



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
 OCEANIC AND ATMOSPHERIC RESEARCH
 Office of Ocean Exploration and Research

Silver Spring, MD 20910

March 30, 2023

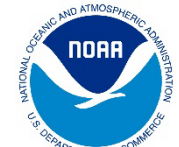
MEMORANDUM FOR: CAPT Amanda Goeller, NOAA
 Commanding Officer, Marine Operations Atlantic

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

Kasey Cantwell
 Operations Chief, Expeditions and Exploration
 NOAA Ocean Exploration

SUBJECT: EX2301 Project Instruction Amendment: Scheduling Revision

Due to operational delays preceding expedition EX2301, scheduled departure has been delayed to April 3rd, 2023. Planned operations will be carried out for 25 days, departing Portland, OR and arriving on April 27, 2023 in Seattle, WA. The 25-day expedition will combine mapping shakedown, ROV shakedown, and science operations originally planned for EX2301 and EX2302 into a single expedition, EX2301 2023 Shakedown + EXPRESS West Coast Exploration. This represents a loss of 5 Days at Sea from the original Project Instructions and ship schedule.





doi: 10.25923/90f5-g265

Project Instructions: EX2302, EXPRESS Shakedown - ROV & Mapping

Date Submitted: March 15, 2023
Platform: NOAA Ship *Okeanos Explorer*
Project Number: EX2302
Project Title: ROV Shakedown and West Coast Exploration (ROV and Mapping)
Project Dates: April 8-27, 2023

Prepared by: _____
Thomas Morrow
Expedition Coordinator
NOAA Ocean Exploration

Dated: _____

Approved by: _____
Kasey Cantwell
Operations Chief
NOAA Ocean Exploration

Dated: _____

Approved by: _____
Rachel Medley
Expeditions and Exploration, Division Chief
NOAA Ocean Exploration

Dated: _____

Approved by: _____
CAPT Amanda Goeller

Dated: _____

Commanding Officer
NOAA Marine Operations Center — Atlantic

I. Overview

A. Brief Summary and Project Period

April 8-27, 2023

San Francisco, California – Seattle, Washington

EX2302

EXPRESS Shakedown - ROV & Mapping

This document contains project instructions specific to EX2302. For the annual cross-expedition details, see the [“NOAA Ship *Okeanos Explorer* FY23 Field Season Instructions.”](#) This expedition will commence on April 8, 2023 in San Francisco, California, and conclude on April 27, 2023 in Seattle, Washington. Operations will be conducted 24 hours a day, and consist of remotely operated vehicle (ROV) dives, mapping operations, and full shore-based participation via telepresence.

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

B. Days at Sea

Of the 20 days at sea (DAS) scheduled for this expedition, 7 DAS are provided through the OAR line office base allocation and 13 DAS are program funded days. The total number of DAS and allocation distribution may change as further details are available regarding the planned *Okeanos Explorer* dry dock that will occur in the month prior to this expedition and EX2301. Information provided here reflects the most recent working information and schedule between the ship’s Command and the program and will be finalized as new information is available.

This expedition is estimated to exhibit a high operational tempo due to 24-hour operations, which include USBL calibration, daily ROV dives, overnight mapping operations, CTD casts, and continuous shoreside participation via telepresence.

C. Operating Area

EX2302 will focus operations on U.S. and international waters off the west coast of California, Oregon, and Washington states. Mapping, ROV, and CTD operations will be conducted at depths between 250 and 5000 meters. **Figure 1** shows the general operating area for the expedition. The waypoints for the general working area and proposed expedition track are in **Appendix A**.

As this expedition is operating in remote locations with high voltage operations, far from a suitable port to treat medical emergencies, a medical officer is requested to be aboard for the entirety of the expedition.



Figure 1. Map showing the general operating area for EX2302. The expedition track is subject to change based on survey results, field conditions, and the discretion of the commanding officer.



Figure 2. Map showing the general operating area for EX2302 near San Francisco, California. The expedition track is subject to change based on survey results, field conditions, and the discretion of the commanding officer.

