



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

MEMORANDUM FOR: Captain Mark Wetzler, NOAA
Commanding Officer, NOAA Ship *Okeanos Explorer*

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

SUBJECT: Project Instruction for EX-17-01
Kingman/Palmyra, Jarvis (Mapping)

Attached is the final Project Instruction for EX-17-01, Kingman/Palmyra, Jarvis (Mapping), which is scheduled aboard NOAA Ship *Okeanos Explorer* during the period of January 18²⁰ - February 10, 2017. Of the 24 DAS scheduled for this project, 7 DAS are funded by an OAR Line Office Allocation, and 17 DAS are funded by NOAA National Marine Fisheries Service. This project is estimated to exhibit a Medium Operational Tempo. Acknowledge receipt of these instructions via e-mail to ChiefOps.MOA@noaa.gov at Marine Operations Center-Atlantic. *SMC*





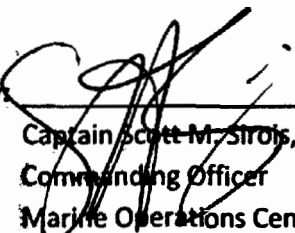
Ocean Exploration and Research

FINAL Project Instructions

Date Submitted: January 17, 2016
Platform: NOAA Ship *Okeanos Explorer*
Project Number: EX-17-01
Project Title: Kingman/Palmyra, Jarvis (Mapping)
Project Dates: January 18 – February 10, 2017

Prepared by: _____ **Dated:** _____
Michael White, NOAA
Expedition Coordinator
Office of Ocean Exploration & Research

Approved by:  _____ **Dated:** 1/17/2017
Craig Russell
Program Manager
Office of Ocean Exploration & Research

Approved by:  _____ **Dated:** 1/18/2017
Captain Scott M. Stolis, NOAA
Commanding Officer
Marine Operations Center - Atlantic



I. Overview

“America’s future depends on understanding the ocean. We explore the ocean because its health and resilience are vital to our economy and to our lives. We depend on the ocean to regulate weather and climate; sustain a diversity of life; for maritime shipping and national defense; and for food, energy, medicine, and other essential services to humankind.”

- NOAA Office of Ocean Exploration and Research Strategic Plan

A. Brief Summary and Project Period

This document contains project instructions for EX-17-01. Operations for this cruise will strategic mapping transits and focused mapping operations within several marine protected areas. The expedition will commence on January 18, 2017 in Honolulu, Hawaii (21° 22.008'N, 157° 57.922'W) and conclude on February 10, 2017 in Pago Pago, American Samoa (14° 16.3'S, 170° 41.22'W). Operations will include the use of the ship’s deep water mapping systems (Kongsberg EM302 multibeam sonar, EK60 split-beam fisheries sonars, ADCPs, and Knudsen 3260 chirp sub-bottom profiler sonar), and the ship’s high-bandwidth satellite connection for real-time ship to shore communications. Focused mapping operations will occur in the Pacific Remote Islands Marine National Monument (PRIMNM)(U.S) in the vicinity of Kingman Reef and Palmyra Atoll, and Jarvis Island, as well as in the Phoenix Islands Protected Area (PIPA) (Republic of Kiribati).

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 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 (EM 302, EK 60, Knudsen sub-bottom, ADCPs) 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.

This expedition is part of a three year Campaign to Address Pacific monument Science, Technology, and Ocean Needs ([CAPSTONE](#)) focused on systematically collecting baseline information to support science and management needs within and around the Monuments and other protected places in the Pacific, and serves as an opportunity for NOAA and the Nation to highlight the uniqueness and importance of these national symbols of ocean conservation. NOAA will continue to work with the scientific and management community to characterize unknown and poorly-known areas through telepresence-based exploration. Baseline information collected during this cruise will support and catalyze further exploration, research and management activities.

Understanding biogeographic patterns between and among the Pacific Monuments and Sanctuaries is a coordinating theme for CAPSTONE science priorities. Themes and objectives for the expedition series include:



- Conduct preliminary seafloor mapping operations in preparation for remotely operated vehicle dives to occur during EX-17-03 and EX-17-05.
- Conduct preliminary seafloor mapping operations to contribute to geological understanding of remote areas of the Pacific Ocean.
- Acquire data to support priority Monument and Sanctuaries science and management needs, including habitat surveys in recently expanded boundary areas;
- Identify and characterize vulnerable marine habitats - particularly potential locations for high density deep sea coral and sponge communities;
- Characterize seamounts within 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; and
- Provide a foundation of publicly accessible data and information products to spur further exploration, research, and management activities.

Originally created by Presidential Proclamation 8336 of January 6, 2009, Pacific Remote Islands Marine National Monument (PRIMNM) boundaries were expanded by Presidential Proclamation 9173, dated September 29, 2014. The expansion includes waters adjacent to Jarvis Island.

Operations will include 24 hour/day mapping operations using the ship's deep water mapping systems (Kongsberg EM302 multibeam sonar, EK60 split-beam fisheries sonars, and Knudsen 3260 chirp sub-bottom profiler sonar), CTD rosette, and the ship's high-bandwidth satellite connection for real-time ship to shore communications. Operations for this cruise will include 24 hour mapping, and continuous telepresence-based remote participation in mapping operations. Multibeam and singlebeam 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 onboard procedures and will be archived with the National Centers for Environmental Information (NCEI).

The transit routes between ports and the operating area 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 fifth cruise to test telepresence enabled mapping operations on Okeanos Explorer. This will be the most dynamic of the five cruises thus far, with mapping efforts to include preplanned mapping surveys over many seamounts during transit and within three geographically discrete marine protected areas.

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 (Michael White).

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 be extensively tested for its reliability and feasibility of controlling the mapping data acquisition from shore. The raw data will be transmitted to shore and further processing will be completed on shore. The onboard mapping lead will be the primary liaison between ship and OER operations and will be attending all the shipboard daily meetings and providing 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 up of the ship conducting operations with nimble teams of mapping personnel onboard with 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, 7 DAS are funded by an OAR Line Office Allocation, 0 DAS are Program Funded, and 17 DAS are funded by NOAA National Marine Fisheries Service. This project is estimated to exhibit a Medium Operational Tempo due to 24 hour mapping operations.

C. Operating Area

EX-17-01 of the CAPSTONE Expeditions is a 24 hour mapping cruise that will focus on numerous previously unmapped seamounts within the following:

- transit through international waters during southward transit from Honolulu
- within waters offshore from Kingman Reef and Palmyra Atoll areas of PRIMNM
- within Jarvis Island area of PRIMNM
- within the Phoenix Islands Protected Area
- transit within waters of Tokelau (pending permit), keeping outside of 12 nm from shore
- transit within waters of Samoa (pending permit)
- transit within waters of American Samoa to final port of Pago Pago



Mapping operations will focus in depths generally between 250 and 6,000 meters.

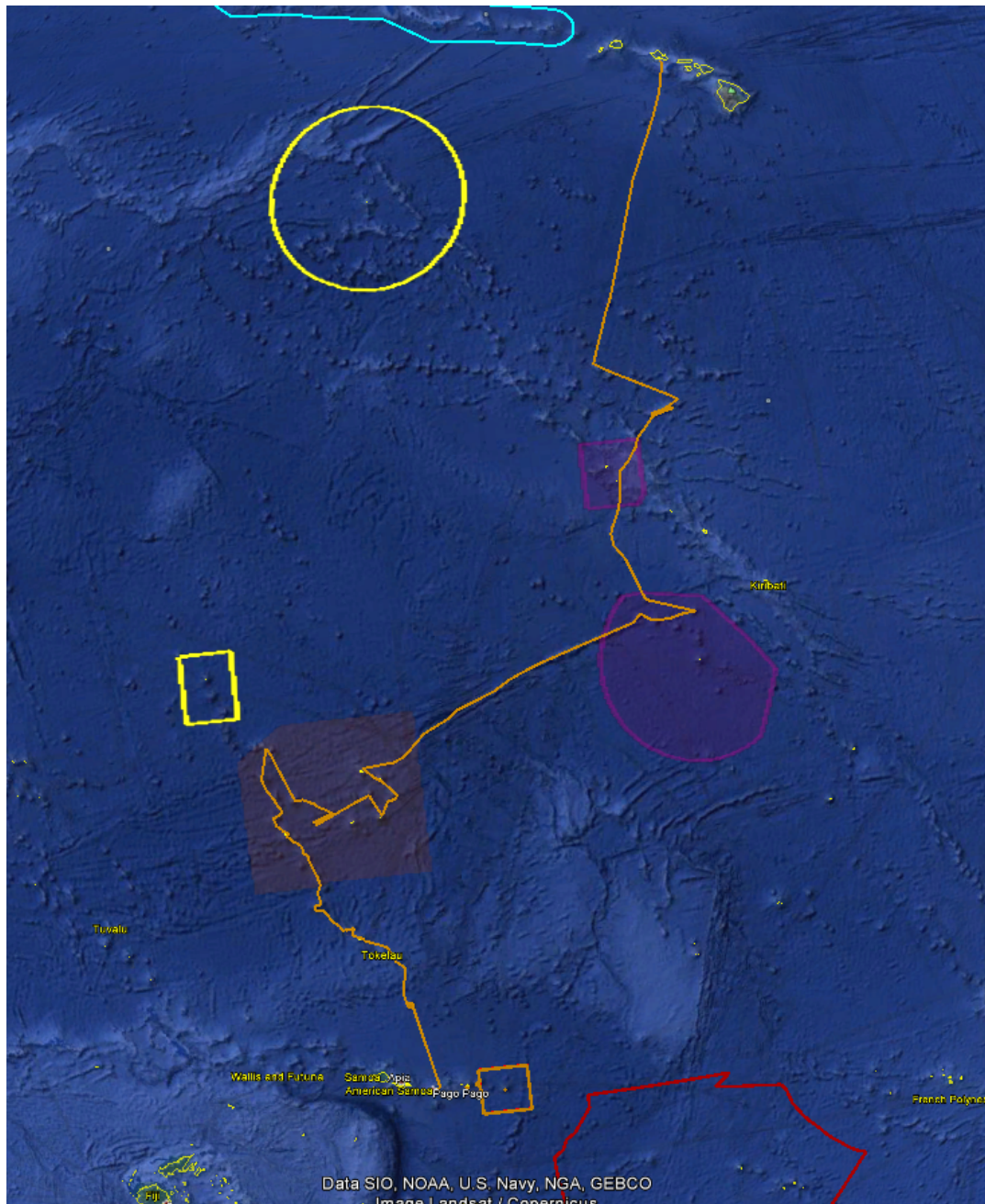


Figure 1:Map indicating the overall operating area of *Okeanos Explorer* for EX-17-01. The gold line is the estimated overall cruise track, which is expected to change slightly following examination of existing data. The purple polygons are areas within PRIMNM; Kingman Reef and Palmyra to the north and Jarvis Island to the south. The orange polygon is the PIPA, part of the Republic of Kiribati

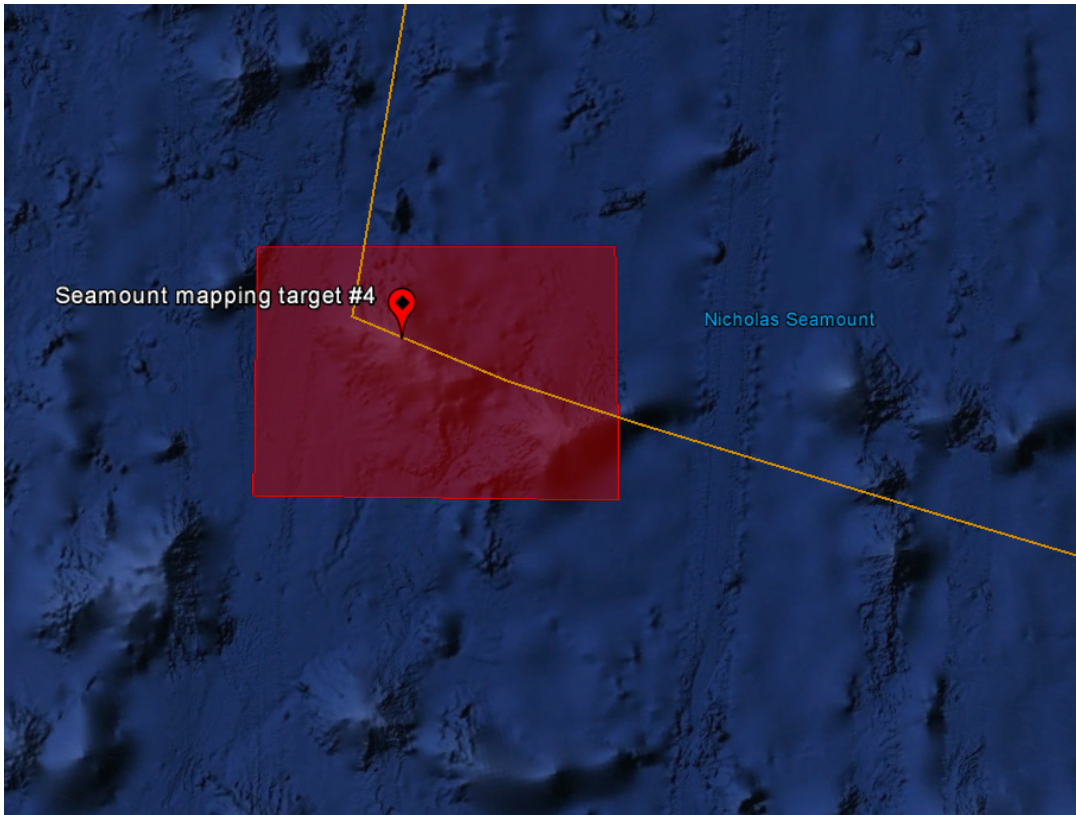


Figure 2: Close up of transit mapping and focused mapping of one of the Navy Red dot seamount mapping targets, known as Seamount Mapping #4. This area will be the focus of a 10x10 nautical mile targeted survey.

