

**DY17-08 Project Instructions**

**Date Submitted:** June 20, 2017

**Platform:** NOAA Ship *Oscar Dyson*

**Project Number:** DY17-08

**Project Title:** Eco-FOCI Fall Moorings

**Project Dates: September 21 – October 07, 2017**

Prepared by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Dated: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Chief Scientist

NOAA-PMEL-Eco-FOCI/JISAO

Approved by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Dated: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Dr. Christopher Sabine

Director

NOAA-PMEL

Approved by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Dated: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Captain Keith Roberts, NOAA

Commanding Officer

Marine Operations Center – Pacific

**I. Overview**

A. Brief Summary and Project Period

Project Period: September 21 – October 7, 2017

This research area is focused on improving fisheries stock assessments and ecosystem assessments in the Bering Sea through the collection of fisheries acoustics information, zooplankton and physical oceanographic data.

B. Days at Sea (DAS)

Of the 17 DAS scheduled for this project, 0 DAS are funded by an OMAO allocation, 17 DAS are funded by a Line Office Allocation, 0 DAS are Program Funded, and 0 DAS are Other Agency funded. DY17-08 is allocated 10 DAS in FY17 and 7 DAS in FY18. This project is estimated to exhibit a High Operational Tempo.

C. Operating Area (include optional map/figure showing op area)

Eastern Bering Sea (see Appendices 1 and 2).

D. Summary of Objectives

(1) Sampling will be along the standard 70-m isobath transect, at Designated Biological Observation (DBO) area 1, and along the Unimak Box during DY17-08 (see map, Appendix 1). An additional CTD transect NW of St. Lawrence Island may be added, time permitting.

(2) Collect electronic oceanographic data including CTD (Conductivity-temperature-depth) vertical profiles of temperature, salinity, light transmission, chlorophyll *a* fluorescence, dissolved oxygen, photosynthetic available radiation (PAR). Continuously (along-track) collect sea surface temperature, salinity, chlorophyll *a* fluorescence data and above surface PAR (Hobo PAR sensor and data logger).

(3) Collect biological oceanographic samples (water and plankton); i.e. zoo- and ichthyoplankton data using a 20 and 60 cm bongo samplers (oblique tow with 150 µm and 505 µm nets, respectively to near bottom or 300 m), and nutrient, chl*a*, dissolved oxygen, and salinity samples using Niskin bottles attached to the carousel housing the CTD. These samples are collected to yield environmental indices of the current status and trends in the Bering Sea ecosystem.

(4) Collect coccolithophore (phytoplankton) samples from Niskin bottles (0 m depth) at a subset of stations.

(5) Sort zooplankton to taxa for energetics analysis (fatty acids) and filter water samples for fatty acid analysis of phytoplankton and microzooplankton at a subset of stations.

(6) Five single acoustic moorings will be recovered and deployed (Unimak, BS1,BS2, BS3, BS4). At 4 stations (M2, M4, M5, M8), 2 surface and 7 subsurface moorings will be recovered, and 10 subsurface moorings will be deployed. At or near these 4 stations, CTD casts will be completed prior to recovery.

(7) Four pop-up buoys will be deployed in the vicinity of the M5 mooring.

(8) Conduct 24/7 passive acoustic monitoring for marine mammals using sonobuoys.

E. Participating Institutions

AFSC - Alaska Fisheries Science Center, Juneau, AK and Seattle, WA

PMEL - Pacific Marine Environmental Laboratory, Seattle, WA

JISAO - Joint Institute for the Study of the Atmosphere and Oceans, Seattle

WACIMARS – Cooperative Institute for Marine Resources Studies, OR

Univ. NH – University of New Hampshire, NH

Cornell – Cornell University, NY

F. Personnel/Science Party: name, title, gender, affiliation, and nationality

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| --- | --- | --- | --- | --- | --- | --- |
| **Name (Last, First)** | **Title/duty** | **Date Aboard** | **Date Disembark** | **Gender** | **Affiliation** | **Nationality** |
| Lebon, Geoff | Chief Scientist | 20-Sep | 7-Oct | M | PMEL/JISAO | USA |
| Wilson, Matt | Zooplankton and ocean | 20-Sep | 7-Oct | M | AFSC | USA |
| Ferm, Nissa | Zooplankton and ocean | 20-Sep | 7-Oct | F | AFSC | USA |
| Ladd, Tanika | Oceanographer | 20-Sep | 7-Oct | F | UC Santa Barbara | USA |
| Langis, Daniel | Moorings | 20-Sep | 7-Oct | M | PMEL/NOAA Corps | USA |
| Grassia, Stephanie | Marine mammals | 20-Sep | 7-Oct | F | AFSC | USA |
| Seger, Kerri | Marine mammals | 20-Sep | 7-Oct | F | Univ NH | USA |
| Proctor, Peter | Oceanographer | 20-Sep | 7-Oct | M | PMEL/JISAO | USA |
| Semones, Molly | Oceanographer | 20-Sep | 7-Oct | F | Knauss Fellow | USA |

G. Administrative

1. Points of Contact:

Geoff Lebon (Chief Scientist, DY17-11), PMEL, 7600 Sand Point Way NE, Bldg 3, Seattle, WA 98115, ph: 206-526-6884, [Geoffrey.t.lebon@noaa.gov](mailto:Lisa.Eisner@noaa.gov)

Janet Duffy-Anderson (RP Program Manager), AFSC, 7600 Sand Point Way NE, Bldg 4, Seattle, WA 98115, ph: 206-526-6465, [Janet.Duffy-Anderson@noaa.gov](mailto:Janet.Duffy-Anderson@noaa.gov)

Phyllis Stabeno (PMEL Program Manager), PMEL, 7600 Sand Point Way NE, Bldg 3, Seattle, WA 98115, ph: 206-526-6453, [Phyllis.Stabeno@noaa.gov](mailto:Phyllis.Stabeno@noaa.gov)

LT Aras Zygas (Operations Officer NOAA Ship *Oscar Dyson*), NOAA Corps, 2002 SE Marine Science Dr., Newport, OR 97365, ph: (541) 867-8911, (617) 283-1324, ops.oscar.dyson@noaa.gov

***Oscar Dyson***

CO cell: 206-403-8433

XO cell: 206-295-0775

CME cell: 541-270-0223

Iridium: 808-659-0050

Underway VOIP: 541-867-8911

INMARSAT: 011-870-336-995-920 (voice)

2. Diplomatic Clearances

None Required.

3. Licenses and Permits

This project will be conducted under the Scientific Research Permit (U.S.) issued by the Alaska Regional Office, National Marine Fisheries Service (Permit number 2017-B1). The Chief Scientist is included as an authorized participant on this permit.

**II. Operations**

The Chief Scientist is responsible for ensuring the scientific staff are trained in planned operations and are knowledgeable of project objectives and priorities. The Commanding Officer is responsible for ensuring all operations conform to the ship’s accepted practices and procedures.

A. Project Itinerary:

**DY17-08**

Sep 20 Embark scientists in Dutch Harbor, AK

Sep 21 Depart Dutch Harbor, AK for eastern Bering Sea

Sep 24 - Oct 3 Oceanographic survey and moorings (planned order, weather permitting: Moorings S to N, DBO1, 70-m isobath, Unimak Box)

Oct 4 - Oct 7 Transit from eastern Bering Sea to Kodiak, AK

Oct 7 Arrive Kodiak, AK

Oct 7 - 8 Offload gear. Disembark scientific party

B. Staging and De-staging:

The scientific gear necessary for the project will be shipped to Dutch Harbor, AK in two 40-foot containers and loaded onto NOAA Ship *Oscar Dyson.* Unloading of the containers and transfer of equipment to the ship will occur as appropriate prior to departure. Members of the scientific party will arrive at least two days prior to departure to assist in the loading of equipment and preparation of the moorings and setting up sampling gear in the labs and on deck. The science party will arrange their own vehicles for transporting personnel and equipment prior to departure of DY17-08 on 19-21 Sept 2017.

Additional mooring equipment will be shipped from the University of Alaska, Fairbanks, to Dutch Harbor for loading on the ship.

**Request DY transport biological and oceanographic samples, equipment, and chemicals to Bellingham, WA (or suitable port in WA) sometime in mid-October as in past years.**

C. Operations to be conducted:

**1.** **Moorings:** Moorings will be recovered and deployed at sites M2, M4, M5, and M8 along with acoustic moorings at Unimak Pass, BS1, BS2, BS3, and BS4. Two surface moorings and 1 subsurface will be recovered at M2 while 2 subsurface moorings will be deployed. Stations M4, M5, and M8 each have two subsurface moorings that will be recovered and replaced and two additional subsurface moorings will be deployed at M8. Each acoustic mooring site, BS1, BS2, BS3, and BS4, has one mooring to be recovered and redeployed. Before recovery of moorings with the exception of acoustic moorings, calibration CTD casts with nutrient and chlorophyll samples will be completed approximately 0.25 miles from the mooring sites or as safely determined by the ship’s command.