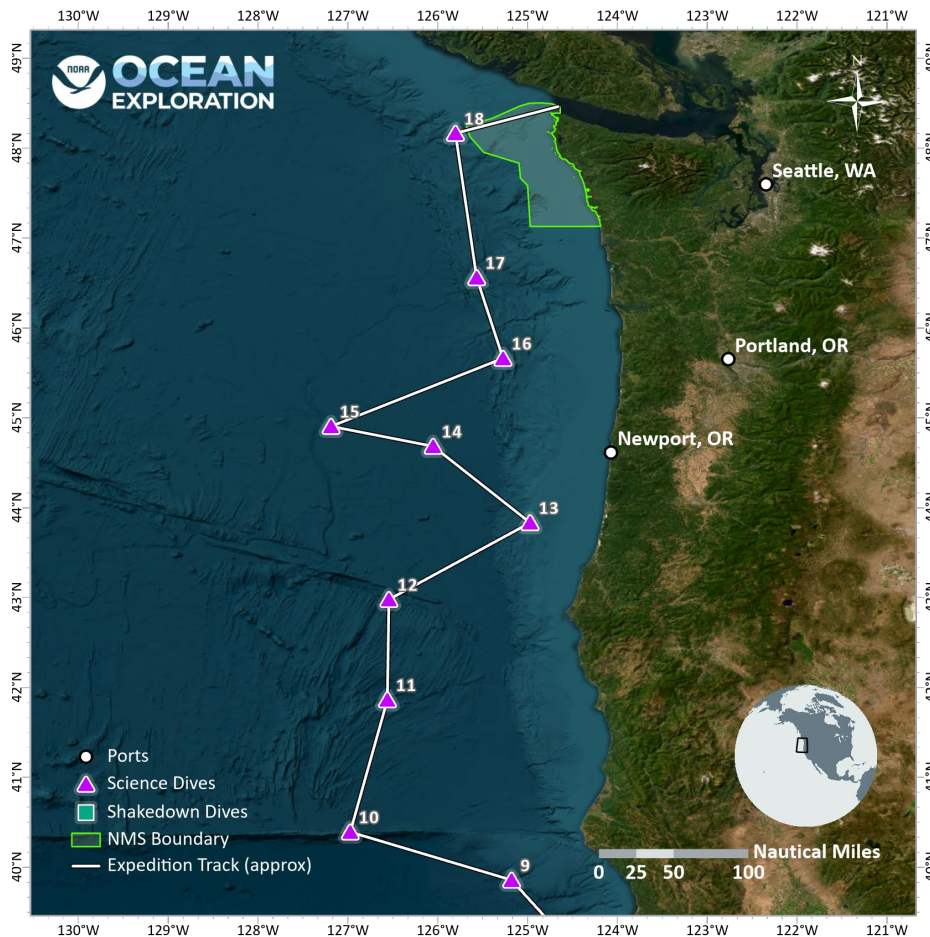


Figure 3. Map showing the general operating area for EX2302 off the coast of Oregon and Washington. The expedition track is subject to change based on survey results, field conditions, and the discretion of the commanding officer.

D. Summary of Objectives

EX2302 operations will involve a transit west followed by an initial USBL calibration and then focused ocean mapping and ROV operations in U.S. waters off the west coast of California, Oregon, and Washington states, primarily in deep water (>200 m). This expedition will evaluate ROV system preparedness for the coming field season, collect critical baseline information to support priority NOAA science and management needs, as well as needs identified by the [EXPRESS](#) (Expanding Pacific Research and Exploration of Submerged Systems) campaign.

Mission objectives for EX2302 include a variety of objectives focused on science, mapping, education, outreach, and data management. Additionally, this expedition will include dedicated time to address engineering objectives that are generally throughout this document as “shakedown” objectives. Overarching objectives that span the entire Fiscal Year 2023 (FY23) field season are covered in the [“NOAA Ship *Okeanos Explorer* FY23 Field Season Instructions.”](#)

See **Appendix B** for the expedition data management plan. Additional objectives specific to EX2302 follow:

1. Science Objectives

- a. Identify, map, and explore the diversity and distribution of benthic habitats, including potential deep-sea coral and sponge communities, fish habitats, and chemosynthetic communities.
- b. Map geologic features to better understand the geological context of the region and improve knowledge of past and potential geohazards.
- c. Acquire acoustic and oceanographic data as a foundation to better understand the characteristics of the water column and the pelagic fauna that inhabit it.
- d. Engage a broad spectrum of the scientific and management community, as well as the public, in telepresence-based exploration.
- 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. Conduct stationary CTD casts as required to support high-priority requests from the science community (e.g., to help identify potential hydrothermal vents).
- g. Use the onboard laboratory to preserve and catalog all biological and geological samples and ready them for shipping to their respective public archives.
- h. Collect water samples using the ROV- and CTD-mounted Niskin bottles and filter samples in the onboard laboratory to obtain eDNA samples for shoreside processing.
- i. Collect sun photometer measurements as part of surveys of opportunity in partnership with NASA.

2. Acoustic Mapping Objectives

- a. Collect transit data that addresses bathymetric gaps or prioritizes areas with poor bathymetric or seabed backscatter data quality. Requested transit speeds will be the best possible speed up to 10 kn.
- b. Collect high-resolution bathymetry in areas with no (or low quality) sonar data.
- c. Execute mapping line plans as defined by onboard personnel, with real-time adjustments made to obtain complete seabed coverage as necessary. An average survey speed of 8-9 kn will be used during mapping operations.
- d. Conduct XBT casts as data quality requires, but not more than six hours apart.
- e. Maintain CTD capabilities as a backup sound velocity profiling method for mapping data requirements.

3. ROV Exploration Objectives

- a. Use the dual-body ROV system for seafloor habitat exploration to:

- i. Conduct close-up imaging operations on potential new, rare, and poorly documented organisms, as well as dominant members of benthic communities.
 - ii. Collect samples of potential new species, new records, dominant community members if not easily recognized, and other organisms to aid in site characterization.
 - iii. Collect geological samples that can be used to age a feature, provide insight into the geological context of the region, or improve knowledge about marine minerals and potential future or past geohazards.
- b. Conduct extended dive operations up to four times per week during the expedition (approximately every other day following transit out of port). The exact locations for extended dives is to be determined upon further coordination with the science community, but will likely be prioritized for the deeper dives of the expedition in order to maximize time at the seafloor. Extended dive operations may also be requested by the mission team in the case of unexpected late ROV deployments and/or exceptional discoveries (e.g., a new hydrothermal vent system, coral garden, shipwreck, etc.). Approval of extended dive operations is at the commanding officer's discretion, and every effort shall be taken to minimize undue hardship on crew fatigue and disruptions to work schedules.