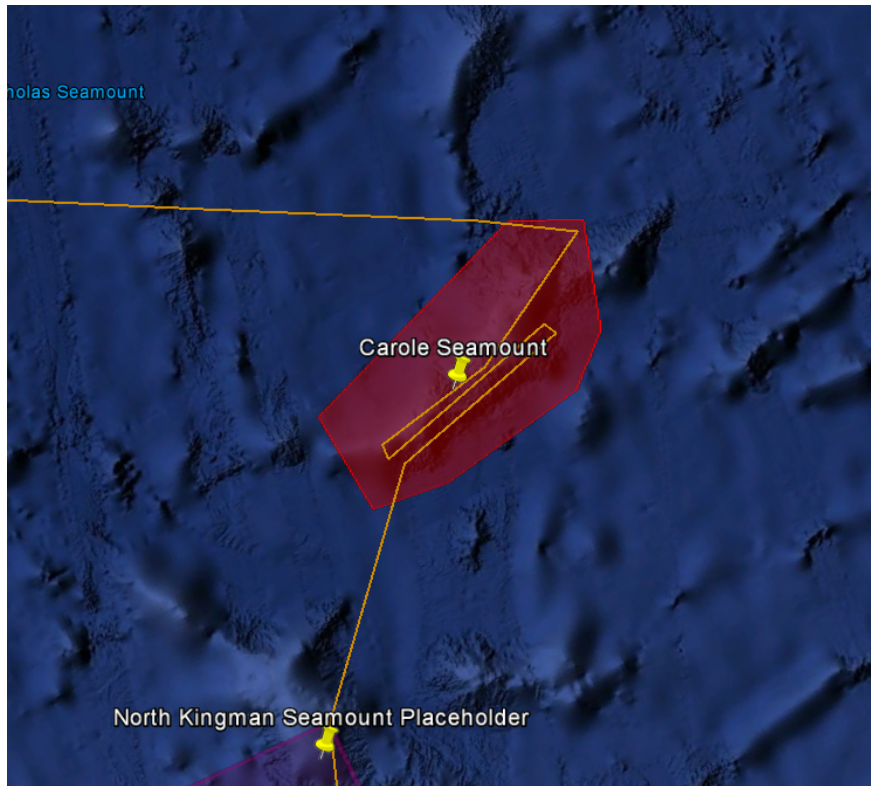


Figure 3: Close up of Carole Seamount mapping target, northeast of the North Kingman Seamount.

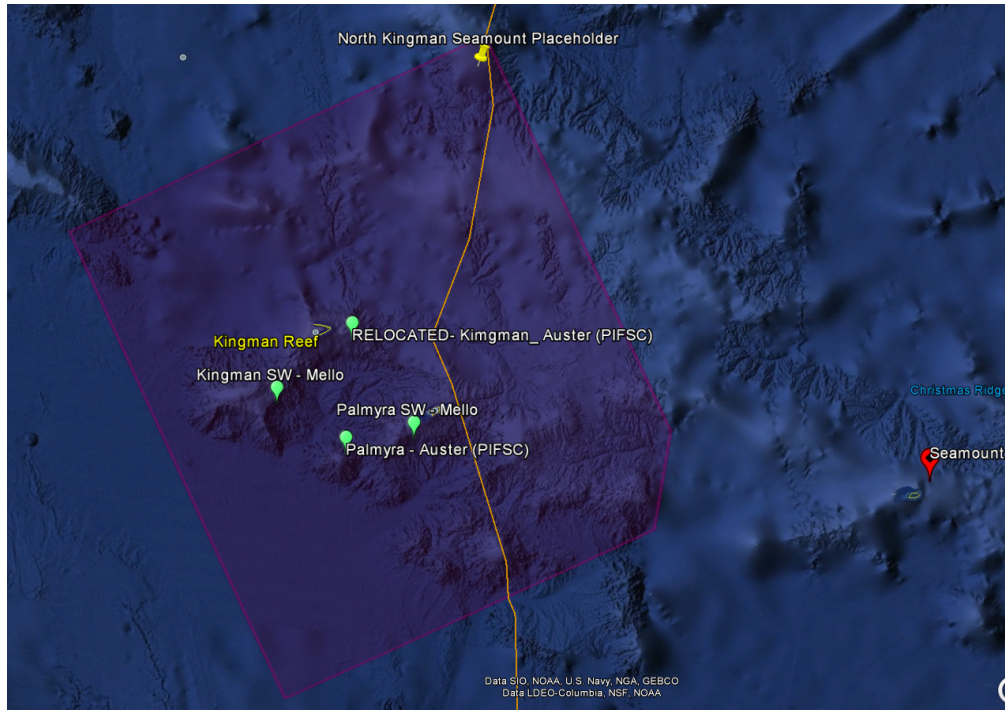


Figure 4: Close up of EX1701 transit through King Reef/Palmyra Area of PRIMNM.

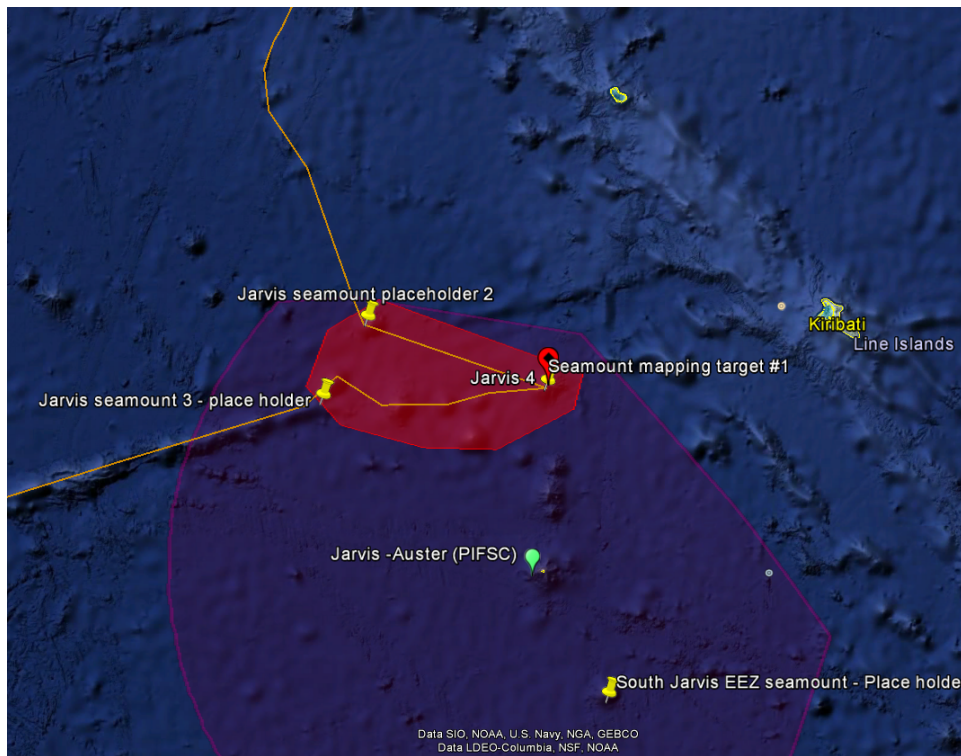


Figure 5: Transit of EX1701 through Jarvis Island area of PRIMNM. The seamounts within the red polygon will be targets for focused surveys. Little to no data exists within this region.

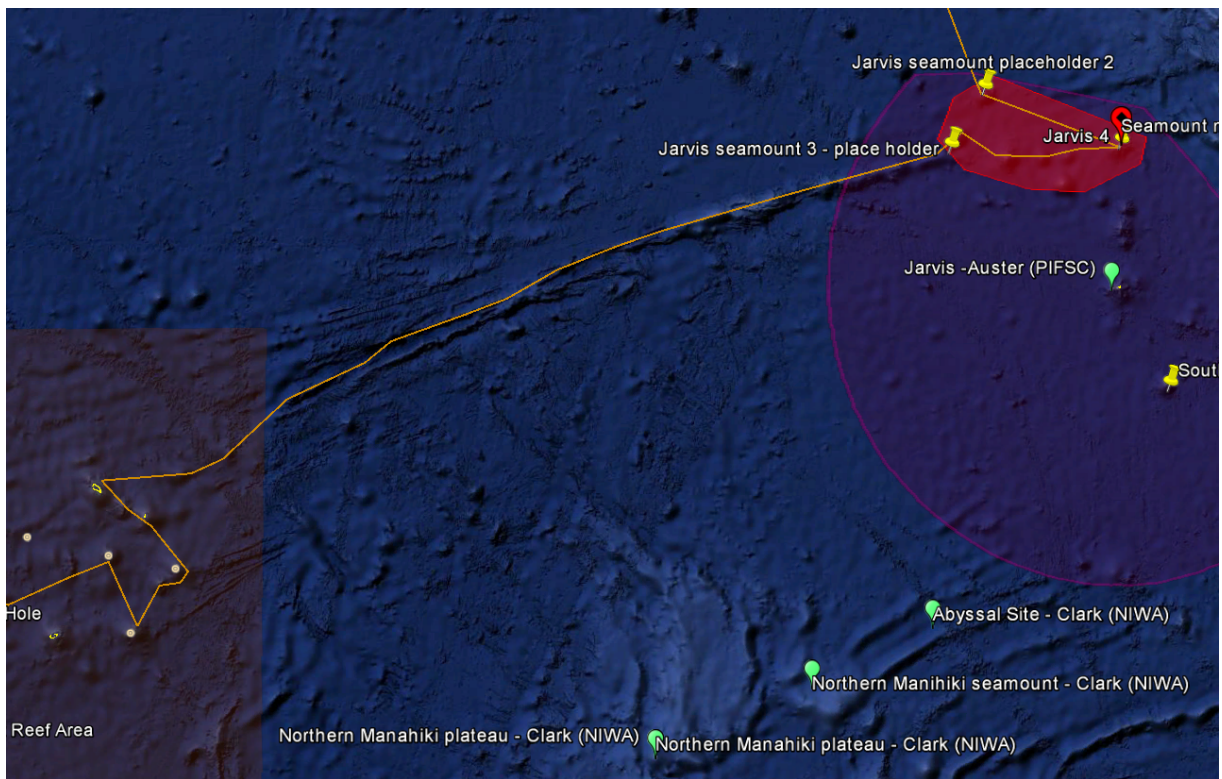


Figure 6: Transit of EX1701 along the Clipperton fracture zone between Jarvis and Eastern PIPA.