**2. Marine Mammal:** During the 2017 DYSON field survey, passive acoustic monitoring for marine mammals will be conducted using sonobuoys. A sonobuoy is a free-floating, expendable, short-term passive acoustic listening device that transmits signals in real time via VHF radio waves to a receiver on a vessel. Sonobuoys will be deployed approximately every three hours (or when possible) to obtain an evenly sampled cross-survey census of marine mammal presence. However, when in areas of high whale density, or when trying to localize on a calling species of interest, multiple sonobuoys may be deployed more frequently to obtain near-continuous recording. The acoustician will monitor the sonobuoys in real-time (visually and with noise cancelling headphones), noting species detected and obtaining bearing and directional information of target species when possible.

Two UHF antennas (one omnidirectional, one directional yagi facing astern) and two pre-amplifiers will be installed in the crow’s nest of the vessel (or as high up as possible – in the past we have installed on the Dyson’s flying bridge) by the acoustician. These antennas will not interfere with coms or the equipment of the vessel. Low-loss RG8 coaxial cables will run from both antennas down into the bridge to the monitoring station. One desk and access to power outlet will be required for the monitoring station (Dyson notes: the table forward of the port console will work). Two laptop computers, two WinRadio receivers, and one soundcard will be positioned at the acoustic monitoring station, in addition to an external hard drive and a notebook. If a GPS feed cannot be provided by the vessel, a GPS antenna will be installed nearest the bridge and fed into the bridge via a feed through to the monitoring station (the ship notes that there is a GPS feed available on the port side). The GPS (or GPS feed provided by the vessel) will provide the ship’s position every minute as well as the sonobuoy deployment location information and time. When monitoring the sonobuoys, only one antenna will be used at a time. The Yagi will be used primarily during transit when the sonobuoy is guaranteed to be behind the vessel, and the omnidirectional antenna will be used for monitoring multiple sonobuoys simultaneously, or when other shipboard scientific operations cause the sonobuoy(s) to not be directly behind the vessel. A switch located in the bridge next to the acoustic station will be used to alternate between antennas depending on the direction of travel.

At the time of deployment, the acoustician will notify the Chief Scientist and CO that a sonobuoy will be deployed. They will then get one prepped sonobuoy from the staging area (was the lowest port rail forward in the past), program the sonobuoy accordingly, and deploy it by throwing it over the rail of the vessel into the water. If the vessel is transiting in a straight line, the buoy may be deployed from either side of the vessel. If the vessel is turning, the buoy will be deployed from the side of the vessel that it is turning toward. Once deployed, the acoustician will inform the Chief Scientist and Captain, before returning to the monitoring station. Immediately after deploying a sonobuoy, the acoustician will mark the deployment with a date/time/location stamp from the gps. They will then monitor in real-time using noise cancelling headphones

Prior to deployment, the sonobuoys will need to be modified and prepared for deployment. Approximately 3 ft of desk or counter space in a wet or dry lab is required (in the past this was done in the wet lab). These modifications include: popping the sonobuoy out of the protective outer case, and removing the parachute and any extraneous plastic or unnecessary pieces. The sonobuoys will then be tied up to shorten the deployment depth to ~25-27 m. Other modifications may include replacing the display batteries if needed. This involves opening up the housing of the sonobuoy, removing the dead battery, and replacing it with a new 9V battery. If the dead battery is a lithium battery, this may also include splicing a 9V battery cap onto the battery lead wires. Once tied up and with new batteries, a piece of tape is placed on the tube with all relevant sonobuoy information (year, type, manufacturer, etc.). The sonobuoy will then be stowed or secured in a predetermined place (preferably along the rail closest to the bridge), referred to as the staging area, where it will be ready for deployment.

**3. Acoustic data** will be collected continuously with a Simrad EK60 echo integration system incorporating centerboard-mounted transducers at 18, 38, 70, 120, and 200 kHz. The centerboard should be left in the **intermediate** position during the entire project. It is requested that vessel not operate other echo sounders or acoustic equipment that interferes with collection of scientific acoustic data unless it is unsafe to navigate without them. The bow thrusters, Doppler speed log and bridge Furuno depth sounder should all be secured, as long as it is safe to do so as determined by the ship’s OOD, as those degrade the quality of acoustic data.

**4. CTD casts** will be conducted at every station; *ad-hoc* casts may be necessary to document changes in oceanographic characteristics during the survey. For each cast, instruments and 5 or 10 L Niskin bottles will be added to the ship’s CTD carousel. Instruments added to the ship’s SBE 911+ CTD include secondary TC sensors, a PAR spherical sensor (Biospherical Instruments QSP 2300), chlorophyll *a* fluorometer with turbidity sensor (Wet Labs ECO FL-NTU), beam transmissometer (Wet Labs C-star), and two dissolved oxygen sensors (SBE 43). CTD casts will be to near-bottom (5-10 m from the sea floor). PAR and transmissometer sensors will be removed for deep casts (bottom depths greater than tolerance of instruments; 1000 m for PAR, and 600 m for transmissometer).

**5. Water samples** will be collected at every station with Niskin bottles attached to the CTD. Samples will be taken for chlorophyll *a*, nutrients, salinity, oxygen, phytoplankton taxa (preserved with 1% formalin), primary production experiments and possibly microzooplankton (preserved with Lugols). Water samples for fatty acid analysis will be conducted at a subset of stations. Chlorophyll *a*, primary production, and fatty acid samples must be stored in the -80 ºC freezer.

**6.** **Bongo nets** will be deployed at ~ every other station to sample small fishes and zooplankton. A tow will be conducted using fine-mesh nets: 60 cm diameter bongo nets with 505 micron mesh nets (Nets 1& 2), and a 20 cm bongo array with 150 micron mesh nets (Nets 1& 2). Zooplankton net tows will occur during day and night time hours. The bongo net will be deployed on one of the oceanographic winches with conducting wire (using real time CTD data collected with an SBE19 or SBE 49). Plankton samples will be preserved in 5% buffered formalin. 60 Bon Net 1 will be preserved for zoo- and ichthyoplankton and 60 Bon Net 2 will be sorted at sea for special projects (e.g. fatty acid analysis, zooplankton rapid analysis (ZRA)) and then discarded. Samples for fatty acids must be stored in the -80 ºC freezer. 20 Bon Net 1 will be preserved for zooplankton, 20 Bon Net 2 will be sorted for special projects (time permitting, e.g. fatty acid analysis, ZRA) and discarded. ZRA will be performed at select stations, approximately every other bongo. Zooplankton tows will be to near-bottom (5-10 m from bottom) or 300 m (if bottom depths are > 300 m).

**7. Along-track surface measurements** of temperature, salinity, and chlorophyll *a* fluorescence will be collected using the ship’s thermosalinograph (TSG) system (SBE-45, Wet Labs WetStar fluorometer). Water samples for chl*a* will be collected once or twice daily from the TSG to calibrate the fluorometer.

**8.** The **Scientific Computing System (SCS)** will be configured to log data from a large array of sensors during the project including data from the thermosalinograph, CTD casts, weather data (particularly above surface PAR or other light measurements (e.g. radiometer) and wind speed and direction), etc.

**9. 70-m isobath.** This portion of the project will serve to continue a long-term time series of observations describing the physical and biological properties of the Bering Sea shelf. Information will be collected through CTD casts and water sampling, underway shipboard measurements and plankton tows along the 70-m isobath and at stations around the moorings (Appendix 1, 2). Activities: CTD – 70-m isobath (chlorophyll 0, 10, 20, 30, 40, 50 m; nutrients 0, 10, 20, 30, 40, 50, near-bottom). Nutrient samples will be filtered through a 0.45 micron filter directly into acid washed and dried, 60 ml bottles. The bottles will then be frozen in the -80°C freezer and shipped to PMEL at the end of the season for analysis at PMEL. Chlorophyll *a* samples will be filtered through glass fiber filters using filter racks on board ship. Filters will be stored frozen in the -80°C freezer and then transported to AFSC for analysis. Stations will likely be occupied from south to north. A CTD cast will usually be the first operation at each station. At ~ every other station along the isobath, a bongo tow will occur. When at the stations around or at each mooring, both a CTD and bongo will be done and when at the mooring stations, triplicate CalVET (i.e. vertical zooplankton sampling nets) tows will be completed as the last operation.

