fully complete each form and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to

sail if a legible email address is provided on the NHSQ.

The participant can mail, fax, or email the forms to the contact information below. Participants should take precautions to protect their Personally Identifiable Information (PII) and medical information and ensure all correspondence adheres to DOC guidance (http://ocio.os.doc.gov/ITPolicyandPrograms/IT_Privacy/PROD01_008240).

The only secure email process approved by NOAA is [Accellion Secure File Transfer](#) which requires the sender to setup an account. [Accellion's Web Users Guide](#) is a valuable aid in using this service, however to reduce cost the DOC contract doesn't provide for automatically issuing full functioning accounts. To receive access to a "Send Tab", after your Accellion account has been established send an email from the associated email account to accellionAlerts@doc.gov requesting access to the "Send Tab" function. They will notify you via email usually within 1 business day of your approval. The "Send Tab" function will be accessible for 30 days.

Contact Information:

Regional Director of Health Services
Marine Operations Center – Atlantic
439 W. York Street
Norfolk, VA 23510
Telephone: (757) 441.6320
Fax: (757) 441.3760
E-mail: MOA.Health.Services@noaa.gov

Please make sure the medical.explorer@noaa.gov email address is cc'd on all medical correspondence.

Prior to departure, the Expedition Coordinator must provide a listing of emergency contacts to the Operations Officer for all members of the scientific party, with the following information: name, address, relationship to member, and telephone number.

Emergency contact form is included as Appendix A.

C. Shipboard Safety

Hard hats are required when working with suspended loads. Work vests are required when

working near open railings and during small boat launch and recovery operations. Hard hats and work vests will be provided by the ship when required.

Wearing open-toed footwear or shoes that do not completely enclose the foot (such as sandals or clogs) outside of private berthing areas is not permitted. Steel-toed shoes are required to participate in any work dealing with suspended loads, including CTD deployments and recovery. The ship does not provide steel-toed boots.

Operational Risk Management: For every operation to be conducted aboard the ship (NOAA-wide initiative), risk management procedures will be followed. For each operation, risks will be identified and assessed for probability and severity. Risk mitigation strategies/measures will be investigated and implemented where possible. After mitigation, the residual risk will have to be assessed to make Go-No Go decisions for the operations. Particularly with new operations, risk assessment will be ongoing and updated as necessary. This does not only apply to over-the-side operations, but to everyday tasks aboard the vessel that pose risk to personnel and property.

- CTD, ROV (and other pertinent) ORM documents will be followed by all personnel working onboard *Okeanos Explorer*.
- All personnel onboard are in the position of calling a halt to operations/activities in the event of a safety concern.

D. Communications

A daily situation report (SITREP) on operations prepared by the Expedition Coordinator will be relayed to the program office. Sometimes it is necessary for the Expedition Coordinator to communicate with another vessel, aircraft, or shore facility. Through various modes of communication, the ship is able to maintain contact with the Marine Operations Center on an as needed basis. These methods will be made available to the Expedition Coordinator upon request, in order to conduct official business. The ship's primary means of communication with the Marine Operations Center is via e-mail and the Very Small Aperture Terminal (VSAT) link. VSAT bandwidth at **9 Mbps** will be paid by OER and provided by OMAO.

Specific information on how to contact NOAA Ship *Okeanos Explorer* and all other fleet vessels can be found at <http://www.moc.noaa.gov/MOC/phone.html#EX>

Important Telephone and Facsimile Numbers and E-mail Addresses

Ocean Exploration and Research (OER):

OER Program Administration
Phone: (301) 734-1010
Fax: (301) 713-4252
E-mail: craig.russell@noaa.gov

University of New Hampshire, Center for Coastal and Ocean Mapping

Phone: (603) 862-3438
Fax: (603) 862-0839

NOAA Ship *Okeanos Explorer* - Telephone methods listed in order of increasing expense:

Okeanos Explorer Cellular: (401) 713-4114
Okeanos Explorer Iridium: (808) 659-9179
OER Mission Iridium (dry lab): (808) 851-3827

EX INMARSAT B
Line 1: 011-870-764-852-328
Line 2: 011-870-764-852-329

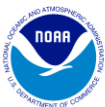
Voice Over Internet Protocol (VoIP) Phone:
(541) 867-8932
(541) 867-8933
(541) 867-8934

E-mail: Ops.Explorerer@noaa.gov- (mention the person's name in SUBJECT field)

E-mail: expeditioncoordinator.explorerer@noaa.gov for dissemination of all hands emails by Expedition Coordinator while onboard. See ET for password.

E. IT Security

1. Any computer that will be hooked into the ship's network must comply with the OMAO Fleet IT Security Policy 1.1 (November 4, 2005) prior to establishing a direct connection to the NOAA WAN. Requirements include, but are not limited to: Installation of the latest virus definition (.DAT) file on all systems and performance of a virus scan on each system.
2. Installation of the latest critical operating system security patches.
3. No external public Internet Service Provider (ISP) connections.



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Completion of these requirements prior to boarding the ship is required.

Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within three days of embarking.

F. Foreign National Guests Access to OMAO Facilities and Platforms

Not applicable to this cruise.



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