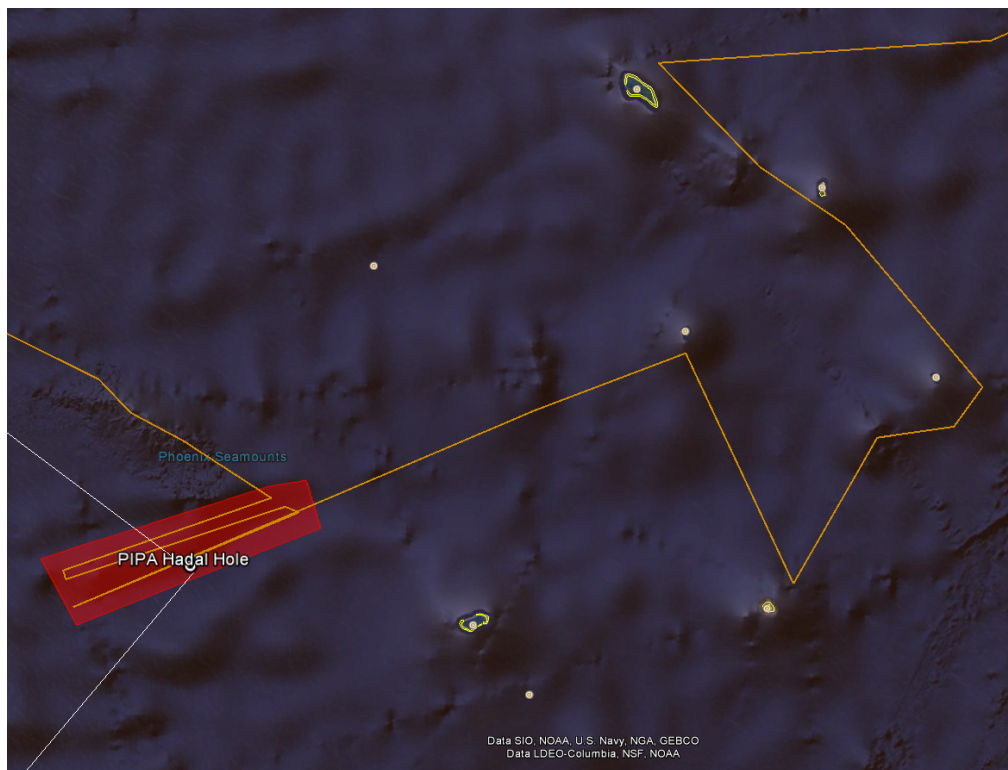


Figure 6: Transit of EX1701 between the eastern PIPA seamounts and Hadal Hole. The Hadal Hole area and individual seamounts will be targeted for focused mapping surveys,

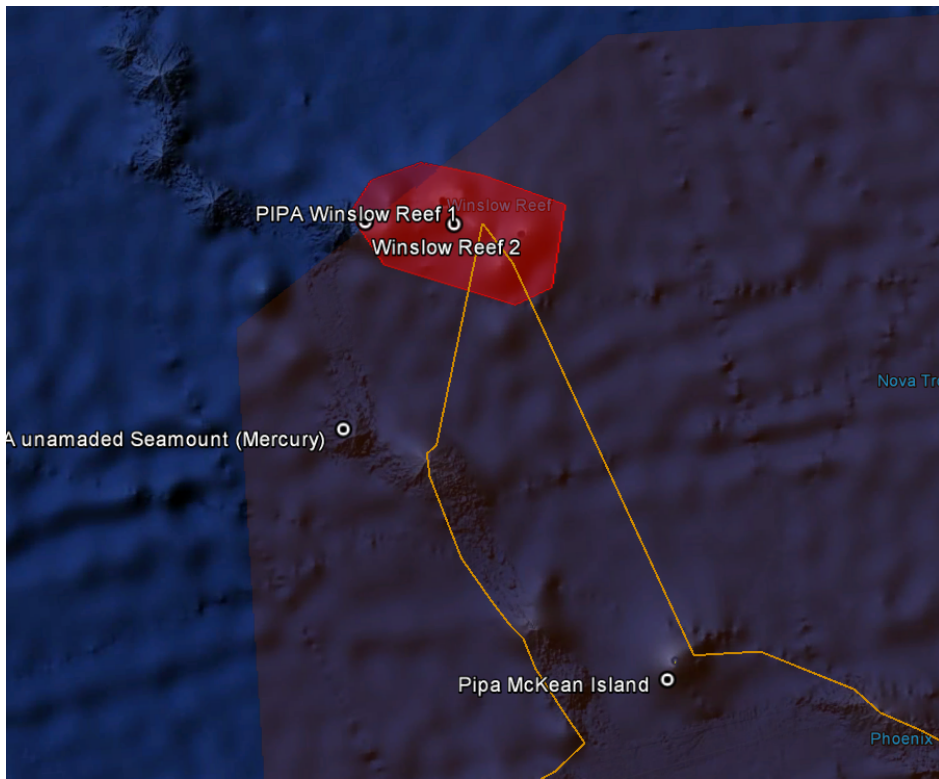


Figure 7: Close-up of the Winslow Reef area within northern PIPA. Winslow Reef is a high priority area for focused mapping surveys on EX1701.

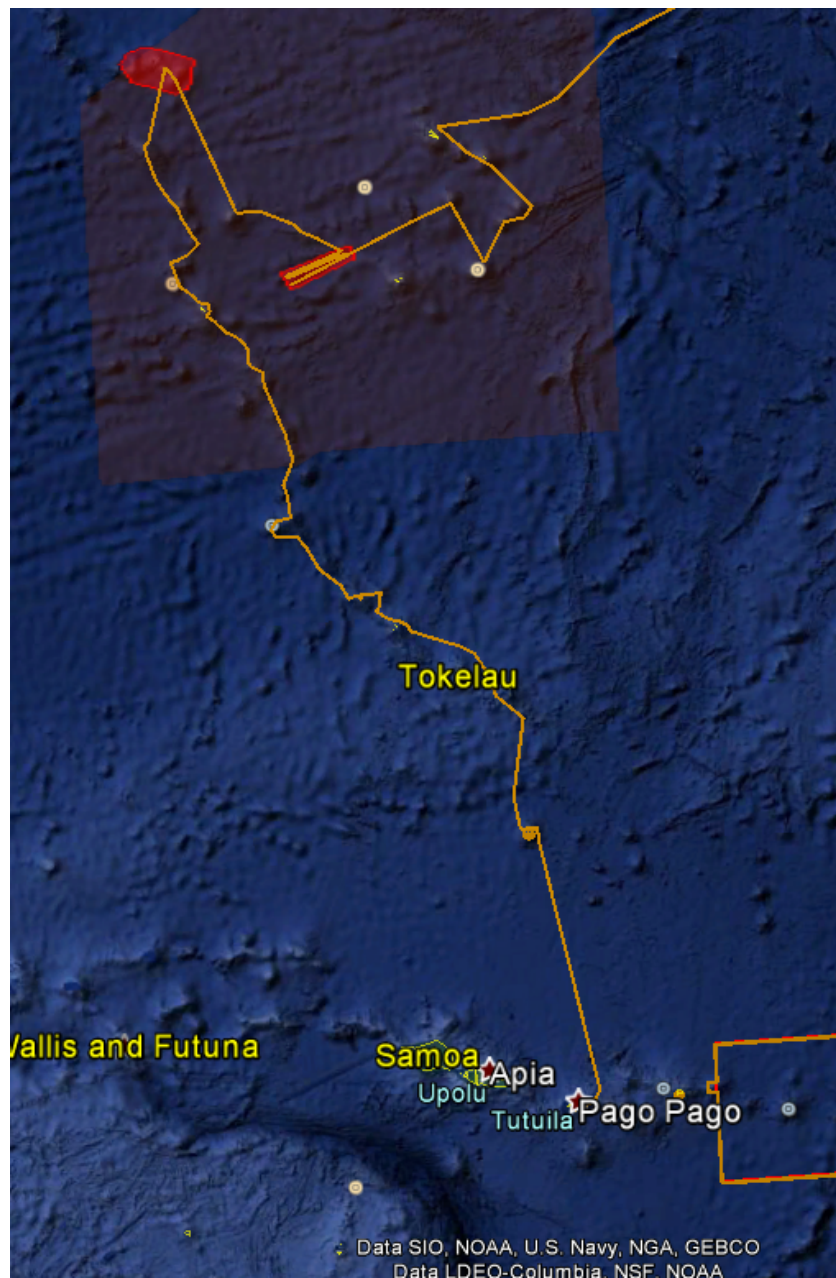


Figure 8: EX1701 transit from Winslow Reef, northern red polygon, through PIPA, orange polygon, and Tokelau. Based on current permissions, EX1701 will stay 12 nautical miles from all Tokelau owned Islands. The ship will arrive in Pago Pago, American Samoa on February 10th, 2017.

Kingman Reef / Palmyra Atoll generalized operating area coordinates		
ID	Latitude	Longitude
NW corner	7° 10.922'N	163° 9.170'W
NE corner	7° 11.860'N	161° 14.239'W
SE corner	5° 11.701'N	161° 27.257'W
SW corner	5° 7.390'N	163° 5.325'W

Table 1: Bounding coordinates of the Kingman/Palmyra operating area shown in Figure 1.

Jarvis generalized operating area coordinates		
ID	Latitude	Longitude
NW corner	1° 52.304'N	162° 24.093'W
NE corner	1° 19.586'N	159° 37.558'W
SE corner	0° 35.313'N	159° 37.717'W
SW corner	0° 25.658'N	163° 10.993'W

Table 2: Bounding coordinates of the Jarvis Island operating area shown in Figure 1.

PIPA generalized operating area coordinates		
ID	Latitude	Longitude
NW corner	1° 34.206'S	174° 58.306'W
NE corner	1° 28.832'S	169° 45.878'W
SE corner	6° 12.263'S	169° 58.161'W
SW corner	6° 16.344'S	175° 33.054'W

Table 3: Bounding coordinates of the PIPA operating area shown in Figure 1.

Detailed survey plans for Hypack and ECDIS for each focused survey will be provided in advance of the cruise.

Tables of transit line coordinates will be provided as transit plans are finalized. A detailed table of coordinates can be found in the Appendices.



D. Summary of Objectives

January 18 - February 10, 2017 (Honolulu, Hawaii to Pago Pago, American Samoa) Telepresence-enabled Mapping Operations.

EX-17-01 operations will occur in US, high seas, and foreign waters as detailed above in Section C: Operating Area. This cruise will collect baseline data and information to support priority NOAA science and management needs in three marine protected areas of the Pacific Ocean.

Mission objectives for EX-17-01 include a combination of mapping/operational, science, education, outreach, and data management objectives:

1. Conduct 24 mapping operations for duration of the cruise
 - a. Collect high resolution mapping data from sonars in priority areas as dictated by operational needs as well as science and management community needs.
 - b. Collect bathymetric, seafloor backscatter, water column backscatter, and ADCP data.
 - c. Subbottom sonar 24 hour data collection will be at the discretion of the CO.
 - d. Collect XBT and Underway CTD casts at regular intervals no longer than 6 hours, as data quality requires, during mapping operations.
 - e. Average survey speeds of 8.5-9 kts will be utilized.
 - f. Transit speeds up to 10-10.5 kts between focused mapping areas is expected.
 - g. Onboard creation of daily standard mapping products.
 - h. Collection of sun photometer measurements as part of survey of opportunity.
2. Map previously unmapped seamount within PRIMNM and PIPA as detailed in Section 1C above.
 - a. Characterization of seamounts within 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.
 - b. Collect information on the geologic history of Pacific Seamounts
3. Utilize all transits between start and end ports to the survey working grounds to conduct exploratory mapping operations.
 - a. Transit points will map significant geologic features, primarily seamounts and ridges, along a line not deviating far from the direct circle route.
 - b. Map three seamounts as requested by Navy Red Dots program.
 - c. Average transit speeds of 10 - 10.5 kts will be utilized; however a more conservative 9-9.5 kts will be used for transit time calculation.
 - d. Run a crossline over multibeam data collected on this expedition as part of continuing efforts to ensure good data quality.
4. Telepresence enabled mapping operations (VSAT 10mbps ship to shore; 1.54 mbps shore to ship)
 - a. Maintain two live video streams from ship to shore



- i. The primary stream will be the multibeam mapping display
 - ii. The secondary stream will be the split EK60/Knudsen screen, Hypack line monitoring screen, or other relevant screens, including sonar processing computers or onboard video cameras as necessary.
 - b. Hourly data transfer to shore to include all raw sonar files including multibeam (.all and .wcd), spit beam, and subbottom.
 - c. Daily transfer to shore of multibeam daily summary products
 - d. Explore telepresence enabled mapping possibilities for potential offering to individuals who may not have the ability to sail for a variety of reasons
5. Train onboard personnel, including new OER physical scientist / expedition coordinator in data collection and processing procedures as needed (continuous throughout cruise).
6. Shoreside operation of sonar computers on the ship using desktop access through NOAA OMAO supplied laptop.
- a. Test telepresence mapping workflow with expedition coordinator based on shore (OER Physical Scientist at UNH)
 - b. Provide training in operating sonar computers to onshore Explorers in Training
 - c. Support onboard watchstanders by monitoring data collection from shore in realtime
 - d. Provide data acquisition and processing troubleshooting from shore.
7. Science
- a. Acquire mapping data to support priority Monument and Sanctuaries science and management needs
 - b. Collect mapping data to be used to generate baseline characterization maps to explore the diversity and distribution of benthic habitats –including bottom fish habitats, deep sea and precious coral communities
 - c. Collect acoustic mapping data at sites to aid the understanding of the geologic history of the Pacific seamounts
 - d. Successfully conduct operations in conjunction with shore-based Exploration Command Centers and remote science team participants
 - e. Create and provide input into standard science products to provide a foundation of publicly accessible data and information products to spur further exploration, research, and management activities.
 - f. Run the ADCPs in relatively shallow water leaving Honolulu, HI to collect datasets necessary to check transducer alignment angles.
8. Conduct emergency drills. Drills may include some or all of the following as determined by CO:
- a. Fire/Damage Control
 - b. Abandon Ship



- c. Man-Over-Board
- d. Steering Casualty
- e. Oil Spill/ Hazmat spill

9. Conduct water column sound velocity profile measurements via XBT and Underway CTD.
 - a. Water column sound velocity casts will be collected at regular intervals of no more than 6 hours in support of multibeam sonar operations
 - b. Update and document procedures for processing sound velocity profiles as a result of updated software (Velocipy and Sound Speed Manager) and newly operational acquisition systems (ex. Automatic XBT launcher).