4. ROV Engineering Objectives

- a. Load and re-integrate ROVs *Deep Discover* and *Seirios*.
- b. Review ROV launch, recovery and emergency procedures with ROV team and ship's crew to facilitate training for new personnel and refresher training for experienced personnel.
- c. Complete a series of ROV dunk tests to practice launch and recovery evolutions.
- d. Run an ROV dive simulation to review launch and recovery operations including aft deck controls, dynamic positioning system, and emergency recovery training as needed with new personnel and/or as requested by NOAA Ocean Exploration or Commanding Officer.
- e. Test the ultrashort baseline (USBL) positioning system dockside.
- f. Work with ship operators to test DP system and ensure DP maneuvers are adequate for ROV dives and similar to previous ROV expeditions.
- g. Calibrate USBL positioning system and update calibration information into navigation software.
- h. Conduct Pilot practice with the manipulator arms for sampling, suction sampling, and temperature probing.
- i. Dive at progressively deeper depths starting at approximately 600 m and finishing as deep as possible in the region over the course of five or more dives.

- j. Test the ROV systems and conduct navigational training and pilot training when diving on benthic exploration targets and on an archaeological target.
- k. Conduct ROV operations in the water column.
- l. Continue refining Blueview Multibeam imaging sonar operation for obstacle avoidance and for potential data products (potential UCH imagery).
- m. Conduct daytime ROV dives on exploration targets.
- n. Continue training of engineers and pilots.
- o. Continue system maintenance, documentation, and training.
- p. Test and continue to refine new ROV midwater exploration procedures.

5. Video Engineering Objectives

- a. Test terrestrial and high-speed satellite links.
- b. Verify Global Foundation for Ocean Exploration (GFOE)-managed telepresence systems perform as expected.
- c. Test all subsea video equipment on *Deep Discoverer* and *Seirios* and ensure their proper alignment and integration into the video system. Ensure proper field of view and angles for all newly installed cameras.
- d. Test all shipboard video equipment (hangar, deck cameras, wireless belt packs, wire camera, etc.) and ensure their proper integration into the video system.
- e. Provide onboard support for 24-hour exploration operations.
- f. Test and evaluate still camera on *Deep Discoverer*

6. Network/Onboard Data Objectives

- a. Ensure integrity of all data processing pipelines and automated transfer to shore for all raw sonar data and daily bathymetry and bottom backscatter mosaic products.
- b. Ensure Global Foundation for Ocean Exploration (GFOE)-managed VSAT, network, and computing infrastructure operate as required to meet mission objectives.
- c. Ensure shipboard instruments/teams are producing expected data products at the expected rates according to established conventions.
- d. Ensure data management processes organize, backup, and transmit data to shore as expected.
- e. Support shore-based personnel with remote access to shipboard resources to better meet mission objectives.
- f. Cross-train network, system administration, and data management personnel.
- g. Improve system documentation.
- h. Conduct at sea testing and evaluation of Starlink low earth orbiting satellite systems and applicability to operations.

7. Outreach and Education Objectives

- a. Host interactions with audiences on shore (exact schedule TBD).

- b. Host limited scheduled ship tours and a port event while in port in Seattle, WA (exact schedule TBD). A pier with public access is needed to facilitate this objective.
- c. Engage the general public in ocean exploration through social media and live video and timely content (dive summaries, web features, highlight videos, video clips, still imagery, and mapping products) on the NOAA Ocean Exploration website.

8. Remote Science and Exploration Command Center Objectives

- a. Conduct operations in conjunction with shore-based exploration command centers and remote science team participants.

9. Ship Objectives

- a. Conduct stationary CTD operations as requested and able.
- b. Review ROV emergency procedures.
- c. Conduct wardroom and deck department refresher training of ROV deployment and recovery with a discussion of emergency procedures.
- d. Practice ROV launch and recovery deck operations before departure to train new personnel.
- e. Conduct wardroom Aft Conn familiarity refresher training.
- f. Practice and discuss man-overboard scenarios during ROV recovery, depending on weather and operations.
- g. Continue testing and evaluation of new stern thrusters installed in March of 2023.

10. Ethanol Testing

- a. Test the quality of the ethanol stored in the ejectable O2 Deck container before and after each ROV expedition.
- b. Use NOAA Ocean Exploration's Ethanol Test Guide (**Appendix C**), which provides detailed instructions on how to test the ethanol, calculate the measurements, and record the results.
- c. Update NOAA Ocean Exploration's internal Ethanol Test Guide as procedures are refined.

E. Participating Institutions

See "[NOAA Ship *Okeanos Explorer* FY23 Field Season Instructions](#)" for institutions that consistently participate throughout the field season.

F. Personnel (Mission Party)

Mission personnel (see **Table 1**) will arrive in San Francisco, California on April 2nd, 2023. Mission personnel will begin mobilization work on April 3rd and then be aboard for the duration of the expedition (April 8-27, 2023). Some personnel will depart on April 29th, 2023,

and others will stay aboard for the expedition that follows (EX2303). The expedition will also be supported by shoreside personnel (see **Table 2**).

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

Table 1. Seagoing mission personnel: This list is tentative until travel is booked. Arrival dates are dependent upon downstream impacts related to the scheduling of the March 2023 dry dock and will be confirmed once expedition dates are finalized. Any deviations will be communicated to the operations officer.