**10.** At **Distributed Biological Observatory (DBO) stations** (DBO1, located southeast of St Lawrence Island, see Appendix 1, 2), CTDs and bongo tows will be conducted.

**11. Unimak Box.** A CTD (with nutrient and chlorophyll samples) will be deployed at each of 18 stations in a “box” around Unimak Pass (Appendix 1, 2). A 20/60 cm bongo will be deployed at every station within Unimak Pass and every other station on the other sides of the box for collection of mesozooplankton. If there is not enough time to complete the entire box, the top priority are the stations in Unimak Pass (UBS1, UBS2, UBS3, UBS4), and the second priority is the western side of the box (UBW1, UBW2, UBW3, UBW4). At Unimak Box West stations.

**12. Oculus Coastal Glider:** The oculus glider will be deployed in the summer from the Coast Guard ship Healy. The Dyson will be responsible to retrieve two gliders along the 70-m isobaths track line. Rendezvous position for recovery will be determined during the cruise. Recovery is preferred to be done by small boat operations (weather dependent).

**13. Pop-up buoys**: Four pop-up buoys will be deployed in the vicinity of M5 within 10 nautical miles of the mooring, and far enough from the mooring to avoid interference. Buoys are stand-alone and < 100 lbs with no separate anchor. They are deployed using a quick-release tag line. The pop-up is slowly lowered to water surface, either over the side or back end of the ship, then released at the water surface.

**14. Standard station activities** include:

CTD Stations

- CTD cast with Niskin water sample collection.

CTD/Bongo Stations

- CTD cast with Niskin water sample collection.

- Oblique bongo net tow (FOCI set-up, 20 & 60 cm bongo)

Mooring Stations (M2, M4, M5, M8)

- Oblique bongo net tow (FOCI set-up, 20 & 60 cm bongo).

- CTD cast with Niskin water sample collection (1-2 casts)

- Calvets (3 separate vertical tows)

We plan for 2 scientific teams with 12 hour shifts each. It is likely that the first shift will begin on or around 0600 and end at 1800 and the second shift will begin around 1800 and end around 0600, although some scientists may work different 12 h shifts (e.g. noon- midnight, midnight- noon, 0900-2100.

D. Dive Plan

All dives are to be conducted in accordance with the requirements and regulations of the NOAA Diving Program (<http://www.ndc.noaa.gov/dr.html>) and require the approval of the ship’s Commanding Officer.

Dives are not planned for this project.

E. Applicable Restrictions

Conditions which preclude normal operations include: poor weather conditions, equipment failure, safety concerns, and other unforeseen circumstances. The Chief Scientist will confer with the Commanding Officer to mitigate the impacts of these circumstances on the project goals..

F. Marine Mammal, Endangered, and Protected Species

During fishing and oceanographic operations, take all proactive steps to avoid deploying the gear in any situation where there is a high likelihood for an incidental take of protected species or marine mammals. This could mean delaying a set or moving to a suitable alternate site. Be on the look-out for marine mammals or other protected species prior to initiating a tow and also at haul back.

Within 24 hours of any incidental take of, or injuries or mortalities to, marine mammals as a result of operations, the Chief Scientist/Field Party Chief shall report incident to the vessel CO, Jon Kurland (jon.kurland@noaa.gov, 907-586-7638) or Robyn Angliss (robyn.angliss@noaa.gov, 206-526-4032), and guy.fleischer@noaa.gov and jeff.napp@noaa.gov with cc to john.c.clary@noaa.gov. This information will be entered into the Protected Species Incidental Take (PSIT) system per instructions below.

Seabirds can be sampled and retained for salvage – if take involves seabird, include Shannon Fitzgerald in notification at shannon.fitzgerald@noaa.gov. If take involves ESA-listed bird, retain specimen and we will notify FWS (to issue collection authority). Do not retain gulls – except Kittiwakes. Albatross are high priority.

**KEY ACTIONS IN RESPONSE TO ALL INCIDENTAL TAKES**

**1.** Prior to the project, communicate and coordinate with vessel crew about established protected species incidental take reporting and handling procedures whether NOAA, charter, or partner project. Ensure regional ESA biologists and pertinent staff are in the PSIT email alert notification list. The Office of Law Enforcement (OLE) will be notified of takes via PSIT email alert system for all non-marine mammal takes including seabirds within 48 hours of the event.

**2.** Notify the geographically appropriate Regional Stranding Response Coordinator (numbers in this document) immediately following the incidental take of a marine mammal. Stranding Response Coordinator will contact Office of Law Enforcement (OLE). For live injured/uninjured marine mammals, priority should be to release the animal before notifying stranding response networks. NOTE: If Coordinators are unreachable, collect pertinent PSIT information and release animal and/or retain carcass if logistically feasible.

**3.** For a sea turtle or protected fish (injured/live/dead), follow the Terms and Conditions stated in your Fisheries Independent Monitoring Biological Opinion regarding reporting and data collection. If you do not have a current Biological Opinion, contact your designated Regional or Science Center Protected Species Point of Contact for instructions.

**4.** For handling, sampling and salvaging seabirds (ESA and non-ESA listed), contact regional United States Fish and Wildlife Service (USFWS) points of contact or NMFS regional seabird coordinator. If you have a permit, report seabird takes to PSIT.

**PRE-PROJECT ACTIONS**

**1)** Prior to the project, communicate and coordinate with vessel crew about established protected species incidental take reporting and handling procedures whether NOAA, charter, or partner project.

**2)** Ensure regional ESA biologists and pertinent protected resources staff is in the PSIT email alert notification list.

**3)** The NMFS Chief Scientist or Designee shall contact the appropriate Regional Stranding Network and query about additional numbers or specific contacts to reach in case of an incidental take of a marine mammal.

**WHAT TO DO WITH LIVE, INJURED OR UNINJURED MARINE MAMMAL**

If a live, injured or uninjured marine mammal is incidentally captured, the animal should be released immediately.

**1)** Considering human safety, work from the vessel as quickly and carefully as possible to free the animal from the gear. Ensure the animal can continue to breathe while freeing from the gear.

**2)** If it can be done immediately without further harming the animal, photograph the animal (dorsal and ventral sides including dorsal fin, flanks, head/jaw) and gear interaction at time of capture and when free from gear prior to release and collect required PSIT information.

**3)** If animal is NOT brought aboard the vessel and taking photos is not an option, provide a comprehensive summary of the incident following requirements described under ‘PSIT narrative’ in this document.

**4)** Notify Regional Stranding Response Coordinator about the incident.

**5)** Submit take information for submission to PSIT and attach any forms, photos, and narrative to the take record within a week of the event.

Note: Untrained personnel should not attempt to handle live injured/uninjured marine mammals or disentangle large whales. In the event of a large entangled whale, immediately call your regional entanglement response network.

**WHAT TO DO WITH DEAD MARINE MAMMAL OR SEA TURTLE?**

**1)** Notify Regional Stranding Network Coordinator about the take of a dead marine mammal.

**2)** For sea turtle takes, simply report the take/s to PSIT and follow the instructions listed in your Biological Opinion or follow Regional or Science Center Protected Species Point of Contact instructions.

**3)** If logistically feasible, the animal should be hauled aboard the vessel and retained for pick up by the local Stranding Network. Develop a plan with Stranding Network Coordinator or regional ESA biologist and/or relevant Center scientist for carcass pickup and subsequent necropsy.

**4)** If the animal cannot be hauled aboard due to human safety consideration or there is no feasible way for carcass retention onboard, release animal after necessary information is collected as described below.

**5)** Photos of the carcass should be taken: Dorsal fin, ventral side, and flank for marine mammals, as well as signs of entanglement, scars, and injuries. This also includes collecting required PSIT data.

**6)** Submit take information for submission to PSIT and attach any forms, photos, and narrative to the take record.

**PSIT Reporting**

Report [1] Species involved, [2] number dead, number injured and released, or number uninjured and released, [3] date and time, [4] latitude and longitude, [5] any mitigation measures taken, [6] other comments or observations germane to this take. Note if photo was taken.

In addition to the required PSIT information please complete a narrative which includes the following information.

**1)** Animal Condition (include photos)

Code 1 – Live Animal

Code 2 – Fresh Dead

Code 3 – Moderate Decomposition

Code 4 – Advanced Decomposition

**2)** Mention if animal escaped or was released.

**3)** Indicate if the animal or other marine mammals or sea turtles were seen in the vicinity of the vessel during fisheries operations.