10. The longstanding NASA marine aerosols network survey of opportunity will continue for the cruise.

11. There is potential that a few ARGO floats will be deployed during this cruise. Discussion with ARGOS scientists have existing longstanding permits for the region. Currently four Argos deployment locations are planned. The required permits and documentation have been attached as appendices.

Longitude	Latitude
-161.2294	13.0446
-162.9239	0.8234
-165.4400	-0.0495
-167.8021	-0.9225

Table 4: Proposed Argos Locations



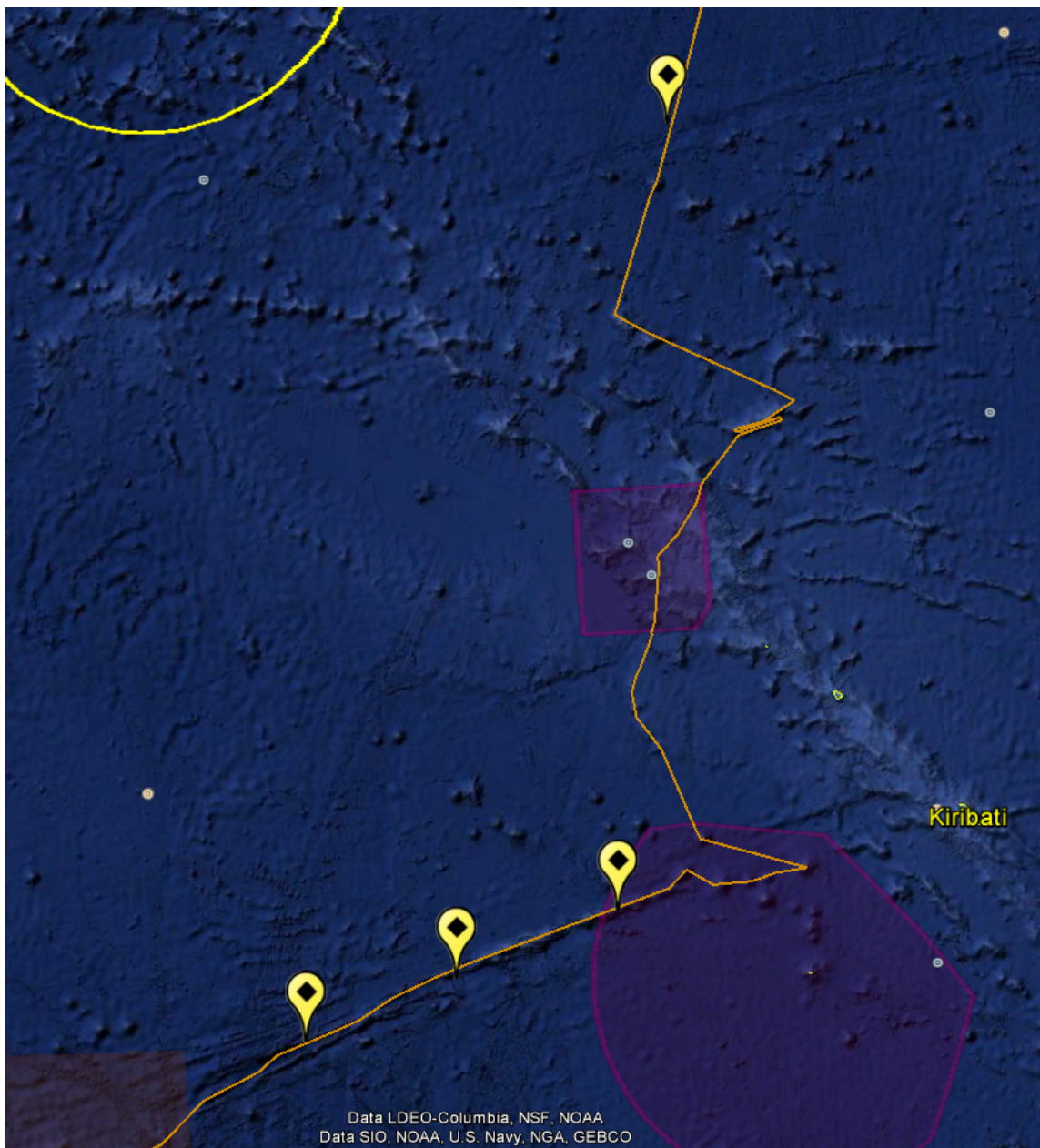


Figure XX: Proposed locations of Argos deployments (yellow) along the EX1701 trackline (gold). Four deployments are currently being planned.

12. Data Management

- a. Provide a foundation of publicly accessible data and information products to spur further exploration, research, and management activities
- b. Provide daily products to shore for operational decision making purposes
- c. Ensure Underwater Cultural Heritage (UCH) data protection protocols are followed, if relevant

13. Outreach



- a. Basic live interactions may occur (TBD)

14. Education

- a. Potentially host two at-sea EITs on the ship
 - i. Provide traditional offshore EIT experience including at-sea operations related to deep water sonar data acquisition and processing techniques

15. Ship

- a. Continue to refine SOPs for the New VSAT
- b. Provide high a high quality stable internet connection with the new VSAT.

16. Review mapping-specific best practices and procedures with the ship's officers and department heads.

- a. Review sonar and marine mammal procedure for 2017- confirm quick read version is easily accessible on bridge.
- b. Review with ship's crew scientific equipment powerpoint – schedule with good attendance from engineering, deck, and bridge. Consider leaving a version on bridge.
- c. Review pre-mapping checklist (originally made by Lt. Emily Rose) with bridge officers – post on wall on bridge to facilitate good communication between Survey Department and the bridge.
- d. Review diagram describing deep water line driving and turning best practice.

17. Work with ET Department to test hot-swappable spare EM302 workstation.

18. There is currently discussion around a potential port call at the Island of Kanton (Phoenix Islands). This port call will build on regional stakeholder relationships as well as provide an opportunity for general education and outreach. The tentative dates are the 29th and 30th of January but this remains to be finalized.

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
- NOAA National Marine Fisheries Service, Pacific Islands Regional Office, 1845 Wasp Blvd, Honolulu, HI 96818



- NOAA National Marine Fisheries Service, Marine National Monuments Program, 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

Name (First, Last)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Michael White	Onboard Mapping Lead	1/15	2/12	M	OER (ERT Corp)	USA
Jason Meyer	Mapping Watch Lead	1/16	2/12	M	UCAR	USA
Daniel Freitas	Mapping Watch Lead	1/16	2/12	M	UCAR	USA
Jay Chitnis	Explorer in Training / Watch Stander	1/17	2/12	M	UCAR	USA
Sarah Rosenthal	Explorer in Training / Watch Stander	1/17	2/12	F	UCAR	USA

G. Administrative

1. Points of Contact:

Ship Operations

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

Mission Operations



Elizabeth 'Meme' Lobecker
Mapping Manager
NOAA Office of Ocean Exploration
and Research (ERT)
O: (603) 862-1475
C: (240) 429-7023
E-mail: elizabeth.lobecker@noaa.gov

CAPT Mark Wetzler, NOAA
Commanding Officer
NOAA Ship *Okeanos Explorer*
Phone: (401) 378-8284
Email: CO.Explorer@noaa.gov

Michael White
Expedition Coordinator
O: (603) 862 3438
C: (631) 561-9802
E-mail: michael.white@noaa.gov

LT Aaron Colohan, NOAA
Operations Officer
NOAA Ship *Okeanos Explorer*
Phone: (808) 659-9197 (Ship's Iridium)
E-mail: Ops.Explorer@noaa.gov

Other Mission Contacts

Craig Russell
Program Manager
NOAA Ocean Exploration & Research
Phone: (206) 526-4803 / (206) 518-1068
E-mail: Craig.Russell@noaa.gov

John McDonough, Deputy Director
NOAA Ocean Exploration & Research
Phone: (301) 734-1023 / (240) 676-5206
E-mail: John.McDonough@noaa.gov

Jeremy Potter
Expeditions Director
NOAA Office of Ocean Exploration and Research

Alan Leonardi, Director
NOAA Ocean Exploration & Research
Phone: 301-734-1016/ Mobile: 202-631-1790
E-mail: alan.leonardi@noaa.gov



Phone: (301) 734-1145 / (240) 215-7101

E-mail: jeremy.potter@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 1/11/16.

NOAA Ship Okeanos Explorer

c/o LT Aaron Colohan

1897 Wasp Blvd, Honolulu, HI 96818

2. Diplomatic Clearances

Consent to conduct Marine Scientific Research in the jurisdictional waters of Samoa, Tokelau, and Kiribati has been requested through the U.S. Department of State. In addition, a separate permit is required for entry into and work in the Phoenix Islands Protected Area. That application has also been submitted to Kiribati through diplomatic channels. Clearances are pending (as of 12/6/16).

3. Licenses and Permits

The expedition is being planned and conducted by NOAA as an agency of the U.S. Federal government, in partnership with NOAA NMFS Pacific Islands Regional Office Marine National Monument Program. We do not require a permit to work in the PRIMNM.

MSR permit through Tokelau waters has been requested and is pending. At all times the ship will stay further than 12 nautical miles from shore when transiting through Tokelau waters.

In order to support or conduct Marine Scientific Research within the U.S. EEZ, work funded, authorized and/or conducted by NOAA must be compliant with the National Environmental Policy Act (NEPA). NOAA Administrative Order (NAO) 216-6 describes NOAA's specific obligations with regard to NEPA compliance. Among these is the need to review all NOAA-supported projects with respect to their environmental consequences. In compliance with NAO



216-6 and NEPA, a memorandum describing the project's scientific sensors' possible effects on the environment has been submitted for the project. As expected with ocean research with limited time or presence in the marine environment, the project has been determined to not have the potential to result in any lasting changes to the environment. As defined in Sections 5.05 and 6.03.c.3 (a) of NAO 216-6, this is a research project of limited size or magnitude or with only short-term effects on the environment and for which any cumulative effects are negligible, and as such, the project is categorically excluded from the need to prepare a full-scale NEPA environmental assessment. The categorical exclusion met the requirements of NOAA 216-6 and NEPA, and authorizes the Marine Scientific Research conducted for the project.

Additionally, 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.

The appendices of these project instructions contain all relevant documentation regarding licenses and permits, including categorical exclusion and ESA consultation.



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)

Date	Activities
1/15-1/16	Mission personnel arrive to ship in Honolulu
1/17	Mission personnel safety training and mapping orientation
1/18	Depart Honolulu for survey working grounds, commence exploration transit mapping immediately upon exiting port
1/18-22	Exploration mapping transit to working grounds@ 10 - 10.5 kts, including focused mapping over Carole and Ironwood Seamounts, and Navy Red Dot Mapping Target
1/22 - 1/24	Commence focused mapping activities in Kingman/Palmyra area, speed: 8.5-9 kts
1/24	Depart Kingman/Palmyra area for Jarvis mapping area, transit through Kiribati waters
1/25-1/27	Focused mapping in Jarvis
1/27-1/29	Transit mapping along Clipperton Fracture Zone
1/29 - 2/6	Focused mapping in PIPA
2/6-2/8	Focused mapping in Tokelau waters
2/9	Transit mapping through Samoa and American Samoa water
2/10	Arrive sea buoy Pago Pago in the morning

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

Staging of Argos floats aboard the Okeanos Explorer.

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, including the mapping lead and Explorers-In-Training.
- b. Telepresence interactions will not be scheduled for specific times, but are expected to occur throughout the cruise between onshore personnel at the UNH ECC and onboard mapping watchstanders.

2. In-Port Events

- a. None scheduled.

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. No dives are currently planned prior or during this cruise.

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

- Kongsberg Simrad EM302 MultibeamEchosounder (MBES)
- Kongsberg Simrad EK60DeepwaterEchosounders 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 UnderwayCTD
- LHM Sippican XBT Mark21 System(Deep Blue probes)
- AOML Automated XBT Launcher (Deep Blue probes)
- Seabird SBE 911Plus 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 20 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.