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
1	Morrow, Thomas	Expedition Coordinator	04/05	04/30	M	NOAA Ocean Exploration	USA
2	Gillespie, Treyson	Watch Lead	04/05	Onboard EX2303	M	UCAR	USA
3	Freitas, Dan	Watch Lead	04/05	04/29	M	UCAR	USA
4	Alexis Weinnig	Science Lead	04/05	04/30	F	USGS	USA
5	Koenig, Paige	Science Lead	04/05	04/30	F	UCAR	USA
6	Ritter, Chris	ROV Lead	04/05	04/29	M	GFOE	USA
7	McLetchie, Karl	ROV Engineer	04/05	04/28	M	GFOE	USA
8	Mefford, Jon	ROV Engineer	04/05	04/29	M	GFOE	USA
9	Unema, Levi	ROV Engineer	04/05	04/28	M	GFOE	USA
10	Kennison, Sean	ROV Engineer	04/05	04/29	M	GFOE	USA
11	Murphy, Lars	ROV Engineer	04/05	04/29	M	GFOE	USA
12	Mohr, Bobby	ROV Engineer	04/05	04/30	M	GFOE	USA
13	Wright, Chris	Data Engineer	04/05	04/30	M	GFOE	USA
14	Aragon, Fernando	Data Engineer	04/05	Onboard EX2303	M	GFOE	USA
15	Meyers, Jim	Data Engineer	Onboard EX2301	04/28	M	GFOE	USA

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
16	Doros, Brian	Video Engineer	04/05	04/29	M	GFOE	USA
17	Brian, Roland	Video Engineer	Onboard EX2301	Onboard EX2303	M	GFOE	USA
18	Andrus, Olivia	Video Editor	Onboard EX2301	04/29	F	GFOE	USA
19	Howard, Art	Video Editor	04/06	04/29	M	GFOE	USA
20	Clifton, Jennifer	Watch Lead in-training	04/05	04/30	F	UCAR	USA
21	Marranzino, Ashley	Sample Data Manager in-training	04/05	04/29	F	NOAA Ocean Exploration	USA
22	Ruby, Caitlin	Sample Data Manager	04/06	04/29	F	NCEI	USA

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

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

G. Administrative

1. Points of Contact

Table 2. Points of contact.

Operations	Name, Title	Office	Address	Phone	Email
Marine Operations Center, Atlantic	CAPT Amanda Goeller, Commanding Officer	Marine Operations Center, Atlantic	439 West York Street Norfolk, VA 23510-1145	(757) 441-6778	co.moc.atlantic@noaa.gov
Marine Operations Center, Atlantic	CDR Steven Barry, Chief of Operations	Marine Operations Center, Atlantic	439 West York Street Norfolk, VA 23510-1145	(757) 441-6842	Chiefops.MOA@noaa.gov
NOAA Ship <i>Okeanos Explorer</i> (primary)	CAPT Colin Little, Commanding Officer	NOAA Ship <i>Okeanos Explorer</i>	NOAA Ship <i>Okeanos Explorer</i> 47 Chandler Street Newport, RI 02841	(401) 439-7848	CO.Explorer@noaa.gov

Operations	Name, Title	Office	Address	Phone	Email
NOAA Ship Okeanos Explorer (primary)	LT Hunter Brendel, NOAA Operations Officer	NOAA Ship Okeanos Explorer	NOAA Ship Okeanos Explorer 47 Chandler Street Newport, RI 02841	(808) 659-9179 x221	ops.explorer@noaa.gov
Mission (primary)	Thomas Morrow, Expedition Coordinator	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(202) 650-7319	thomas.morrow@noaa.gov
Mission (other)	Kasey Cantwell, Operations Chief	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(301) 717-7776	kasey.cantwell@noaa.gov
Mission (other)	Rachel Medley, Chief, Expeditions and Exploration Division	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(301) 789-3075	rachel.medley@noaa.gov
Mission (other)	Jeremy Weirich, Director	NOAA Ocean Exploration	1315 East-West Highway, Silver Spring, MD 20910	(301) 452-7366	jeremy.weirich@noaa.gov

2. Diplomatic Clearances

None required.

3. Licenses and Permits

This project will be conducted in part within the Monterey Bay, Greater Farallones, Cordell Bank, and Olympic Coast National Marine Sanctuaries. The expedition coordinator is responsible for obtaining and listing all permits, licenses, and certifications as well as any identification numbers they contain. See **Appendix D** for the applicable documents. Final documents will be archived with the associated expedition report.

4. Shipments

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

For shipments to arrive while in port in San Francisco, California, at the start of the expedition, **shipments should arrive no later than March 31, 2023**, and be shipped to the following address:

NOAA Ship *Okeanos Explorer*
Attn: Name/Dept
47 Chandler Street

Newport, RI 02841

For shipments to arrive while in port in Seattle, Washington, after the expedition from April 27-May 3, 2023, **shipments should arrive no later than April 20 , 2023**, and should be shipped to the following address:

NOAA Ship *Okeanos Explorer*
Attn: Name/Dept
47 Chandler Street
Newport, RI 02841

5. COVID-19 Contingency Plan for Scientific Party

In accordance with the “OMAO Marine Operations COVID-19 Protocols” effective June 24, 2022, shelter-in-place is not required for sailing. All mission personnel shall follow the guidelines written within the documentation, subject to change, pending the release of new guidance. All sailing personnel are required to be fully vaccinated, which means they must have completed the initial vaccination series and all applicable boosters.

The current protocol requires that mission personnel will be tested via a rapid antigen test the day of or night before sailing and possibly before being cleared to move aboard the ship for berthing. Any mission personnel who test positive will have their test confirmed by a molecular test. If an individual tests positive for COVID-19 on the molecular confirmation test, they will be disqualified from sailing, and backup personnel will be activated as mission objectives and priorities dictate.

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

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

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

Abby Letts
Technical Operations Team Lead, Expeditions and Exploration Division
NOAA Ocean Exploration
Joint Hydrographic Center
24 Colovos Road
Durham, NH 03824

II. Operations

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

A. Expedition Itinerary

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

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

Table 4. Expedition itinerary: This is an approximate itinerary and is subject to change based on objective completion, weather, and logistical needs. See **Table 5** for ROV dive details.