**4)** Animal condition post-release: Describe any observed injuries, the condition and behavioral state of released or injured animal (e.g., no obvious injuries and animal swam away vigorously, did not swim away vigorously, animal surfaced to breathe, animal sank to bottom, or blood in water observed).

**5)** If gear was still attached to animal after release, describe how the gear was cut and approximately how much gear is left and where it is still entangled/injured.

**6)** Photos: Provide comprehensive photographic evidence or written description of live/dead or injured animal. Provide pictures (if possible) of how the animal was entangled in the gear, and any gear-related interactions such as wounds or constrictions.

**7)** Decision-making: Include rationale for any discretionary decisions taken by Chief Scientist/crew.

**8)** Describe possible causes for incidental capture of the animal and any additional mitigation measures that were taken, or might be taken to prevent similar captures in all subsequent operations.

**ENTANGLEMENT RESPONSE NETWORK NUMBER**

Alaska Region: 1-877-925-7773

**III. Equipment**

A. Equipment and Capabilities provided by the ship (itemized)

1. Acoustic Equipment

* + GPS with NEMA 183 to Ek60 (2)
  + 50/200 kHz EK60 Bridge sounder
  + Furuno FE-700 fathometer
  + Acoustic echosounders (5)

2. Oceanographic Equipment

* Both starboard oceanographic winches with conducting cable, slip rings and blocks. Forward winch terminated for CTD/rosette; aft winch terminated for SeaCat/FastCat.
  + - * Seabird SBE 911+CTD System with 10 L Niskin bottles (5 L bottles as backups)
      * Seabird SBE19+CTD and PDIM for real time data on zooplankton tows
      * SBE45 Thermosalinograph with fluorometer
      * Wire speed indicators and readout for both hydrographic winches visible in Dry Lab or where SEACAT operations occur
      * Weather instr. For above surface PAR, wind speed/direction
      * Ship’s crane

3. Computing equipment

* + Scientific Computing System

4. Sample storage equipment

* + Supercold freezer (-80C)
  + Walk in freezer (-10C)
  + Stand up freezer (-20C)
  + Hazmat storage cabinets

5. Laboratory and exterior working space

* + - * Scientific Computer System (SCS)
      * Video monitors in Dry, Chemistry, and Wet labs for viewing SCS and Electronic MOA output
      * Laboratory space with exhaust hood, sink, lab tables, and storage space
      * Sea-water hoses and spray nozzles to wash nets (quarterdeck and aft deck),
      * Adequate deck lighting for night-time operations,
      * Navigational equipment including GPS and radar,
      * Safety harnesses for working on starboard sampling station/hero platform and fantail
      * Ship’s crane(s) used for loading and/or deploying gear and supplies
      * Surface seawater on aft deck for jellyfish experiments and primary production experiments.

B. Equipment and Capabilities provided by the scientists (itemized)

1. Oceanographic Equipment (1,500lbs)

* + - * Biospherical SP2300 PAR sensor
      * Wet labs ECO Fluorometer and turbidity sensor (FL-NTU)
      * Wet labs C-star Transmissometer
      * SBE 43 dissolved oxygen sensor (2)
      * Secondary TC sensors for SBE 911+
      * SBE 19Plus SeaCat
      * SBE 49 FastCat
      * sonobuoys
      * pop-up buoys
      * Filter racks and pumps (3)
      * Microscopes (compound, dissecting, stereo) (4)
      * 20 & 60 cm Bongo frames, 505/153 mesh nets, cod ends, weights, and flowmeters
      * CalVET frame and 53 µm mesh nets, cod ends, and flow meters
      * Two wire-angle indicators
      * Biological supplies (misc.) \*

2. Subsurface and Acoustic Mooring Equipment

floats, instruments and anchors

3. Biological Sampling Equipment (500lbs)

* Marel M60 60 kg scale (2); already on ship (MACE)
* Marel M60 6 kg scale (2); already on ship (MACE)
* Mechanical platform scale (2); already on ship (MACE)

4. Miscellaneous scientific sampling and processing equipment

* + - * Dishpans (10, MACE)
      * 5-gal buckets (5)
      * Two length board and strips for adult fish
      * Triple-beam balance for small fish weights
      * Sieves, jar holder, funnels, squirt bottles
      * 30 cases of 32-oz jars, closures, and labels
      * 10 flowmeters, calibration data, hardware for attaching and maintaining them
      * Preservative-dispenser equipment
      * Hazardous materials spill kit
      * Spare wire angle indicator
      * Winkler Oxygen Analysis rig

5. Computing equipment (50lbs)

* + - * IBM compatibles
      * Printers\*
      * Laptops
      * Cruise Operations Database (COD) software and forms

**IV. Hazardous Materials**

A. Policy and Compliance

The Chief Scientist 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). 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 and ship’s ECO 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

Dyson loaded 1/19/2017 by FOCI and MACE personnel. All chemicals listed will be used for the entire 2016 Dyson field season. Chemical volumes will be reported to the Ops Officer and the designated contact for each survey will be required to report to chemical owners. The name of the group responsible for each of the chemicals is designated after the chemical name in the table. MSDS, chemical hygiene plan, and SOPs will be provided to the Dyson before the loading of the vessel.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Common Name** | **Concentration** | **Amount** | **Spill Response (all FOCI/MACE/PMEL/EMA personnel)** | **Notes** | **Trained Person(s)** |
| Dihydrogen Oxide  Property of PMEL |  | 20 liters | Spill Control: W  Gloves  Paper towels | Not a regulated chemical/solution.  Used for oxygen titrations. | Peter Proctor |
| DNA Away | 100% | 1 – 250 ml | Gloves  Paper towels  Plastic bag | Not a regulated chemical. |  |
| Ethanol  Property of FOCI | 100% | 2 -1 gal. plastic jugs | Gloves  3M Sorbent Pads  Plastic bag | Store in Chem. Lab yellow flammables cabinet. | Peter Proctor |
| Ethylene Glycol  Property of FOCI | 100% | 1 – 500 ml | Gloves  Paper towels  Plastic bag | Not a regulated chemical. Store in Spill Kit. |  |
| Formaldehyde  Property of FOCI | 37% | 3 – 5 gal. barrels | Gloves  Eye Protection  Fan-Pads  Formalex  PolyForm-F  Plastic bags | Store in Fish Lab flammable cabinets. Will need to place 2-3 in each cabinet. | Matt Wilson |
| Glutaraldehyde/formaldehyde | 0.5% glutaraldehyde, 10% PFA | 30 ea - 20ml aliquots | Gloves  Eye Protection  Fan-Pads  Formalex  PolyForm-F  Plastic bags | Store in -80° freezer. | Peter Proctor and Tanika Ladd |
| Glycerol/Thymol Solution  Property of MACE | 50 % | 1 – 5 gal., 1 – 4 gal. bucket | Gloves  Paper towels  Kitty litter | Not a regulated chemical/solution.  Store in Fish Lab under sink. |  |
| Hydrochloric Acid  Property of PMEL |  | 1 – 500 ml | Gloves  1-1 Spilfyter Acid Neutralizer | Stored in over-pack bucket. | Peter Proctor |
| Lithium 3v Batteries  Property of FOCI |  | 9 | NA | Store in Survey Office for Fall Multi-Net use | Peter Proctor |
| Lithium 9v Batteries  Property of PMEL |  | 8 | NA | In SeaBird and Wetlabs instruments | Peter Proctor |
| Lithium AA Batteries  Property of PMEL |  | 96 | NA | In SeaBird instruments and MicroCats Saft LS14500 | Peter Proctor |
| Lithium D Cell Batteries  Property of PMEL |  | 150 | NA | In RCM9 & Peggy Mooring | Peter Proctor |
| Manganese Chloride  Property of PMEL | 3M | 1 liter |  | Not a regulated chemical/solution.  Used for oxygen titrations. | Peter Proctor |
| Potassium Iodate  Property of PMEL | 0.00167 M | 1 liter | Spill Control: PI  Gloves  Plastic bag | Used for oxygen titrations. | Peter Proctor |
| Sodium Borate Solution  Property of FOCI | 5-6% | 1 – 5 gal. | Gloves  Paper towels  Plastic bag | Not a regulated chemical. Working container will be secured on Fish Lab counter. |  |
| Sodium Borate Powder  Property of FOCI | 100% | 1 – 500 g | Gloves  Wet paper towels  Plastic bag | Not a regulated chemical. Stored in Spill Kit. |  |
| Sodium Iodide/NaOH Solution  Property of  PMEL | 0.11M | 1 liter | Spill Control: B | Used for oxygen titrations. | Peter Proctor |
| Sodium Thiosulfate  Property of PMEL | 0.11 M | 1 liter | Spill Control: ST | Used for oxygen titrations. | Peter Proctor |
| Sulfuric Acid  Property of PMEL | 5 M | 1 liter | Spill Control: A | Used for oxygen titrations. | Peter Proctor |
| Mercuric Chloride  Property of PMEL | Saturated solution of HgCl2 in DIW | 25 ml | Spill Control: HgCl2 |  | Peter Proctor |
|  |  |  |  |  |  |

C. Chemical safety and spill response procedures

Chemicals will be transported, stored and used in a manner that will avoid any spills and adequate containment; absorbents and cleanup materials will be available in the event of a chemical spill.