- Argos Floats



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

Item	Use	Approx. locations
95% Denatured Ethanol (10 gallons)	Sample preservation	Wetlab, under the chemical hood
10% Buffered Formalin (3 gallons)	Sample preservation	Wetlab, under the chemical hood
Chaos Buffer (0.5 gallons) (4 M guanidine thiocyanate, 0.5% N-lauroylsarcosine, 25 mM Tris pH 8.0, 0.1 M beta-mercaptoethanol)	Sample preservation (genetics)	Wetlab, under the chemical hood
Aqua Shield	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	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	ROV Workshop Fire cabinet
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
Mineral Oil	Vitrea	Hanger, Vehicles
Por-15	Paint Kit	ROV Workshop Fire cabinet
Univis HVI 13	Hydraulic Fluid	Hanger, ROV D2
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



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. Supplementary Projects

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 F 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 B 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 B 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 ship 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. Daily Operations Briefing meetings will be held at 1330 in the forward lounge 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-Project 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-Project Meeting:

The Commanding Officer is responsible for conducting a meeting no earlier than 24 hrs before or seven days after the completion of a project to discuss the overall success and short comings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Expedition Coordinator, and members 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 Expedition Coordinator. The form is available at <http://www.oma.noaa.gov/fleeteval.html> and provides a "Submit" button at the end of the form. 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 make-up 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 Expedition Coordinator or the NOAA website <http://www.corporateservices.noaa.gov/noaforms/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 four 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 one 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. Hard hats are also 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.

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 15Mbps 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: Firstname.Lastname@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 IP (VoIP) Phone:

(541) 867-8932

(541) 867-8933

(541) 867-8934

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

E-mail: expeditioncoordinator.explorer@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.

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.



Appendix A

EMERGENCY CONTACT DATA SHEET–NOAA SHIPOKEANOS EXPLORER

Scientists sailing aboard *Okeanos Explorer* should fill out the form found at the following link location:

https://docs.google.com/a/noaa.gov/forms/d/1pcoSgPluUVxaY64CM1hJ75l1ilYirTk48G-lv37Am_k/viewform with their emergency contact information



Appendix B

Data Management Plan

Okeanos Explorer (EX1701): Kingman, Palmyra, Jarvis (Mapping)



OER Data Management Objectives

06-Jan-17

Page 1

1. General Description of Data to be Managed

1.1 Name and Purpose of the Data Collection Project

Okeanos Explorer (EX1701): Kingman, Palmyra, Jarvis (Mapping)

1.2 Summary description of the data to be collected.

Operations will include the use of the ship's deep water mapping systems (Kongsberg EM302 multibeam sonar, EK60 split-beam fisheries sonars, ADCPs, and Knudsen 3260 chirp sub-bottom profiler sonar), and the ship's high-bandwidth satellite connection for real-time ship to shore communications.

1.3 Keywords or phrases that could be used to enable users to find the data.

expedition, exploration, explorer, marine education, noaa, ocean, ocean discovery, ocean education, ocean exploration, ocean exploration and research, ocean literacy, ocean research, OER, science, scientific mission, scientific research, sea, stewardship, systematic exploration, technology, transformational research, undersea, underwater, Davisville, mapping survey, multibeam, multibeam backscatter, multibeam sonar, multi-beam sonar, noaa fleet, okeanos, okeanos explorer, R337, Rhode Island, scientific computing system, SCS, single beam sonar, singlebeam sonar, single-beam sonar, sub-bottom profile, water column backscatter, Pago Pago, American Samoa, Pacific Remote Islands Marine National Monument, PRIMNM, Kingman Reef, Palmyra Atoll, Jarvis Island, Phoenix Islands Protected Area, PIPA, Republic of Kiribati, CAPSTONE, biogeographic patterns, Monument and Sanctuaries, habitat surveys, vulnerable marine habitats, Prime Crust Zone, PCZ, deep sea minerals, Central Pacific Seamounts, oceans

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

Okeanos Mapping Cruises

1.5 Planned or actual temporal coverage of the data.

Dates: 1/18/2017 to 2/10/2017

1.6 Planned or actual geographic coverage of the data.

Latitude Boundaries: 0.42 to 7.2

Longitude Boundaries: -175.55 to -161.23

1.7 What data types will you be creating or capturing and submitting for archive?

Cruise Plan, Cruise Summary, Data Management Plan, Highlight Images, Quick Look Report, ADCP, CTD (processed), CTD (product), CTD (raw), EK60 Singlebeam Data, Mapping Summary, Multibeam (image), Multibeam (processed), Multibeam (product), Multibeam (raw), SCS Output (compressed), SCS Output (native), Sub-Bottom Profile data, Water Column Backscatter, XBT (raw)

Okeanos Explorer (EX1701): Kingman, Palmyra, Jarvis (Mapping)



1.8 What platforms will be employed during this mission?

Deep Discoverer ROV. NOAA Ship Okeanos Explorer. SEIRIOS Camera Sled

2. Point of Contact for this Data Producing Project

Overall POC: Elizabeth Lobecker, Multibeam Mapping Expert, Contractor (ERT, Inc.), NOAA Office of Ocean Exploration and Research, elizabeth.lobecker@noaa.gov
 Title: Expedition Coordinator
 Affiliation/Dept: NOAA Office of Ocean Exploration and Research, UNH CCOM/JHC
 E-Mail: elizabeth.lobecker@noaa.gov
 Phone: 603-862-1475

3. Point of Contact for Managing the Data

Data POC Name: Susan Gottfried (stewardship), Andrew O'Brien (shoreside and onboard (remote) data management)
 Title: Data Manager
 E-Mail: susan.gottfried@noaa.gov, andrew.obrien@tgfoe.org

4. Resources

4.1 Have resources for management of these data been identified? True

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 as well as an archive-ready, documented, and compressed NetCDF3 format to NCEI-MD; multibeam data and metadata will be compressed and delivered in a bagit format to NCEI-CO

5.2 What quality control procedures will be employed?

Quality control procedures for the data from the Kongsberg EM302 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. CTDs are post-processed by the data management team as a quality control measure and customized CTD profiles are generated for display on the Okeanos Atlas (explore.noaa.gov/okeanosatlas).

6. Data Documentation

6.1 Does the metadata comply with the Data Documentation Directive? True

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

6.2 Where will the metadata be hosted?

Okeanos Explorer (EX1701): Kingman, Palmyra, Jarvis (Mapping)



- Organization:** An ISO format collection-level metadata record will be generated during pre-cruise planning and published in an OER catalog and Web Accessible Folder (WAF) hosted at NCEI-MS for public discovery and access. The record will be harvested by data.gov.
- URL:** <http://www.ncddc.noaa.gov/rdn/oer-waf/ISO/Resolved/>
- Meta Std:** ISO 19115-2 Geographic Information with Extensions for Imagery and Gridded Data will be the metadata standard employed; a NetCDF3 standard for oceanographic data will be employed for the SCS data; the Library of Congress standard, MACHine Readable Catalog (MARC), will be employed for NOAA Central Library records.

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?

True

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.

- Org:** National Centers for Environmental Information
- URL:** www.ncei.noaa.gov; <https://explore.noaa.gov/digitalatlas>

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

Hold Time: data from Okeanos Explorer are immediately publicly accessible

Authority:

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 FY16 Data Management Plan at NOAA's EDMC DMP Repository (EX_FY17_DMP_Final.pdf) for detailed descriptions of the processes, procedures, and partners involved in this collaborative effort.

8.2 If no archive planned, why?

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

60-90 days

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

Okeanos Explorer (EX1701): Kingman, Palmyra, Jarvis (Mapping)



Appendix C: Categorical Exclusion



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OCEANIC AND ATMOSPHERIC RESEARCH
Office of Ocean Exploration and Research
Silver Spring, MD 20910

January 4, 2017

MEMORANDUM FOR: The Record

FROM: Craig Russell, Program Manager, *Okeanos Explorer* Expeditions
Office of Ocean Exploration & Research (OER)

SUBJECT: NEPA Categorical Exclusion for NOAA Ship *Okeanos Explorer*
Cruise EX-17-01, Vicinity of Central Pacific Marine Protected Areas
(Mapping)

This memorandum documents the applicability of a Categorical Exclusion under the National Environmental Policy Act to the NOAA Ship *Okeanos Explorer* Cruise EX-17-01 activities that NOAA's Office of Ocean Exploration & Research (OER) is undertaking for 24 days leaving Honolulu, HI, working in and around areas of the Pacific Remote Islands Marine National Monument (PRIMNM), Phoenix Islands Protected Area (PIPA) and arriving in Pago Pago, American Samoa. NAO 216-6, Environmental Review Procedures, requires all proposed projects to be reviewed with respect to environmental consequences on the human environment. The proposed action is to collect data using the sonar mapping systems on the NOAA vessel *Okeanos Explorer*.

Description of the Project

This Categorical Exclusion addresses NOAA Ship *Okeanos Explorer* cruise EX-17-01 "Kingman/Palmyra, Jarvis (Mapping)" led by Elizabeth Lobecker, Expedition Manager for NOAA OER. This expedition serves as an opportunity for NOAA and the Nation to highlight the uniqueness and importance of the Pacific Monuments and Sanctuaries, which are national symbols of ocean conservation. Operations conducted during this expedition and the broader 3-year CAPSTONE campaign support NOAA missions to understand and predict changes in climate, weather, oceans and coasts, and share the knowledge and information with others. Much of this year's work will contribute to and complement NOAA's Deep Sea Coral Research and Technology Program's three-year Pacific Islands Regional Initiative.

This project is part of the NOAA Office of Ocean Exploration and Research's "FY17 Science Program" and entails ocean acoustic mapping activities ranging from 50 - 6500m water depths and water column profiling measurements using CTD, XBT, and/or UnderwayCTD casts. The latitude and longitude bounding coordinates for the operating area of the cruise are 21° 22.008' North, 157° 57.922' West and 14° 16.3' South, 170° 41.22' West.

EX-17-01 is a telepresence-enabled mapping cruise that will be conducted from January 18 to February 10, 2017 with focused mapping operations in the PRIMNM (U.S.), in the vicinity of

Kingman Reef and Palmyra Atoll and Jarvis Islands as well as in PIPA (Republic of Kiribati). Operations will be focused primarily on deep water areas 250m and deeper. The cruise will start in Honolulu, Hawaii and end in Pago Pago American Samoa.

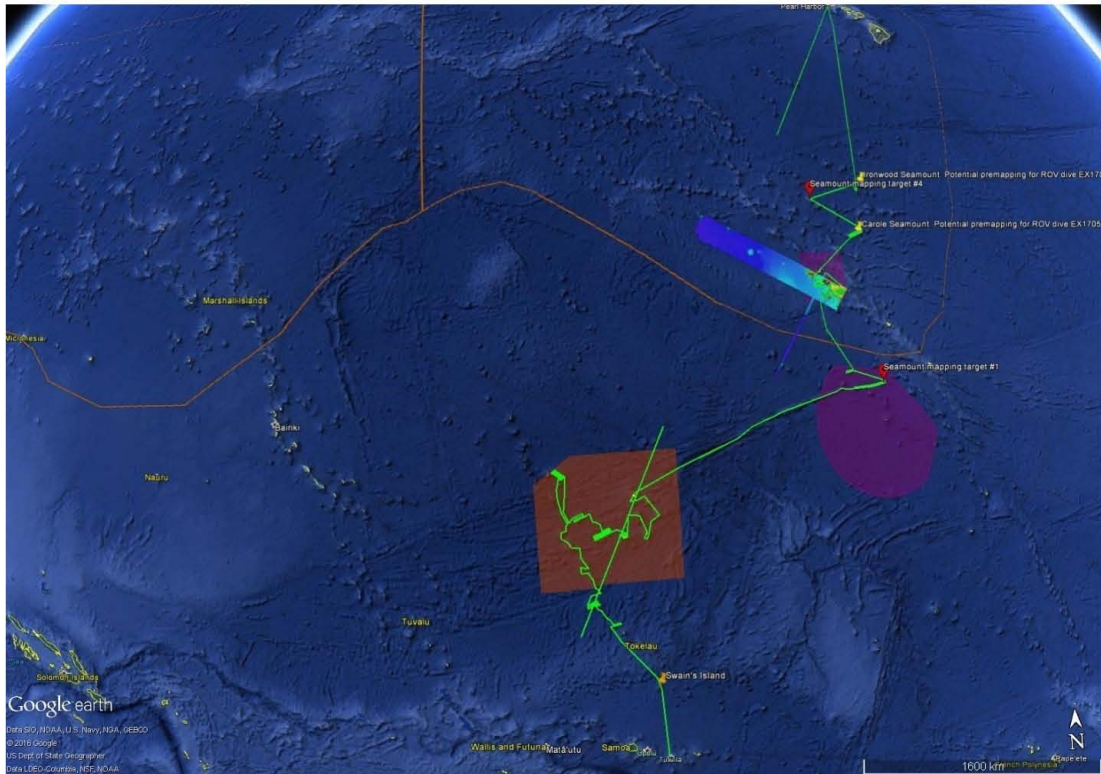


Figure 1: Map indicating the overall operating area of *Okeanos Explorer* for EX-17-01. The green line is the estimated overall cruise track, which is expected to change slightly following examination of existing data. The red polygons are a subset of the PRIMNM, with the northern dark pink polygon at Kingman Reef and Palmyra Atoll, and the southern dark pink polygon at Jarvis Island. The orange polygon is the PIPA, part of the Republic of Kiribati. Red balloon markers indicate three mapping targets from Navy Red Dot Seamount mapping program.