Date	Activities
4/3	Mission personnel begin to arrive on ship. Underway preparations, training, and mobilization. Planned delivery of ROVs- deck support needed for onload of <i>Deep Discoverer</i> , <i>Seirios</i> , and the CONEX box. High Voltage and hydraulics needed by ROV team to support pre-expedition testing and vehicle reintegration. Ship's power requested for High Voltage, not shoreside power. Winch support required. GFOE personnel may also need to place a transponder overboard and ping the USBL. Personnel may need to be aloft if changes are desired on Starlink or VSAT systems. Forklift support is requested depending on pier logistics, especially if there is a need to reposition containers for craning.

Date	Activities
4/4	Mobilization. Mission personnel arrive. High voltage and hydraulics needed by ROV team to roll <i>Deep Discoverer</i> out of hangar and conduct pre-expedition testing. Ship's power requested for High Voltage, not shoreside power. No dunk test planned. Personnel may need to be aloft if changes are desired on Starlink or VSAT systems.
4/5	Mobilization. Mission personnel arrive. High voltage and hydraulics needed by ROV team to roll <i>Deep Discoverer</i> out of hangar and conduct pre-expedition testing (including cooling and power for winch operations). Ship's power requested for High Voltage, not shoreside power. ROV team may also need an operator for crane and A-frame operations to dunk <i>Deep Discoverer</i> and <i>Seirios</i> overboard. GFOE personnel may also need to place a transponder overboard and ping the USBL. Personnel may need to be aloft if changes are desired on Starlink or VSAT systems.
4/6	Mobilization. Mission personnel arrive. High voltage and hydraulics needed by ROV team to roll <i>Deep Discoverer</i> out of hangar and conduct pre-expedition testing (including cooling and power for winch operations). Ship's power requested for High Voltage, not shoreside power. ROV team may also need an operator for crane and A-frame operations to dunk <i>Deep Discoverer</i> and <i>Seirios</i> overboard. GFOE personnel may also need to place a transponder overboard and ping the USBL. Personnel may need to be aloft if changes are desired on Starlink or VSAT systems. If deck and bridge personnel, this would be a good day for launch and recovery evolutions as well as emergency recovery walk through.
4/7	Mobilization. High voltage and hydraulics needed by ROV team for full power-on pre-dives, high voltage pre-expedition checklist. Ship's power requested for High Voltage, not shoreside power. GFOE personnel may also need to place a transponder overboard and ping the USBL. Deck and bridge crew requested a full walk through of launch and recovery evolution and emergency recovery procedure as well as ROV launch and recovery evolution practice. Vessel familiarization meeting (~45 min) with mission personnel that have not sailed on <i>Okeanos Explorer</i> within the last year.
4/8	Depart San Francisco, California at 0900. Pre-project meeting to be held with ship at 14:30 or as possible in combination with daily operations meeting. USBL calibration offshore and DP testing.
4/9	Dive 1, drills, overnight mapping.
4/10	Dive 2, CTD cast, overnight mapping.
4/11	Dive 3, overnight mapping.
4/12	Dive 4, CTD cast, overnight mapping.
4/13	Dive 5, overnight mapping.
4/14	Dive 6, overnight mapping.
4/15	Dive 7 (10 hour extended dive), overnight mapping.
4/16	Dive 8, overnight mapping.

Date	Activities
4/17	Dive 9, overnight mapping.
4/18	Dive 10 (10 hour extended dive), overnight mapping.
4/19	Dive 11, CTD cast, overnight mapping.
4/20	Dive 12 (10 hour extended dive), overnight mapping.
4/21	Dive 13, CTD cast, overnight mapping.
4/22	Dive 14, overnight mapping.
4/23	Dive 15 (10 hour extended dive), overnight mapping.
4/24	Dive 16, CTD cast, overnight mapping.
4/25	Dive 17 (10 hour extended dive), overnight mapping.
4/26	Dive 18, and transit to Seattle, WA. End of cruise meeting
4/27	Arrive in Seattle, WA
4/28	Demobilization, VIP tours
4/29	Port event

B. Staging and Destaging

Pre-season staging and mobilization support will be required, including crane and A-frame operations to load *Deep Discoverer* and *Seirios*, hydraulic use (for traction winch, ROV trolley, and ship's equipment), the ability to place a transponder overboard and ping the USBL, high voltage operations supplied by the ship's power, support for ROV deployment and recovery practice. A dunk test is currently planned and clearance will be required behind the moored vessel to deploy and recover the ROV.

Minimal demobilization is expected. Standard demobilization for ROV expeditions is anticipated, which may include hydraulic crane use and high voltage operations.

C. Operations to Be Conducted

1. ROV Dives

Table 5. List of planned ROV dive sites for EX2302: Note, this is an approximate itinerary and is subject to change based on community input, survey results, field conditions, and discretion of the commanding officer. Shakedown dives are subject to change based on the needs of engineering objectives, survey results, field conditions, and discretion of the CO. The position information for each dive is tentative until the dive planning call, which is held one day before each scheduled ROV dive.