The scientific chemicals to be used for this project are: (1) ethyl alcohol (100%), (2) formaldehyde (37%) and (3) Mercuric Chloride (saturated solution). Additional chemical reagents will be used for oxygen concentration analysis as noted in **Section V** below. Other chemicals brought aboard are consumer products in consumer quantities. Dilutions of the scientific chemicals will be used to preserve in faunal organisms collected with bongo nets, as described in the Operations section of these Project Instructions. Use of these chemicals and the specified dilutions will only occur in exterior locations on the ship away from air intakes. Scientific chemicals shall not be disposed over the side. We will use Mercuric Chloride (HgCl2) (100 micro-liters per 250 ml sample) to preserve water samples for pCO2. The samples will then be shipped to UAF for analysis.

Standard Operating Procedures and Information Sheets are provided here for the scientific chemicals. Included are details concerning personal protective equipment, work area precautions, special handling and storage requirements, spill and accident procedures/first aid, waste disposal and other pertinent information. Both small and large spills are of particular concern. In both cases, the spill response is intended to first contain the spill and then neutralize it. This may be easily accomplished for small spills depending on the degree of vessel motion and the prevailing environmental conditions. In all cases, the first responder should quickly evaluate the risks of personal exposure versus the potential impacts of a delayed response to the spill and act accordingly. For example, if the spill is small and it is safe to do so, a neutralizing agent should be rapidly applied to encircle/contain the spill and then cover it. However, a large formaldehyde spill (> 1 L) is extremely hazardous and individuals at risk of exposure should immediately leave the area. The CO or OOD should be notified immediately so that a response team with self-contained breathing apparatus (SCBA) can be deployed to complete the cleanup operation or dispense the hazard with a fire hose directed overboard. The vessel’s course should be adjusted to minimize exposure of personnel to wind-driven vapors and to limit spread of the spill due to vessel motion. The reportable quantity (RQ) of formaldehyde is 1,000 pounds and the RQ for ethyl alcohol is 5,000 pounds, which greatly exceed the quantities brought aboard for this project.

Inventory of Spill Kit supplies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Product Name | Amount | Chemicals it is useful against | Amount it can clean up | Notes |
|  |  |  |  |  |
| Formalex | 1-5 gallon  2 – 1 gal. | Formaldehyde cleanup (all concentrations) | 7 gallons 1:1 control | Formalex will be used in conjunction with Fan-Pads to reduce total spill volume |
| Fan-Pads | 2 rolls (50 sheets) | Formaldehyde cleanup (all concentrations) | 50 sheets=50-150 ml spills | Formalex will be used in conjunction with Fan-Pads to reduce total spill volume |
| PolyForm-F | 1 – 5 gal. bucket | Formaldehyde cleanup (all concentrations) | 1:1 control | Pour onto large spill immediately to deactivate formaldehyde. |
| 3 M Pads | 10 pads | Ethanol cleanup | 10 pads=10-250 ml spills | Pads may be reused if dried out |
| Nitrile Gloves | 8 pairs each S,M, L, XL | For all cleanup procedures | N/A | Gloves will be restocked by each survey group |
| Eye Protection | 4 pairs goggles  1 face shield | Formaldehyde cleanup | N/A | Eye protection will be cleaned before reuse |
| Tyvex Lab Coats | 2 coats | Formaldehyde cleanup | N/A | Coats will be cleaned with Fan-Pads and Formalex before reuse |
| Plastic Bags | 2 | Formaldehyde cleanup/Fan Pads | N/A | Bags may be packed full and sealed |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PMEL Acid-Base Spill Kit Contents** | **Amount** | **Use** | **Total Spill Volume Controllable** | **Notes** |
| Spilfyter Acid Neutralizer | 1 box | Clean up acid spill—H2SO4 | 1.5l of 5M Sulfuric Acid  5.57l of 10% (1N) HCl |  |
| Spilfyter Base Neutralizer | 1 box | Clean up base spill--NaOH | 2.0l of Sodium Hydroxide |  |
| Vinyl Gloves | 1 box | Protect hands during cleanup | N/A |  |
| Foxtail/Dustpan | 1 each | Pick up absorbed neutralizer | N/A |  |
| Rubber apron | 1 each | Protect during cleanup | N/A |  |
| Paper Towels | 1 roll | Absorb liquids | N/A |  |
| **Goggles** | **2 pair** | **Protect eyes** | **N/A** |  |
| Chemical absorbent | 1 liter | Absorb liquids | 0.5l |  |
| Plastic Bags | 2 each | Contain used absorbents/waste | N/A |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PMEL Mercuric Chloride Spill Kit Contents** | **Amount** | **Use** | **Total Spill Volume Controllable** | **Notes** |
| Absorbent pads | 3 sheets | Absorb HgCl2 liquid | 100 ml |  |
| Poly bags | 3 | Contain contaminated clean up materials |  |  |
| Vinyl gloves | 4 pair | Protect hands while cleaning spill | N/A |  |

SPILL CONTROL

**A: ACID**

Wear appropriate protective equipment and clothing during clean-up. Keep upwind. Keep out of low areas.

Ventilate closed spaces before entering them.

Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible.

**Large Spills**: Dike far ahead of spill for later disposal. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal.

**Small Spills**: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills in original containers for re-use.

Neutralize spill area and washings with soda ash or lime. Collect in a non-combustible container for prompt disposal.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

**B:Base**

Use proper PPE.

Ventilate area.

Neutralize with dilute acid such as HCl if possible.

Absorb with cat litter or vermiculite.

Vacuum or sweep up material and place into suitable disposal container.

Do not breath dust.

Do not get water on spilled substances.

**M: Mercury as Saturated HgCl2 Solution**

Use proper PPE – protective gloves for small amounts of HgCL2.

Absorb spill with absorbent material and place in a suitable container for disposal.

Wipe area with DIW soaked toweling and place used towels in a suitable container for disposal.

**F: Formalin/Formaldehyde**

Ventilate area of leak or spill. Remove all sources of ignition.

Wear appropriate personal protective equipment.

Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible.

Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container.

Do not use combustible materials, such as saw dust.

**PI:Potassium Iodate**

Avoid Contact with combustibles (wood, paper, clothing …).

Keep substance damp with water spray.

Vacuum or sweep up material and place into suitable disposable container (plastic bag).

**ST: Sodium Thiosulfate**

Ventilate area of leak or spill.

Wear protective gloves and clean body-covering

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Recover liquid or particulate in 5 gallon bucket. Absorb with a kitty litter and place in disposable bag. Do not use combustible materials, such as saw dust to absorb.