The overarching goal of the project is to extend our breadth of knowledge about deep water habitats, remote seamounts, unique geologic features and historically culturally significant areas. In addition the mapping data acquired on this cruise will serve as integral tool for the planning of future ROV dives and cruises. Ideally, the findings from this cruise will spur further exploration and research and ultimately contribute to effective resource management decisions.

Mapping

The acquisition of high-resolution seafloor mapping data is an essential precursor to making significant biological, geological, archaeological and oceanographic discoveries. The *Okeanos*

Explorer cruises will collect seafloor mapping data in areas previously unmapped with sonar or modern sonar, and to supplement previous work. These maps form the basis for selecting ROV dive targets. ROV cruises would take the next major step in baseline habitat characterization by using the ROV system to visually investigate unknown and little known deep water habitats within American Samoa identified as priority scientists and managers. CTD casts may be conducted to collect additional information about the physical and chemical properties of the water column, including at sites of interest identified from mapping and ROV investigation.

As is standard procedure on exploration cruises with this vessel, the ship will conduct sonar mapping operations at all times during non-ROV or non-CTD rosette operations throughout the cruise. Acoustic instruments that will be operational during the project are a 30 kHz multibeam echosounder (Kongsberg EM 302), Kongsberg EK60 singlebeam echosounders (18, 38, 70, 120, and 200,kHz), Teledyne Acoustic Doppler Current Profilers (38 and 300 kHz), and a 3.5 kHz sub-bottom profiler (Knudsen Chirp 3260). Additionally, expendable bathythermographs (XBTs) and the ship's UnderwayCTD (UCTD) will be deployed at regular intervals in association with multibeam data collection. All of these systems are routinely used by this exploration vessel.

Bridge Officers and Watch Standers will be on watch during all hours and will look for marine mammals and other observable species potentially sensitive to the sound of the sonars. If cetaceans are sighted, knowledgeable personnel will follow established best management practices to minimize disturbance. If cetacean species are present within 400 m of the ship, the vessel will stop until the animals depart the area.

Multibeam:

Multibeam sonar data will produce high-resolution bathymetry and acoustic backscatter maps. These maps will provide critical baseline information to scientists and resource managers interested in identifying and expanding our understanding of the important biological habitats and ecological connections in Samoa and American Samoa, and to improve understanding of the geological history of the region. Additionally, the data collected will help scientists better understand the size and character of seafloor habitats in the area, allowing for improved targeting of future exploration and research, including the selection of sites for further investigation with a ROV. Multibeam data will be collected at planned ROV dive sites, during transits between ROV dives and to/from ports, and at unmapped or poorly mapped areas in the vicinity of ROV dive sites.

Expendable bathythermographs (XBT):

XBTs are deployed to obtain sound velocity profiles. The profiles are required to calibrate the multibeam system and ensure accurate bathymetric mapping. During mapping operations water column sound velocity profiles will be conducted every 4-6 hours. If the UnderwayCTD is not yet ready for collecting these profiles, the data will be gathered using XBTs.

UnderwayCTD

The UnderwayCTD (UCTD) is a piece of equipment used to gather conductivity/temperature/depth (CTD) measurements or sound velocity measurements while the ship is moving. Accurate measurements of sound speed as a function of depth down to

approximately 760 meters are needed every 3-6 hours during multibeam sonar mapping operations. The ship currently obtains sound velocity profiles using expendable probes (XBTs). These sound speed measurements are essential for ray-tracing calculations used by the EM302 multibeam sonar system in order to accurately collect bathymetry and backscatter data. To get these essential data, the *Okeanos Explorer* can either use an XBT or the UCTD equipped with a sound velocity probe. OER has installed the UCTD in order to minimize the use of XBTs while still gathering essential sound velocity profile data needed in order to accurately collect high quality multibeam sonar data. The UCTD has a re-usable probe that is dropped through the water column to log data then retrieved by rewinding the line onto a motorized spool. The UCTD was installed on the ship in December 2015 on the starboard aft railing. When working correctly, UCTD casts will be used instead of XBTs to obtain water column profile data in order to avoid leaving behind expendable XBT waste in the ocean.

Split Beam Sonars:

Kongsberg EK 60 split-beam sonars are used to collect information about the water column, such as at gas plume or seep sites, and to obtain information about biomass. The EK60 split-beam sonar is used as a quantitative scientific echosounder to identify water column acoustic reflectors - typically biological scattering layers, fish, or gas bubbles – providing additional information about water column characteristics and anomalies. Fishery scientists have developed methods to analyze EK60 data to support fish stock assessment (e.g. Atlantic herring, pollock, capelin) and to predict hot spots of large fish in coral reefs. Split-beam sonars are also being used to help develop "acoustic signatures" of different marine species, which will greatly enhance existing efforts to assess abundance, distribution, and behavior using remote sensing methods. Additionally, split beam sonars are being used to estimate gaseous seep flux rates and improve assessments of their contribution to ocean and atmospheric chemistry. The *Okeanos Explorer* has five operational EK60 transducers at the following frequencies: 18 kHz, 38 kHz, 70 kHz, 120 kHz, and 200 kHz. One or more of these sonars will be operated during the majority of the cruise.

Sub Bottom Profiler:

The primary purpose of the Knudsen 3260 (3.5 kHz chirp) sonar is to provide echogram images of surficial geological sediment layers underneath the seafloor to a maximum depth of about 80 meters below the seafloor. The Sub Bottom Profiler is normally operated to provide information about the sedimentary features and the bottom topography that is simultaneously being mapped by the multibeam sonar. The data generated by this sonar is fundamental in helping geologists interpret the shallow geology of the seafloor. The profiler will be run intermittently to gather test data sets and to evaluate syncing options with other sonars.

CTD Operations

The CTD instrument package is used to obtain conductivity, temperature, depth and other oceanographic data (dissolved oxygen, light scattering, oxygen reduction potential). At least one, and potentially several, CTD casts are planned for this cruise. The instrument is attached to an open cylindrical steel frame approximately 1.15 m in diameter and 1.4 m high with a 24-position rosette carousel containing 24 2.5 L Niskin bottles for collecting water samples. The system

would be lowered to a maximum depth of 6800 m by an embedded scientific winch and wire while the vessel would be stopped and hold station using dynamic positioning. The average time to conduct a CTD casts varies from one to several hours depending on water depth (the CTD is lowered through the water column at 60m/min). CTD casts would be conducted at selected sites including locations where ROV dives are conducted to allow for an improved understanding of the environmental conditions by measuring the physical or chemical properties of the water column overlying or hosting a particular habitat. The CTD will not touch the seafloor and will have limited time and presence in the marine environment.

Effects of the Project

OER has conducted a Biological Evaluation for all operations to be conducted as part of the program's 2015-2017 expeditions in the Pacific Ocean. On February 7, 2016 OER received concurrence from the NOAA National Marine Fisheries Service Protected Resources Division that under Section 7 of the Endangered Species Act (ESA), the activities slated to occur during the 2016-17 expeditions are not likely to adversely impact ESA-listed marine species, and would have insignificant effects on designated or proposed critical habitat. The ESA Section 7 concurrence letter is provided as Appendix A.

OER has also consulted with NOAA's Habitat Conservation Division on the potential impacts of our operations to Essential Fish Habit (EFH) as defined in the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855 et seq. §305(b)). They concurred that our operations would not adversely affect EFH provided adherence to OER proposed procedures and their provided guidance. This concurrence letter is provided as Appendix B.

Exposure to noise from the use of the scientific sonars on the *Okeanos Explorer* may result in avoidance behavior or other finite disturbance to this environment and its marine mammals and fish. The methods used to map the ocean during this cruise are used routinely by NOAA and UNOLS research vessels, are non-destructive in nature, and not known to cause harm. Nonetheless, exposure to noise from use of the abovementioned geophysical equipment may result in avoidance behavior or other finite disturbance to this environment and its marine mammals, sea turtles and fish.

Standard practice during all *Okeanos Explorer* cruises and operations include Officers or Watch Standers on the Bridge around-the-clock, monitoring the surrounding ocean for the presence of other ships, unanticipated hazards, and marine animals – especially cetaceans. If a cetacean is observed, the Mapping Watch Stander or Science Lead is notified and if appropriate the team then proceeds with protocols to continue monitoring the animal or shut down mapping or other ship operations until the animal has departed the area for an appropriate period of time. If cetacean species are observed within 400 m of the ship, the vessel would stop until the animals depart the area but the mapping sonars would continue transmitting to avoid startle responses. If an observed animal is unable or unwilling to depart the immediate area, sonars will be secured and the ship will slowly move away from the area if feasible.

When marine mammals are able to be identified by Bridge Officers or Watch Standers, these observations are noted in the NOAA fleet marine mammal observation log as part of standard practice. During the 2016-2017 field season, these procedures will include monitoring for the presence of sea turtles and, when appropriate, taking protection measures. It is understood that visual monitoring for the presence of marine mammals at night is not typically effective due to limited visibility – however no practicable alternative is currently available. Modest ship transit speeds (<9-10 knots) and avoidance behavior of mammals to noise that may bother them should make it highly unlikely that a marine mammal would get close enough to the ship's sonar transducers to cause temporary or permanent hearing impacts.

Multibeam Echosounder (MBES)

The Kongsberg EM 302 MBES is hull-mounted on the *Okeanos Explorer* and operates at 30 kHz. The transmitting beamwidth is 0.5° fore–aft and 150° athwartship. In the deepest operating mode the maximum source level of the EM302 is 243 dB re 1 microPa. When operating in shallow modes the source level is 238 dB re 1 microPa. The EM302 is a focused sonar array that uses selective angular directivity and transmits short pulses at limited ping rates (Lurton & DeRuiter 2011). These two characteristics of this type of sonar decrease the potential sound exposure level as well as decrease the probability of the animals being subjected to temporary threshold shift intensity levels affecting hearing.

Dr. Xavier Lurton (IFREMER) has recently created a simplified model of the specific behavior of the *Okeanos Explorer's* EM302 system in terms of direct radiated level inside the water. Model output graphics showing radiated sound transmission patterns in the horizontal and vertical planes of the water column are provided below. This analysis represents our best estimates of radiated sound levels given the current configuration of the sonar. The assumptions behind the model are:

- 1) The Deep Mode of the EM302 was used (i.e., longest pulse length and highest power -- or worst case scenario).
- 2) The model uses the current best understanding of the directivity pattern of the sonar that includes both the individual transducer directivity and the transmit sector beam forming.
- 3) The model does not include any masking effects by the hull or gondola. The draft of the transducer "gondola" on the *Okeanos Explorer* is 5.65 m below the water line. This configuration causes a baffle effect from the gondola structure and the hull above, and further reduces the likelihood of direct ensonification of an animal on or near the surface, especially a short distance away from the ship.
- 4) A value of 6 dB/km @ 30 kHz was used as a first-order approximation of the absorption coefficient representative of oceanographic conditions in the vicinity of the Main Hawaiian Islands.

Figure 1 (below) shows horizontal plane (top-down) views of sound pressure levels at three different receiving depths within the water column directly below the transducer: 10m, 50m, and 200m. These figures demonstrate the remarkably narrow zone of ensonification in the

along-track direction. Note the difference in the 160 dB/ μ Pa isopleth in the beam plane and elsewhere around the ship. For all but this plane, the isopleth occurs at 400 m or less from the ship. For animals directly within the beam plane, sound pressure levels drop below 160 dB/ μ Pa within 1500 m of the ship near the surface, and within 1800 m at a depth of 200 m. Submerged animals more than 400 m from the ship that are caught in the ensonification volume as the ship passes will be only briefly subjected to the elevated sound levels occurring inside the transmitter beam pattern. Furthermore, the narrow fan-shaped beam patterns of the *Okeanos Explorer* system provide ample possibilities for the animals to quickly escape the sound. The only possible scenario for more extended exposure would be if the animal were to suddenly start moving in the exact direction and speed as the ship while within the narrow ensonification beam, which is unlikely. This very selective spatial pattern of the sound radiation makes this configuration very different from seismic airgun sources (omnidirectional) or military mid-frequency active sonars that are often directed horizontally through the water column.