Dive #	Date	Location	Longitude	Latitude	Depth (m)	Dive Focus
01	4/9	Monterey Bay Flats	-122° 3.659 ' '	36° 23.937 ' '	657	Engineering
02	4/10	Big Sur Flats	-121° 47.327 ' '	35° 44.744 ' '	1,039	Engineering
03	4/11	Davidson Sister Flats	-123° 22.05 ' '	35° 24.765 ' '	3,914	Engineering
04	4/12	Gumdrop Seamount	-123° 33.394 ' '	37° 22.948 ' '	2,880	Engineering
05	4/13	<i>USS Shafroth</i>	RESTRICTED	RESTRICTED		Engineering /UCH
06	4/14	Taney Neighbor Seamounts	-125° 10.916 ' '	36° 59.552 ' '	3,933	Benthic
07	4/15	Cordell Canyon	-123° 37.63 ' '	37° 56.43 ' '	2,615	Benthic
08	4/16	Point Arena Canyon	-123° 57.834 ' '	38° 31.38 ' '	1,771	Benthic
09	4/17	Gorda Valley	-125° 10.671 ' '	39° 51.42 ' '	2,845	Benthic
10	4/18	Mendocino Ridge	-126° 58.417 ' '	40° 23.509 ' '	2,496	Benthic
11	4/19	Gorda Ridge Off-Axis	-126° 33.616 ' '	41° 51.774 ' '	4,416	Benthic
12	4/20	Blanco Transform RTI	-126° 32.606 ' '	42° 58.765 ' '	2,906	Benthic
13	4/21	Heceta Bank	-124° 58.276 ' '	43° 49.996 ' '	2,093	Benthic

Dive #	Date	Location	Longitude	Latitude	Depth (m)	Dive Focus
14	4/22	Cascadia Water Column	-126° 3.053 '	44° 41.026 '	2,631	Water Column
15	4/23	Unnamed Cascadia Seamount	-127° 11.214 '	44° 54.328 '	2,262	Benthic
16	4/24	Cascadia Deformation Front 1	-125° 16.37 '	45° 39.747 '	2,282	Benthic
17	4/25	Cascadia Deformation Front 2	-125° 33.996 '	46° 33.602 '	2,148	Benthic
18	4/26	Nitinat Canyon	-125° 48.174 '	48° 9.968 '	2,617	Benthic

2. CTD Casts

CTD cast locations are to be determined based on further coordination with the science community, but will occur as part of extended over-the-side operations. CTD casts will be scoped with the operations officer and chief survey technician in advance. At least four CTD casts are expected during the expedition.

3. Extended Operations

This expedition includes planned extended over-the-side operations. Current expedition plans include conducting extended over-the-side (e.g., CTD operations) and dive operations up to four times per week during the expedition. The exact locations for extended dives and CTD operations are to be determined upon further coordination with the science community, but will likely be prioritized for the deeper dives of the expedition to maximize time at the seafloor. A final plan for extended operations will be circulated prior to the start of the expedition. Best attempts will be made to stick to this schedule pending weather, mechanical issues, or other operational constraints. Extended dive operations may also be requested by the mission team in the case of unexpected late ROV deployments and/or exceptional discoveries (e.g., a new hydrothermal vent system, coral garden, shipwreck).

Approval of extended dive and over the side operations is at the commanding officer's discretion, and every effort shall be taken to minimize undue hardship on the crew and disruptions to work schedules.

4. Telepresence/Outreach Events

- a. Three live video feeds will be used throughout the expedition to provide situational awareness for onshore personnel.
- b. Live interactions are planned for this expedition, pending availability of shoreside engagement groups. Live interactions will consist of video calls from the control room and/or live streaming interactions via telepresence calls on the active dive streams.

5. In-Port Events

- a. A public in port event is scheduled for April 29th, in Seattle, Washington at pier, and VIP tours are scheduled for April 28th.

6. Special/Unusual Operations or Requests

- a. For mobilization, the pier in San Francisco will need to be capable of supporting a 75 ton crane and have ample room for maneuvering a crane truck and the delivery truck that will have ROVs Deep Discoverer and Sierios, and the equipment CONEX box. Deck support is requested to facilitate the onload of equipment.
- b. Full support from the Deck Department is requested on April 5-7 for ROV launch and recovery practice, High Voltage, crane, and winch operations.
- c. The ROV team requests to work with ship operators to test DP system prior to ROV launch and ensure DP maneuvers are adequate for ROV dives and similar to previous ROV expeditions.
- d. USBL calibration will require ship maneuvers, deck support for crane operations, deploying and recovering a transponder to ~1000 m depth, with an acoustic release and alongside recovery.

D. SCUBA Dive Plan

All SCUBA dives are to be conducted in accordance with the requirements and regulations of the [NOAA Diving Program](#) and require the approval of the ship's commanding officer. No SCUBA science dives are planned during EX2302, but the ship may plan training, safety drills, or maintenance dives.

E. Applicable Restrictions

Conditions that preclude normal operations include dives, CTD, and mapping operations inside National Marine Sanctuaries. Permits have been requested for these activities and are expected prior to departure. Permits and operational restrictions will be reviewed with the ship during the pre-cruise meeting prior to departure. (see additional information in **Appendix D**).

III. Equipment

A detailed list of equipment provided by the ship and NOAA Ocean Exploration can be found in the [“NOAA Ship *Okeanos Explorer* FY23 Field Season Instructions.”](#) There are no specific changes relative to this expedition.

IV. Hazardous Materials

A. Policy and Compliance

See the [“NOAA Ship *Okeanos Explorer* FY23 Field Season Instructions.”](#)

B. Inventory

Table 6. Inventory of hazardous materials that will be aboard for EX2302.