**W: Water**

Absorb the liquid and wash with water

Wear PPE

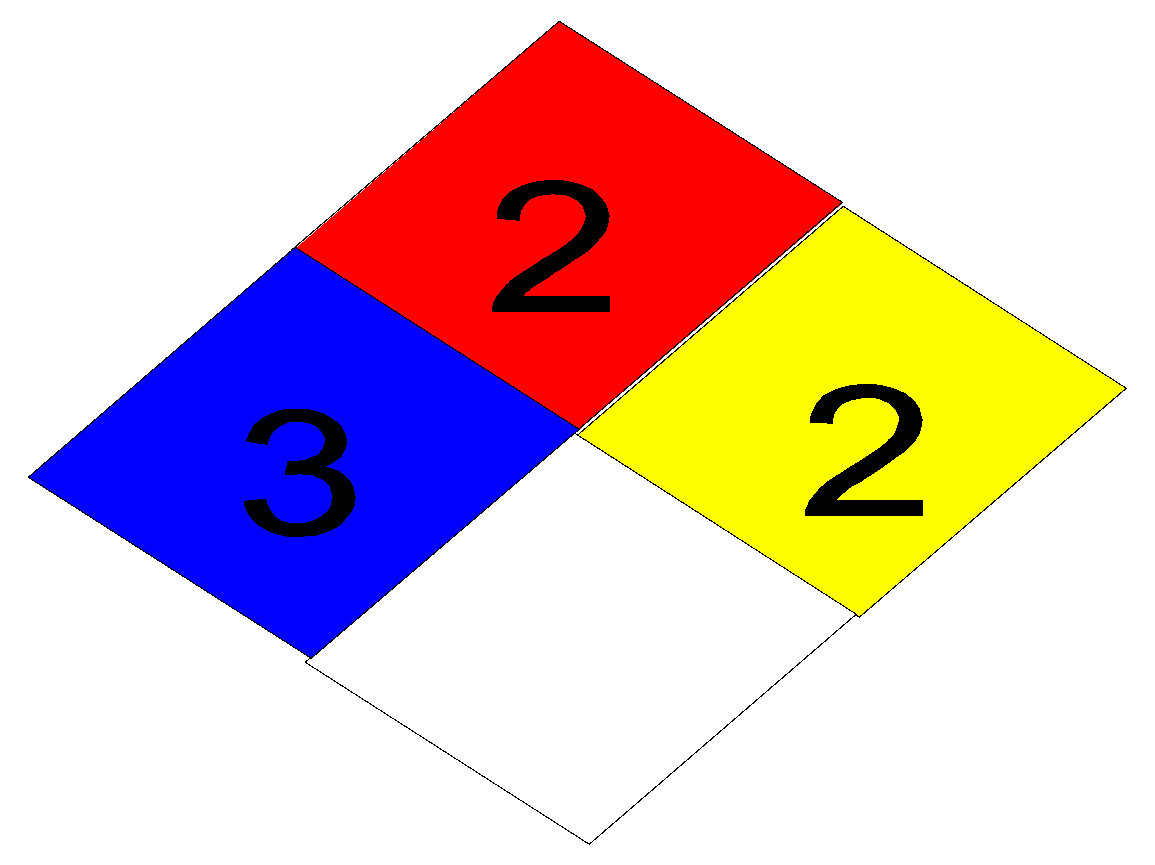
**E: Ethanol**

Eliminate all ignition sources

Wear PPE

Chemical Hygiene Plan and Standard Operating Procedures (SOPs)

**Standard Operating Procedures – Formaldehyde At-Sea**



Chemical Name: 37% Formaldehyde

UN Number: 1198

Hazard Ratings: (on a scale of 0 to 4)

Health (blue): 3 Flammability (red): 2

Reactivity (yellow): 2 Special (white):

Personal Protection Gear Needed

\*gloves

\*goggles or face shield

Special Handling Instructions

\* If a ventilation hood is not available, then pouring of chemical must be done outside. At least two people should be involved with large chemical transfers in case of an emergency.

\* Chemical must be stored at temperatures above 15o c to prevent polymerization of paraformaldehyde.

First Aid

\* If swallowed, give large amounts of drinking water and induce vomitting.

\*If vapors inhaled, get out into fresh air immediately. Give oxygen if breathing is difficult.

\* If spilled on skin or splashed in eyes, flush with water for at least 15 minutes.

Spill Cleanup Procedures

**For small spills** (500-1000 mls):Cover spill quickly with a Fan Pad and spray on Formalex to deactivate and absorb chemical. Let material sit for 10 - 15 minutes. Dispose of materials in plastic bag.

**For large spills** (>1000 mls): Use a combination of Fan Pads and Formalex as quickly as possible to contain spill and deactivate it. Vacate area and try to ventilate room, if possible. Call Bridge immediately.

Deactivation/Disposal Procedures At Sea

\*Formalex is a greenish liquid that is to be used to insure proper chemical deactivation. Formalex should also be used in conjunction with Fan Pads. Place used Fan Pad in plastic bag, seal, and put in bottom of Spill Kit.

\*Fan Pads may be used to absorb small spills alone but these pads work best when used with Formalex to immediately control the vapor layer.

Shipping Procedures and Restrictions

37% formaldehyde cannot be ship by air due to its flammability rating. All quantities should be over-packed with absorbency material in case the original container is damaged. When shipping by barge or land, labels are not required for quantities under 110 gallons by D.O.T. but the container should have MSDSs and the UN number readily available.

**Standard Operating Procedures – Ethanol At-Sea**

**3**

**0**

**2**

Chemical Name: 100% Alcohol

UN Number: 1170

Hazard Ratings: (on a scale of 0 to 4)

Health (blue): 2 Flammability (red): 3

Reactivity (yellow): 1 Special (white):

Personal Protection Gear Needed

\*gloves

\*goggles or face shield when pouring

Special Handling Instructions

\* Keep away from heat, flame, and other potential ignition sources.

\* Store in a well ventilated area or in a flammable cabinet.

First Aid

\* If swallowed, give large amounts of drinking water and induce vomiting.

\* If vapors inhaled, get out into fresh air immediately. Give oxygen if breathing is difficult.

\* If spilled on skin or splashed in eyes, flush with water for at least 15 minutes.

Spill Cleanup Procedures

Absorb ethanol with 3M Sorbent Pads and allow to dry in a well ventilated area away from ignition source.

Deactivation/Disposal Procedures At Sea

Use 3M Sorbent Pads to absorb the ethanol. Put used pads outside to dry (secure from blowing overboard and exposure to flame). Once dry, the pads may be reused or burned.

Shipping Procedures and Restrictions

Due to the flammability rating of 95% ethanol, this chemical cannot be shipped by air. Transportation by barge or land vehicle will require the ethanol container to be over-packed with absorbent materials such as clumping kitty litter or shredded paper. Include MSDSs and the UN number with the shipment for reference in the event of a spill.

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

E. Inventory (itemized) of Radioactive Materials – **N/A**

**V. Additional Projects**

A. Supplementary (“Piggyback”) Projects

1. Nutrient sampling and dissolved oxygen sample analysis will be conducted on-board ship by scientists from PMEL.

Nutrient sampling:

Nutrients will be sampled from the Niskin bottles on the CTD rosette. Samples will be filtered through a 0.45 micron filter directly into acid washed and dried, 60 ml bottles. The bottles will then be frozen in the -80°C freezer and shipped to PMEL at the end of the season for analysis at PMEL.

Oxygen Measurements

The procedure is based on that of Carpenter (1965)[JS1]. Winkler (1888) [CGR2]titrations will be conducted according to WOCE/CLIVAR protocols, and described in detail in GO\_SHIP Repeat Hydrography Manual, Report number 14, ICPO Publication Series No. 134, Version 1, 2010. Samples will usually be collected in the upper layer on one station and in the bottom layer on the next station. End point determinations of the Winkler titration will be determined by an amperometric method Culberson, (1991). Thiosulfate will be standardized for each batch of sample titrations, and blanks will be measured periodically during the project. Side by side comparison of this method with the photometric method show differences 0.06% or +/- 0.15 umol/kg. The automated amperometric titrator was designed by Chris Langdon at RSMAS in Miami.

Oxygen is the first sample to be taken from the Niskin bottles to prevent the contamination of the sample via air and oxygen entering the Niskin through the vent. The sample is collected in glass 125 ml flasks and “pickled” with 1 ml each of 3M MgCl2 and 4M NaI/8M NaOH. After the samples have accumulated until a sufficient number have been collected the samples are analyzed.

Analysis consists of the addition 1 ml of 5M H2SO4 to dissolve the precipitate from the “pickling” and then the sample is titrated with 0.16M H10O8Na2S2 (Sodium Thiosulfate). The amount of titrant is directly related to amount of oxygen in the water.

References:

Carpenter, J. H., 1965. The Chesapeake Bay Institute technique for the Winkler dissolved oxygen method. Limnol. Oceanogr. 10, 141 -143.

Culberson, C. H., 1991. Dissolved Oxygen, in WHP Operations and Methods – July 1991

Winkler, L. W., 1888. Die Bestimmung des im Wasser gelosten Saurestoffes. Berichte der deutschen chemischen Gesellshaft. 21, 2, 2843 – 2854.

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned.