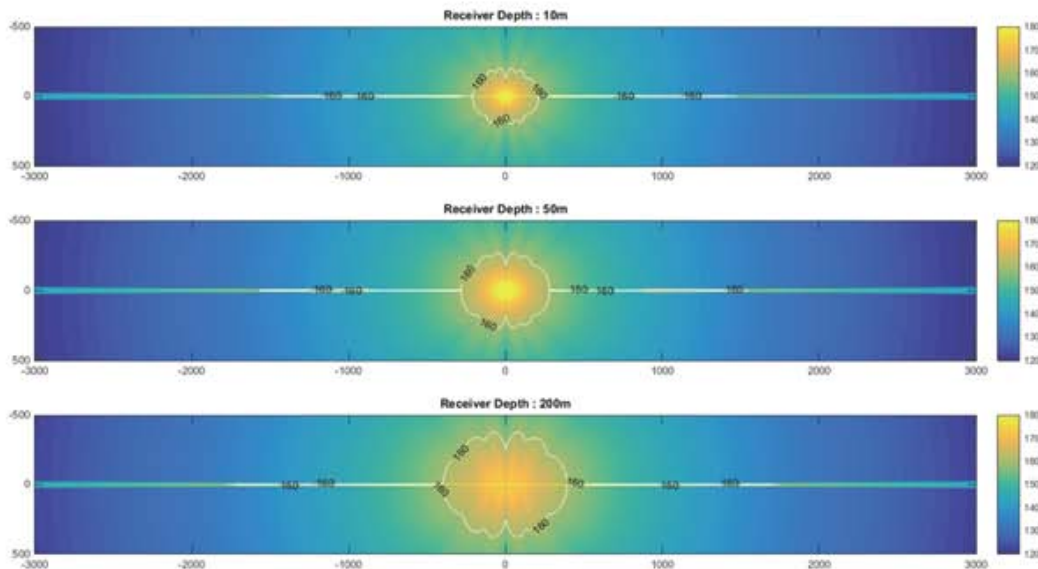


Figure 2: Top down view image of the EM302 radiated beam pattern at several depths (10m, 50m and 200m) created by Dr. Xavier Lurton (IFREMER). The ship track is straight up, the Y axis is distance in meters while the X axis is distance in meters. The color scale is signal strength in decibels (dB).

Figure 3 (below) shows the across track radiation pattern for the full water column below the EM302 transducer, with a close up of the near surface region. The 160 and 180 dB/ μ Pa isopleths are plotted to show ranges from the sonar relevant to potential PTS and TTS impacts on cetaceans.

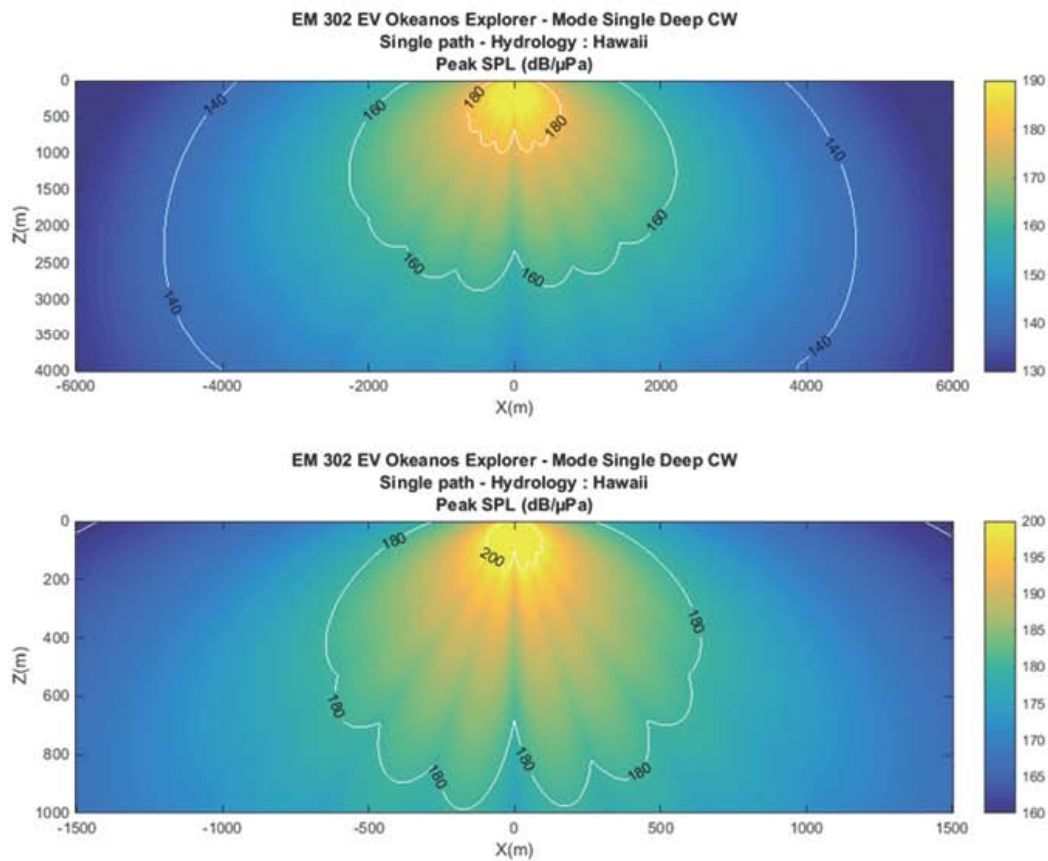


Figure 3: Model created by Xavier Lurton (IFREMER) of the EM302 radiated transmission patterns with the 140, 160 and 180 dB/μPa isopleths plotted for the full water column (top) and of the near surface region (bottom) of a single ping, looking forward through the water column in the along track direction. The y axis is depth below sea surface in meters, and the x axis is distance in meters. The color scale is signal strength in decibels (dB).

Transmit pulse forms and rates are yet two other differences that distinguish multibeam sonar from other types of sonar and acoustic sources and further reduce their potential threat to ESA-listed species. Sound is not transmitted continuously from these systems but rather in extremely short pulses (i.e., pings). Ping durations obtained from the EM302 manual (page 36) are very brief -- 0.7 to 5.0 milliseconds. The ping rate or in other words, how frequently pings are emitted, is depth dependent and is provided for different depths in tables 2 and 3 of the manual and show that at a depth of 400 m, the ping rate is 30 pings/min, decreasing to 3.6/min at 4000 m. Another way of putting it is that when the ship is mapping in 400 m of water, any submerged animal within the ensonification volume will be subjected to only a 0.7 millisecond ping every 2 seconds. When the ship is mapping in 4,000 m of water, a submerged animal could potentially experience a 5-40 millisecond ping every 17 seconds. The fore-aft width of the

sonification volume at 200 m distance from the ship is approximately 4 meters. Based on a mapping speed of 8 knots and using this width as an example, this distance will be traversed by the ship in 1 second. Therefore, a submerged stationary animal 200m from the ship while it is surveying depths of 400 m should be subjected to at most a single ping of 0.7 milliseconds of duration. If the encounter occurs where the water depth is 4,000 m, the chances are low that it will even be subjected to a single ping.

The low operating frequencies, low duty cycles (because of the narrow fore-aft width of the beam), and short pulse lengths portend limited exposure to the MBES pulse for fish, marine mammals and turtles. Based on observed responses to other types of pulsed sounds, and the likely brevity of exposure to the bathymetric sonar sounds, pinniped and sea turtle reactions to the sonar sounds are expected to be limited to a startle or an otherwise brief response of no lasting consequence. In general, marine animals are expected to exhibit no more than short-term and inconsequential responses to these systems given their characteristics.

As a precautionary measure, to circumvent disturbance and/or possible startling of nearby animals, initial pinging of the multibeam sonar will always be started in the “soft start” mode. The soft start mode is a delay function, starting the sonar transmissions at a low output level and then gradually increasing to the level required for optimal bathymetry data collection. The multibeam power on soft start is set to -20 decibels (20 decibels lower than the full source power setting) with a 10 minute ramp up time to the normal power setting. The soft start feature keeps source levels dampened in case there are cetaceans in the immediate vicinity of the ship, and provides them with time to move away from the ship before the system operates at full power.

Because the EK60, SBP, and ADCP sonars are of lower intensity than the multibeam, and are typically run simultaneously with the multibeam, these protective measures will help avoid inadvertent exposure of marine mammals, sea turtles, and hammerhead sharks to all three sonars. If the multibeam sonar is not being used, but other sonar systems are being turned on, they will be started in lower power settings and will gradually (over a 15 minute time period) be adjusted to higher power settings as appropriate for the water depths. This approach essentially mimics the approach of the “soft-start” mode of the multibeam.

Expendable bathythermographs (XBT):

The very fine wire connecting the XBT probe to the ship is extremely easy to break by hand once the probe reaches maximum depth. The low tensile strength of the wire should represent a minimal entanglement risk for marine animals. The expended materials are unlikely to result either in any significant environmental impacts to the sea floor or in a significant degradation of marine water quality. Over a period of years, these materials would degrade, corrode, and become incorporated into the sediments.

UnderwayCTD

The *Okeanos Explorer* proposes to use the UCTD during the 2017 field seasons as much as possible as a more environmentally-friendly alternative to XBTs, since it does not leave anything

in the ocean after gathering the measurements. Given the limited duration of casts (<1 hour) entanglement risk is considered low.

The UCTD should always be nearly directly behind the ship, either freefalling, or being reeled back in. When UCTD profiling casts are conducted in deep water, the probe has its own tail spool that has hundreds of meters of line wound on to it. This tail spool allows the probe to freefall through the water column with very little drag, since it does not have to pull all the line between the probe and the ship as it falls. Once the probe is dropped off the back of the ship, all of the line on the tail spool must be paid out before it is even possible to begin rewinding the line to reel back in the probe. If a marine mammal is spotted while the probe is falling, we will still have to wait until all the line on the tail spool is paid out prior to starting recovery. Therefore once a deep water UCTD cast is started, there is really not a practicable way to make it much shorter or abort it.

If a marine mammal is spotted by the bridge while the UCTD is in the water, the ship will slow down to 3-5 knots (as possible given what the Engineering Department needs to do with the engines to make this happen), and maintain heading. The Survey Department will finish the UCTD cast as quickly as possible by rewinding the line as soon as they measure the time by which all of the tail spool line should have completed paying off the spool. Slowing the ship down and maintaining heading are the only measures practicable to minimize the risk of entanglement. We will also monitor for entanglement during probe recovery.

Split Beam Sonars:

EK60 and ADCP sonar calibration work planned near Hawaii is specifically planned for an area outside any marine managed areas, Sanctuaries, known sensitive habitats, and state waters. There are no known impacts of EK60 split-beam sonars on marine animals, and there are used routinely by NOAA to assess water column biomass.

Sub Bottom Profiler:

Marine mammal responses to the sub-bottom profiler are likely to be similar to those for other pulsed sources. The pulsed signals from the sub-bottom profiler are much weaker than those from the multibeam echosounder described above. Since they are usually operated simultaneously with other higher-power acoustic sources, behavioral responses are not expected, unless marine mammals are very close to the source. In fact, most animals will move away in response to the approaching higher-power sources or the vessel itself before being close enough for there to be the possibility of effects from the less intense sounds of the sub-bottom profiler.

ADCPs:

Both ADCP instruments on the *Okeanos Explorer* are manufactured by Teledyne RD Instruments. Teledyne has provided OER with a proprietary technical memorandum dated April 28, 2015 that provides sound pressure levels associated with their ADCP instruments. Source levels for the ADCPs are far less than the EM302 multibeam. The acoustic beams from the ADCPs are also very focused, with sound energy levels that decrease rapidly away from the main lobe of the

transducer. Given the more limited ranges, narrow beams, and sound pressure values reported for the ADCPs, they are expected to have minimal impacts on species of concern. Teledyne states that it has never received a report any marine mammals being affected by its ADCPs.

CTD and ROV Operations

The planned cruise would include the deployment of a CTD, which would be deployed over the side of the vessel with a cable, and an ROV, which would be deployed off the aft deck with a cable; creating the potential for entanglement should any animals encounter the cable or tether. However, ship officers maintain watch for and avoid protected marine species in the area during CTD and ROV operations and no deployment would occur if sea turtles, marine mammals or scalloped hammerhead sharks are within 50 yards of the vessel, and all individuals participating in the activity would closely monitor the instrument cables at all times while they are deployed. Based on these measures, and given that protected marine species would likely be widely scattered throughout the proposed areas of operation, we consider it extremely unlikely that any of those animals would come into contact with any of the cables, and have determined that the risk of entanglement would be discountable.