Item	Use	Approximate Locations
95% UPS denatured ethanol (275 gal)	Sample preservation	02 Deck, port side ethanol storage container
Formaldehyde (2 gal) to be buffered into 10% buffered formalin	Sample preservation	Wet lab, under the chemical hood
Bleach (1 qt)	Sterilization and sample preservation	Wet lab cabinet under sink
Magnesium chloride (500 g)	Sample preservation	Wet lab under hood
Sodium phosphate (1 kg)	Sample preservation	Wet lab under hood
AquaShield	Underwater lubricant	ROV workshop fire cabinet, pit
Dow Corning 4	Electrical insulating compound	ROV workshop fire cabinet, pit
Fluid film spray	Silicone lubricant	ROV workshop fire cabinet
Isopropanol alcohol (2 gal)	Solvent	ROV workshop fire cabinet
Scotchkote	Electrical insulating compound	ROV workshop fire cabinet
3M silicone spray	Silicone lubricant	ROV workshop fire cabinet
Synthetic AW hydraulic oil, ISO-22	Amsoil (AWG-05)	Hanger, pit, vehicles
Tap Magic cutting fluid	Cutting/machining lubricant	ROV workshop fire cabinet
Tap Magic heavyweight cutting fluid	Cutting/machining lubricant	ROV workshop fire cabinet

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

Appendix A. Waypoints

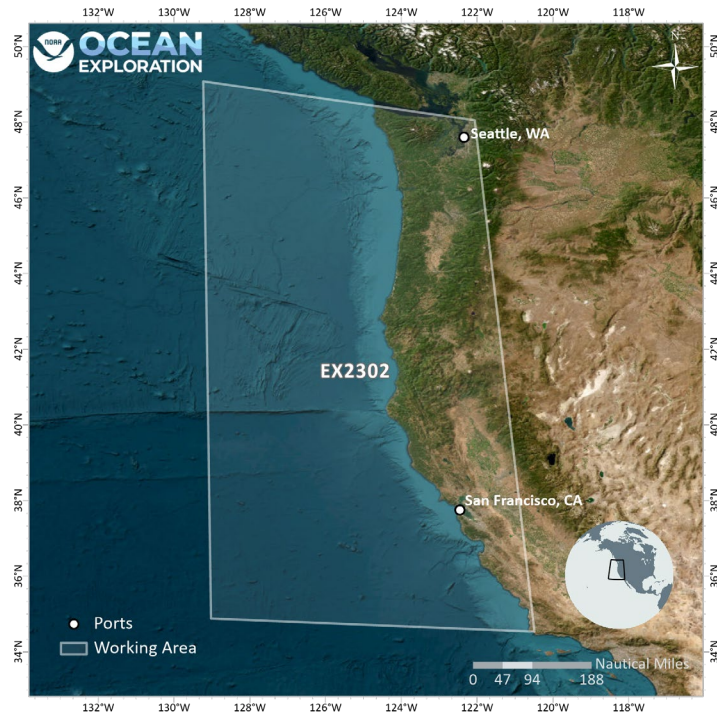


Figure A1. Map showing the general operating area for EX2302 (for reference).

Table A1. Waypoints for the general working area (white polygon).

Longitude (D DM)	Latitude (D DM)
-120° 29.062 '	34° 32.216 '
-129° 1.458 '	34° 52.793 '
-129° 13.806 '	49° 4.735 '
-122° 3.721 '	48° 2.981 '

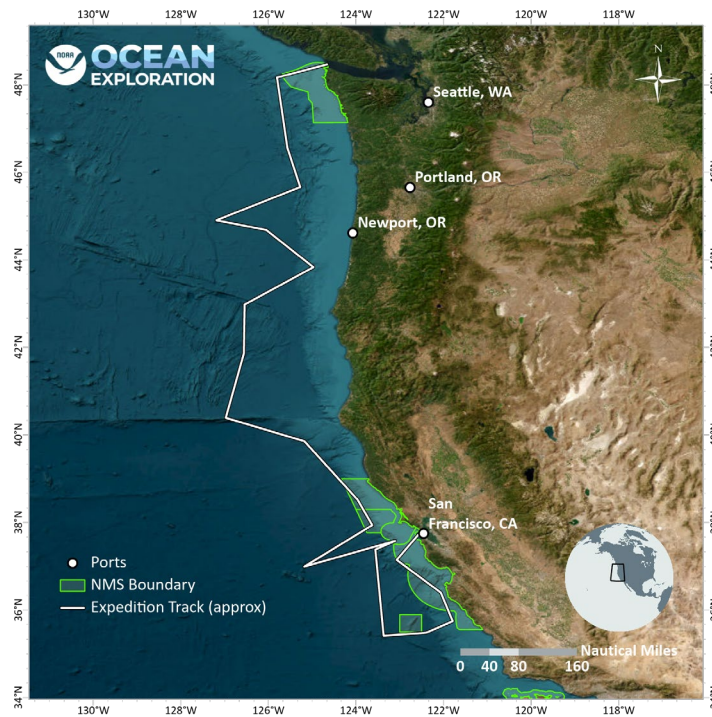


Figure A2. Map showing the general operating area for EX2302 (for reference).

Table A2. Waypoints for proposed expedition track (white line).