**VII. Meetings, Vessel Familiarization, and Project Evaluations**

1. Pre-Project Meeting: The Chief Scientist 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 Chief Scientist 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 conducted a meeting no earlier than 24 hours before or 7 days after the completion of a project to discuss the overall success and shortcomings 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 Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.
4. Project Evaluation Report

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

**VIII. Miscellaneous**

A. Meals and Berthing

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

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Chief Scientist. The Chief Scientist and Commanding 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 Chief Scientist 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 Chief Scientist is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the project and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Chief Scientist will ensure that all non-NOAA or non-Federal scientists aboard also have proper orders. It is the responsibility of the Chief Scientist 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 17, 2000 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts

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

All NHSQs submitted after March 1, 2014 must be accompanied by [NOAA Form (NF) 57-10-02](http://www.moc.noaa.gov/all-ships/NOAA%20Form%2057-10-02%20(1-14)%20Tuberculosis%20Screening%20Document.pdf) - Tuberculosis Screening Document in compliance with [OMAO Policy 1008](http://www.moc.noaa.gov/all-ships/1008%20-%20Tuberculosis%20Policy.pdf) (Tuberculosis Protection Program).

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

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

The only secure email process approved by NOAA is [Accellion Secure File Transfer](https://sft2.doc.gov/courier/web/1000@/wmLogin.html) which requires the sender to setup an account. [Accellion’s Web Users Guide](https://sft2.doc.gov/courier/1000@/Accellion_Secure_Collaboration_Guide.pdf) 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](mailto:accellionAlerts@doc.gov) requesting access to the “Send Tab” function. They will notify you via email usually within 1 business day of your approval. The ‘Send Tab” function will be accessible for 30 days.

Contact information:

|  |  |
| --- | --- |
|  | Regional Director of Health Services  Marine Operations Center – Pacific  2002 SE Marine Science Dr.  Newport, OR 97365  Telephone 541-867-8822  Fax 541-867-8856  Email [MOP.Health-Services@noaa.gov](mailto:MOP.Health-Services@noaa.gov) |

Prior to departure, the Chief Scientist must provide an electronic listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: contact name, address, relationship to member, and telephone number.

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. At the discretion of the ship CO, safety shoes (i.e. steel or composite toe protection) may be required to participate in any work dealing with suspended loads, including CTD deployment and recovery. The ship does not provide safety-toed shoes/boots. The ship’s Operations Officer should be consulted by the Chief Scientist to ensure members of the scientific party report aboard with the proper attire.

D. Communications

A progress report on operations prepared by the Chief Scientist may be relayed to the program office. Sometimes it is necessary for the Chief Scientist to communicate with another vessel, aircraft, or shore facility. Through various means of communications, the ship can usually accommodate the Chief Scientist. Special radio voice communications requirements should be listed in the project instructions. The ship’s primary means of communication with the Marine Operations Center is via email and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at increased cost to the scientific party. If increased bandwidth is being considered, program accounting is required and it must be arranged through the ship’s Commanding Officer at least 30 days in advance.

E. IT Security

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:

(1) 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 the above 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 3 days of embarking.

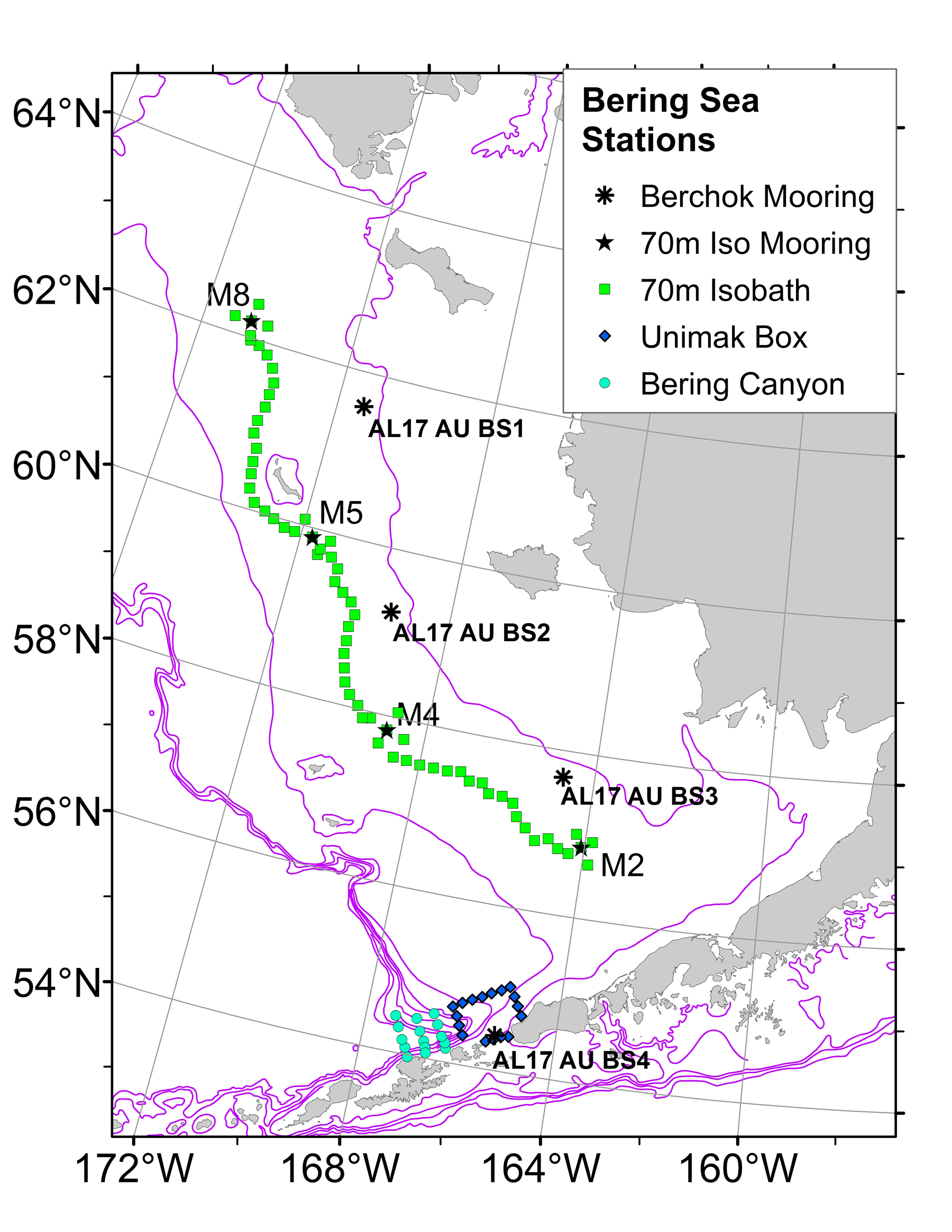
F. Foreign National Guests Access to OMAO Facilities and Platforms

Foreign National access to the NOAA ship or Federal Facilities is not required for this project.

**IX. Appendices**

1. Map of study area
2. Station/Waypoint List (coordinates in Latitude, Longitude; degrees-minutes)
3. Mooring schematics