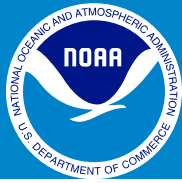
In Summary

In general, these scientific techniques are routinely used by NOAA. As expected for ocean research with limited duration or presence in the marine environment, this project will not have the potential for significant impacts. Knowledgeable experts, who are aware of the sensitivities of the marine environment, will conduct the at-sea portions of this project. Providing the United States, the Territory of American Samoa, and Samoa with scientifically robust and quality-controlled oceanographic data is a key benefit that will result from the cruise.

The survey activities will be localized and of short duration in any particular area at any given time. The survey also will not bring about any permanent influence on marine mammals, their habitats, or the food sources they utilize. This project will not result in any notable or lasting changes to the human environment. In sum, the survey activities are not expected to have any significant impacts of a direct or cumulative nature.

Categorical Exclusion

The geographic scope of this action is small and the temporal duration is short. It is a research project of limited size or magnitude and with only short-term effects on the environment, and for which any adverse or cumulative impacts are negligible, consistent with the class of CE in Section 6.03.c.3(a) of NOAA Administrative Order (NAO) 216-6. It does not trigger any exceptions in section 5.05c of the NAO that would require an environmental assessment or environmental impact statement.



Ocean Exploration and Research

Appendix D: ESA Section 7 Initiation
Letter, Biological Evaluation and Letter of
Concurrence???

Appendix E: Diplomatic Notes

Diplomatic notes are pending



Appendix F: Argo Deployment Permits



David L. Evans
UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH
1315 East-West Highway
Silver Spring, Maryland 20910

JUN 8 2000

MEMORANDUM FOR: Susan B. Fruchter
National Environmental Protection Act Coordinator

FROM: David L. Evans *David L. Evans*


SUBJECT: Categorical Exclusion, Argo Floats Project

The Office of Oceanic and Atmospheric Research is proposing to deploy Argo floats globally. Through discussions with your office and the General Counsel's Office, it has been determined that the proposed action requires a Categorical Exclusion, not an Environmental Assessment.

The proposed project would provide a consistent, global system operating within the ocean to collect the subsurface observations necessary to complement observations from space. This array will improve our ability to understand the time-varying climate system and to provide reliable ocean state and climate forecasts worldwide.

Because this action will benefit the global community with better, more reliable forecasts with no significant adverse impact to the human environment, this action is categorically excluded under NAO 216-6 from requirements to prepare an environmental document. Please contact Stephen Piotrowicz, from our Office of Scientific Support at 301-713-2465 x 124 if you have any questions regarding this issue.

Attachment

 Printed on Recycled Paper

THE ASSISTANT ADMINISTRATOR



**Ocean Exploration
and Research**



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Silver Spring, MD 20910

OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH

MEMORANDUM FOR: THE RECORD
FROM: *Donald Beran*
Donald Beran
Acting Director,
Office of Scientific Support
SUBJECT: Categorical Exclusion, Argo Floats

NAO 216-6, Environmental Review Procedures, requires all proposed projects to be reviewed with respect to environmental consequences on the human environment. This memo documents the categorical exclusion of the proposed Argo floats program from the need of an Environmental Assessment.


After reviewing NAO 216-6, including the criteria used to determine significance, we have concluded that the proposed action would not have a significant effect, individually or cumulatively, on the human environment. Further, the Argo float program will not result in any significant impact to marine life for the life of the project. Therefore, we have determined that the proposed action is categorically excluded from the requirement to prepare an environmental assessment or environmental impact statement.

BACKGROUND

To forecast individual storms, warm periods, and other day-to-day events that comprise the weather, meteorologists use observations from an extensive atmospheric observing system: a network of land and ocean surface measurements, and a sparser network of balloon-borne sensors that collect profiles of temperature, humidity, and winds at least once a day. Data collected by these networks enable accurate three- to five-day weather forecasts. Predicting climate, the broad pattern of weather over seasons and years, requires additional observations -- temperature, salinity, and currents within the upper layer of the ocean.

Every few years, the upper layer of the eastern Tropical Pacific Ocean heats up, and remains warm for months. This warming, termed El Niño alters the global atmospheric circulation, and changes the likelihood that many types of extreme weather conditions will occur. La Niña, a cooling of those same waters that sometimes follow an El Niño episode, causes a different set of weather conditions to become more likely. Each affects weather around the world.

NOAA operates the ENSO Observing System, which takes measurements from the ocean surface and its subsurface layers, and reports this information back to forecast centers in real time. Data gathered by this system, complemented by measurements from space, led to successful seasonal climate forecasts for the United

 Printed on Recycled Paper



States during the 1997/98 El Niño, six months in advance.

Research has revealed that phenomena in addition to El Niño and La Niña occur in other parts of the global ocean. These also influence year-to-year climate variations. A consistent, global system operating within the ocean to collect the subsurface observations necessary to complement the observations from space is needed. The Office of Oceanic and Atmospheric Research is proposing an array of 3,000 Argo floats to be deployed globally. This array will improve our ability to understand the fluctuating climate system and to provide reliable forecasts worldwide.

The Argo floats will be spaced about 300 kilometers apart. Each float will sink to a typical depth of 2,000 meters. After drifting with the ocean current at that depth for 10 days, it will rise to the surface, measuring the temperature and salinity of the layers as it rises. On the surface, the float will transmit its data and position to an orbiting satellite before returning to depth and beginning another cycle.

Satellites will relay the data received from Argo floats to land based receiving stations. From there, the data will go to a number of scientific teams around the world, who will carry out initial quality control. They will then make the data available for operational forecast centers and scientists in near real time. The observations will be used, together with other available data, to make "weather maps" of the ocean, to initialize climate forecast models for the ocean-atmosphere system, and to improve our understanding of the ocean itself.

Argo will also be a major component of the Global Ocean Observing System (GOOS), an international effort led by the Intergovernmental Oceanographic Commission of UNESCO, the World Meteorological Organization, and the United Nations Environmental Program, with scientific guidance from the International Council of Scientific Unions. Endorsed at the Earth Summit in 1992, GOOS is an international initiative to create a global system for gathering, archiving, and distributing ocean data and derived products with worldwide utility. Its objectives include improving the management of living resources and coastal areas, ensuring safe marine navigation, and assessing the health of the ocean -- as well as laying the basis for improved understanding and forecasting of climate. Argo will provide critical data for this initiative.

This project would not result in any changes to the human environment. As defined in Section 6.03(c)3(a) of NAO 216-6 this is an action of limited size or magnitude and will not have an individual or cumulative significant impact on the quality of the human environment. As such, it is categorically excluded from the need to prepare and Environmental Assessment.





SOUTH PACIFIC APPLIED GEOSCIENCE COMMISSION

Tel : 381139/381377
Fax : 370040/384461
http : //www.sopac.org

Postal Address : SOPAC Secretariat
Private Mail Bag, GPO
Suva, Fiji Islands
Street Address : Mead Road, Suva, Fiji Islands

20 March 2002

Mathieu Belbeoch
ARGO Technical Co-ordinator
8-10 Rue Hermes
Parc Technologique du Canal
31526 Ramonville – Cedex
FRANCE

ARGO FLOAT DEPLOYMENTS IN THE SOPAC REGION

We hereby confirm that concurrence for the deployment of Argo floats has been provided by the following SOPAC member countries, within their EEZ's:

- Cook Islands
- Fiji
- Kiribati
- Marshall Islands
- Nauru
- New Caledonia
- Niue
- Papua New Guinea
- Samoa
- Solomon Islands
- Tonga
- Tuvalu
- Vanuatu

Yours Sincerely


Mohinish Kumar
Financial and Administrative Controller

Member Countries: Australia, Cook Islands, Federated States of Micronesia, Fiji Islands, French Polynesia (Associate), Guam, Kiribati, Marshall Islands, Nauru, New Caledonia (Associate), New Zealand, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu



Appendix G: NASA Maritime Aerosols Network Survey of Opportunity

Survey or Project Name

Maritime Aerosol Network

Lead POC or Principle Investigator (PI & Affiliation)

POC: Dr. Alexander Smirnov

Supporting Team Members Ashore

Supporting Team Members Aboard (if required)

Activities Description(s)(Include goals, objectives and tasks)

The Maritime Aerosol Network (MAN) component of AERONET provides ship-borne aerosol optical depth measurements from the Microtops II sun photometers. These data provide an alternative to observations from islands as well as establish validation points for satellite and aerosol transport models. Since 2004, these instruments have been deployed periodically on ships of opportunity and research vessels to monitor aerosol properties over the World Oceans.



Appendix G: Table of Approximate times and locations along the estimated track line for EX1701.

Notes - Description and Days at 8 knts	DDMLat	DDMLon	Approximate Dates
Hono Start	21 14.85540N	157 57.85200W	18-Jan
	21 04.86960N	157 55.51800W	
	19 55.96920N	158 16.83600W	
	16 29.03040N	159 55.93800W	
	12 05.00640N	161 29.02200W	
Seamount Target 4 plus 0.5 days	09 57.68832N	162 20.55600W	21-Jan
	08 26.93808N	159 37.38600W	
Carole Seamount Area plus 0.25 days	08 03.47220N	160 35.61600W	24-Jan
	08 09.14880N	159 51.07200W	
	07 14.15868N	161 11.82000W	
	06 57.03504N	161 17.86200W	
Palmyra/Kingman	06 10.25034N	161 57.47400W	25-Jan
	05 10.18080N	162 04.66800W	
	04 22.23186N	162 25.03200W	
	03 44.31996N	162 27.34200W	
	01 49.34976N	161 35.55000W	
Jarvis plus 0.5 days	01 15.39012N	159 57.83400W	27-Jan
	01 12.78750N	160 28.63800W	
	01 06.38940N	161 26.05800W	
	01 21.79098N	161 49.82400W	
	00 18.31451S	166 24.30000W	
	01 07.69956S	168 16.15800W	
	01 47.37108S	169 26.76600W	
	02 38.28060S	170 32.97000W	
Fracture Zone to Eeastern PIPA plus 1 days	02 43.65030S	171 36.81600W	1-Feb
	03 14.23542S	171 00.77400W	
	03 44.87964S	170 34.17600W	
	03 52.48806S	170 39.59400W	
	03 54.77112S	170 54.30000W	
	04 22.72554S	171 09.99000W	
	03 39.13740S	171 31.04400W	
	04 28.92564S	173 27.87000W	

	04 09.21240S	172 47.11800W	
	04 21.91344S	173 29.82000W	
Hadal Hole plus 0.5 days	04 07.57584S	172 49.80600W	3-Feb
	03 45.31458S	173 23.30400W	
	03 34.40106S	173 46.11600W	
	03 34.29432S	174 02.61000W	
	01 54.35928S	174 41.30400W	
Winslow Reef plus 0.75 days	01 44.00010S	174 48.21000W	5-Feb
	02 38.22240S	175 03.12000W	
	02 40.16604S	175 05.61000W	
	03 23.94702S	174 47.74200W	
	03 54.35976S	174 31.15200W	
	04 05.62680S	174 51.71400W	
Western PIPA	04 23.31822S	174 46.30200W	8-Feb
	04 35.77980S	174 33.43200W	
	04 37.03128S	174 27.27000W	
	04 42.81786S	174 25.97400W	
	04 49.58742S	174 23.22000W	
	04 58.08036S	174 15.75000W	
	05 12.81768S	173 59.97000W	
	05 21.71436S	174 00.43800W	
	05 28.63686S	173 51.04800W	
	06 12.52884S	173 37.90800W	
	06 31.57806S	173 33.37200W	
	06 48.60834S	173 41.47800W	
	07 11.81976S	173 37.60200W	
	07 13.91718S	173 48.74400W	
	07 19.55094S	173 52.48800W	
	07 24.90426S	173 49.23600W	
	07 24.80754S	173 42.28200W	
	07 25.24734S	173 34.44000W	
	07 49.74390S	173 19.94400W	
	08 01.89210S	173 05.62200W	
	08 11.63562S	173 00.67200W	
	08 09.27432S	172 54.49200W	
	08 12.46044S	172 51.57000W	
	08 08.58660S	172 52.17600W	
	08 09.19512S	172 42.79800W	
	08 07.94826S	172 37.78800W	
	08 21.48888S	172 42.13800W	
Tokelau	08 32.95764S	172 20.32800W	



	08 57.17904S	171 50.03400W	
	09 00.94698S	171 41.22600W	
	09 26.17734S	171 21.34800W	
	09 42.39840S	171 03.36600W	
	10 36.50820S	171 13.96800W	
	11 00.13860S	171 10.69200W	
	10 59.57880S	170 58.50000W	
	14 04.61580S	170 26.92800W	
	14 16.96560S	170 31.00800W	
Pago Pago	14 20.56740S	170 38.44800W	10-Feb