Longitude (D DM)	Latitude (D DM)
-122° 30.024 '	37° 48.522 '
-123° 4.167 '	37° 8.786 '
-122° 3.659 '	36° 23.937 '
-121° 47.327 '	35° 44.744 '
-122° 23.93 '	35° 28.907 '
-123° 22.05 '	35° 24.765 '
-123° 33.394 '	37° 22.948 '
-123° 6.151 '	37° 34.848 '
-125° 10.916 '	36° 59.552 '

Longitude (D DM)	Latitude (D DM)
-123° 37.63 '	37° 56.43 '
-123° 57.834 '	38° 31.38 '
-125° 10.671 '	39° 51.42 '
-126° 58.417 '	40° 23.509 '
-126° 33.616 '	41° 51.774 '
-126° 32.606 '	42° 58.765 '
-124° 58.276 '	43° 49.996 '
-126° 3.053 '	44° 41.026 '
-127° 11.214 '	44° 54.328 '
-125° 16.37 '	45° 39.747 '
-125° 33.996 '	46° 33.602 '
-125° 48.174 '	48° 9.968 '
-124° 39.582 '	48° 27.8 '

Appendix B. Data Management Plan

Okeanos Explorer Mission EX2302 Data Management Plan

Report Date: 2023-02-28

1. General Description of Data to be Managed

1.1 Name and Purpose of the Data Collection Project:

EX-23-02, ROV Shakedown and West Coast Exploration (ROV and Mapping)

Operations will focus on exploring deep waters (greater than 200 m for mapping operations and 250 m for ROV operations) in U.S. and international waters off the west coast of California, Oregon, and Washington states.

1.2 Summary Description of the data to be collected:

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

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

Theme Keywords:

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

Place Keywords:

California, Oregon, Washington, U.S. West Coast

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

Okeanos ROV Cruises

1.5 Planned or Actual Temporal Coverage of the data:

Start Date: 2023-04-08 and End Date: 2023-04-27

1.6 Actual or Planned Geographic Coverage of the data:

Northernmost Boundary: 50 and Southernmost Boundary: 33
Westernmost Boundary: -130 and Easternmost Boundary: -120

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

Bottom Backscatter, Cruise Plan, Cruise Summary, Digital Video, Digital Still Images, EK60 Split Beam Data, EK80 Split Beam Data, Multibeam (image), Multibeam (processed), Multibeam (product), Multibeam (raw), Navigational Data, SCS Output (compressed), SCS Output (native), Seafloor Imagery, Sound Velocity Profile, Sub-Bottom Profile data, Temperature data, Water Column Backscatter, XBT (raw)

1.8 What platforms will be employed?

NOAA Ship Okeanos Explorer, Deep Discoverer ROV, Seirios Camera Platform

2 Points of Contact for this Data Producing Project

Overall POC: Thomas Morrow, thomas.morrow@noaa.gov

Title: Expedition Coordinator

Affiliation: NOAA Office of Ocean Exploration and Research

Phone: (202) 650 7319 (Thomas Morrow)

3 Points of Contact for Managing the Data

Data POC: Caitlin Ruby

Data POC Title: Stewardship Data Management

Data POC Email: caitlin.ruby@noaa.gov

4 Resources

4.1 Have resources for management of these data been identified?

Yes

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

Unknown

5 Data Lineage and Quality

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

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

5.2 What quality control procedures will be employed?

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

6 Data Documentation

6.1 Does the metadata comply with the Data Documentation Directive?

Yes

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

Not Applicable

6.2 Where will the metadata be hosted?

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

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

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

6.3 Process for producing and maintaining metadata:

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

7 Data Access

7.1 Do the data comply with the Data Access Directive?

Yes

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

Not Applicable

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

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

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

Organization: NOAA National Centers for Environmental Information (NCEI)

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

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

Hold time: Data are considered immediately publicly accessible as soon as possible after the

mission, unless there are documented restrictions.
Hold authority: not applicable

7.4 Prepare a Data Access Statement

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

8 Data Preservation and Protection

8.1 Actual or planned long-term data archive location:

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

8.2 If no archive planned, why?

Not Applicable

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

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

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

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

8.5 Prepare a Data Use Statement

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

Appendix C. NOAA Ocean Exploration Ethanol Testing

To ensure the quality of the ethanol stored aboard NOAA Ship *Okeanos Explorer*, NOAA Ocean Exploration has developed an [Ethanol Test Guide](#). This guide provides step-by-step instructions on how to test the ethanol stored in the ejectable ethanol storage barrel on the O2 Deck. This guide also provides a built in calculator to plug in the measurements and get a definitive result. Finally, this guide is a log of the current and previous results of the ethanol testing.

Appendix D. Licenses, Permits, and Environmental Compliance

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

An environmental review memorandum was completed for NOAA Ocean Exploration expeditions on NOAA Ship *Okeanos Explorer* in 2023 in accordance with Section 4 of the companion manual in the form of a categorical exclusion worksheet. Based on this review, a categorical exclusion was determined to be the appropriate level of NEPA analysis necessary, as no extraordinary circumstances exist that require the preparation of an environmental assessment or environmental impact statement. This document is on file with NOAA Ocean Exploration and can be provided upon request.

See the "[NOAA Ship *Okeanos Explorer* FY23 Field Season Instructions](#)" for additional information regarding environmental compliance that applies to the entire field season (e.g., Endangered Species Act Section 7 consultation and potential impacts to essential fish habitat).

Permits have been requested for operations within the National Marine Sanctuaries (Monterey Bay, Greater Farallones, Cordell Bank, Olympic Coast) and are anticipated to arrive prior to departure. Mission and ship will be briefed on permits and restrictions prior to departure. Permits will be attached to the final revision of Project Instructions if available at the time of signing. If the permit is not available at time of document signing, a digital copy of the permit will be made available to the ship's command upon receipt and a hard copy of the permit will be onboard at time of departure.

Final licenses, permits, or compliance documents will be appended to the associated expedition report.