Appendix 1



Appendix 2

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Type | StnID | Latdd | Londd | Lat Deg | Lat Min | Lon Deg | Lon Min | Operation | depth |
| DBO | DBO1.1 | 62.0100 | -175.0600 | 62 | 0.6000 | -175 | 3.6000 | CTD/BON | 50-80 |
| DBO | DBO1.2 | 62.0500 | -175.2100 | 62 | 3.0000 | -175 | 12.6000 | CTD/BON | 50-80 |
| DBO | DBO1.3 | 62.2190 | -174.8770 | 62 | 13.1400 | -174 | 52.6200 | CTD | 50-80 |
| DBO | DBO1.4 | 62.3900 | -174.5700 | 62 | 23.4000 | -174 | 34.2000 | CTD/BON | 50-80 |
| DBO | DBO1.5 | 62.4680 | -174.0830 | 62 | 28.0800 | -174 | 4.9800 | CTD | 50-80 |
| DBO | DBO1.6 | 62.5600 | -173.5500 | 62 | 33.6000 | -173 | 33.0000 | CTD/BON | 50-80 |
| DBO | DBO1.7 | 62.7870 | -173.5000 | 62 | 47.2200 | -173 | 30.0000 | CTD | 50-80 |
| DBO | DBO1.8 | 63.0300 | -173.4600 | 63 | 1.8000 | -173 | 27.6000 | CTD/BON | 50-80 |
| DBO | DBO1.9 | 63.2800 | -173.0800 | 63 | 16.8000 | -173 | 4.8000 | CTD | 50-80 |
| DBO | DBO1.10 | 63.6040 | -172.5910 | 63 | 36.2400 | -172 | 35.4600 | CTD | 50-80 |
| Isobath70m | M2-S | 56.6667 | -163.8670 | 56 | 40.0002 | -163 | 52.0200 | CTD/BON | 76 |
| Isobath70m | M2-W | 56.7667 | -164.3338 | 56 | 46.0002 | -164 | 20.0300 | CTD/BON | 74 |
| Isobath70m | 70M3 | 56.8087 | -164.5833 | 56 | 48.5200 | -164 | 34.9998 | CTD | 74 |
| Isobath70m | 70M5 | 56.8597 | -165.1215 | 56 | 51.5800 | -165 | 7.2900 | CTD | 74 |
| Isobath70m | 70M2/M2 | 56.8670 | -164.0690 | 56 | 52.0200 | -164 | 4.1400 | CTD/BON | 72 |
| Isobath70m | 70M2/M2 | 56.8670 | -164.0690 | 56 | 52.0200 | -164 | 4.1400 | 3 CalVETs | 72 |
| Isobath70m | 70M4 | 56.9095 | -164.8275 | 56 | 54.5700 | -164 | 49.6500 | CTD/BON | 72 |
| Isobath70m | M2-E | 56.9452 | -163.8327 | 56 | 56.7100 | -163 | 49.9600 | CTD/BON | 70 |
| Isobath70m | 70M6 | 56.9928 | -165.3775 | 56 | 59.5700 | -165 | 22.6500 | CTD/BON | 72 |
| Isobath70m | M2-N | 57.0167 | -164.2167 | 57 | 1.0002 | -164 | 13.0002 | CTD/BON | 69 |
| Isobath70m | 70M7 | 57.1070 | -165.6150 | 57 | 6.4200 | -165 | 36.9000 | CTD | 71 |
| Isobath70m | 70M8 | 57.2627 | -165.7465 | 57 | 15.7600 | -165 | 44.7900 | CTD/BON | 70 |
| Isobath70m | 70M9 | 57.3217 | -166.0097 | 57 | 19.3000 | -166 | 0.5800 | CTD | 70 |
| Isobath70m | 70M10 | 57.3223 | -166.3263 | 57 | 19.3398 | -166 | 19.5798 | CTD/BON | 71 |
| Isobath70m | 70M12 | 57.4290 | -166.8120 | 57 | 25.7400 | -166 | 48.7200 | CTD/BON | 70 |
| Isobath70m | 70M11 | 57.4380 | -166.5125 | 57 | 26.2800 | -166 | 30.7500 | CTD | 70 |
| Isobath70m | 70M14 | 57.4988 | -167.3442 | 57 | 29.9300 | -167 | 20.6502 | CTD/BON | 71 |
| Isobath70m | 70M16 | 57.5007 | -167.9862 | 57 | 30.0402 | -167 | 59.1702 | CTD/BON | 72 |
| Isobath70m | 70M15 | 57.5012 | -167.6653 | 57 | 30.0702 | -167 | 39.9200 | CTD | 72 |
| Isobath70m | 70M17 | 57.5208 | -168.3063 | 57 | 31.2500 | -168 | 18.3800 | CTD | 72 |
| Isobath70m | 70M13 | 57.5223 | -167.0382 | 57 | 31.3398 | -167 | 2.2902 | CTD | 70 |
| Isobath70m | 70M18 | 57.5245 | -168.6135 | 57 | 31.4700 | -168 | 36.8100 | CTD/BON | 72 |
| Isobath70m | 70M19/M4-S | 57.6000 | -168.7000 | 57 | 39.1800 | -169 | 1.2000 | CTD/BON | 70 |
| Isobath70m | M4-E | 57.7653 | -168.6670 | 57 | 45.9200 | -168 | 27.9100 | CTD/BON | 72 |
| Isobath70m | 70M21/M4 | 57.8330 | -168.8920 | 57 | 49.9800 | -168 | 53.5200 | CTD/BON | 72 |
| Isobath70m | 70M21/M4 | 57.8330 | -168.8920 | 57 | 49.9800 | -168 | 53.5200 | 3 CalVETs | 72 |
| Isobath70m | M4-W | 57.7670 | -169.2000 | 57 | 55.6800 | -169 | 19.3200 | CTD/BON | 68 |
| Isobath70m | 70M23 | 57.9088 | -169.5013 | 57 | 54.5300 | -169 | 30.0800 | CTD | 70 |
| Isobath70m | M4-N | 57.9170 | -169.0000 | 58 | 3.9700 | -168 | 43.5700 | CTD/BON | 71 |
| Isobath70m | 70M24 | 58.0422 | -169.6727 | 58 | 2.5302 | -169 | 40.3600 | CTD/BON | 72 |
| Isobath70m | 70M25 | 58.1472 | -169.9182 | 58 | 8.8302 | -169 | 55.0902 | CTD | 72 |
| Isobath70m | 70M26 | 58.2820 | -170.0928 | 58 | 16.9200 | -170 | 5.5700 | CTD/BON | 72 |
| Isobath70m | 70M27 | 58.4455 | -170.1857 | 58 | 26.7300 | -170 | 11.1402 | CTD | 74 |
| Isobath70m | 70M28 | 58.6165 | -170.2755 | 58 | 36.9900 | -170 | 16.5300 | CTD/BON | 73 |
| Isobath70m | 70M29 | 58.7743 | -170.2937 | 58 | 46.4598 | -170 | 17.6202 | CTD | 72 |
| Isobath70m | 70M30 | 58.9483 | -170.3273 | 58 | 56.8998 | -170 | 19.6398 | CTD/BON | 70 |
| Isobath70m | 70M31 | 59.1060 | -170.2492 | 59 | 6.3600 | -170 | 14.9500 | CTD | 68 |
| Isobath70m | 70M32 | 59.2462 | -170.4117 | 59 | 14.7700 | -170 | 24.7000 | CTD/BON | 68 |
| Isobath70m | 70M33 | 59.3353 | -170.6558 | 59 | 20.1198 | -170 | 39.3498 | CTD | 70 |
| Isobath70m | 70M34 | 59.4357 | -170.9060 | 59 | 26.1402 | -170 | 54.3600 | CTD/BON | 73 |
| Isobath70m | 70M35 | 59.5953 | -170.9208 | 59 | 35.7200 | -170 | 55.2500 | CTD | 71 |
| Isobath70m | M5-S | 59.7023 | -171.4840 | 59 | 42.1400 | -171 | 29.0400 | CTD/BON | 74 |
| Isobath70m | 70M36 | 59.7155 | -171.1398 | 59 | 42.9300 | -171 | 8.3898 | CTD/BON | 72 |
| Isobath70m | 70M37 | 59.7743 | -171.4497 | 59 | 46.4600 | -171 | 26.9802 | CTD | 73 |
| Isobath70m | M5-E | 59.8980 | -171.2583 | 59 | 53.8800 | -171 | 15.4998 | CTD/BON | 70 |
| Isobath70m | M5-W | 59.8980 | -172.1667 | 59 | 53.8800 | -172 | 10.0002 | CTD/BON | 73 |
| Isobath70m | 70m38/ M5 | 59.8920 | -171.7110 | 59 | 53.5200 | -171 | 42.6600 | 3 CalVETs | 70 |
| Isobath70m | 70m38M5 | 59.8920 | -171.7110 | 59 | 53.5200 | -171 | 42.6600 | CTD/BON | 70 |
| Isobath70m | 70M40 | 59.9115 | -172.4352 | 59 | 54.6900 | -172 | 26.1102 | CTD/BON | 74 |
| Isobath70m | 70M41 | 59.9782 | -172.7462 | 59 | 58.6902 | -172 | 44.7702 | CTD | 69 |
| Isobath70m | 70M42 | 60.0372 | -173.0065 | 60 | 2.2302 | -173 | 0.3900 | CTD/BON | 70 |
| Isobath70m | M5-N | 60.0750 | -172.0000 | 60 | 4.5000 | -172 | 0.0000 | CTD/BON | 70 |
| Isobath70m | 70M43 | 60.1005 | -173.3167 | 60 | 6.0300 | -173 | 19.0002 | CTD | 70 |
| Isobath70m | 70M44 | 60.2517 | -173.5217 | 60 | 15.1002 | -173 | 31.3002 | CTD/BON | 70 |
| Isobath70m | 70M45 | 60.4250 | -173.5917 | 60 | 25.5000 | -173 | 35.5002 | CTD | 65 |
| Isobath70m | 70M46 | 60.5718 | -173.6395 | 60 | 34.3098 | -173 | 38.3700 | CTD/BON | 68 |
| Isobath70m | 70M47 | 60.7388 | -173.6480 | 60 | 44.3298 | -173 | 38.8800 | CTD | 72 |
| Isobath70m | 70M48 | 60.9073 | -173.8247 | 60 | 54.4398 | -173 | 49.4802 | CTD/BON | 81 |
| Isobath70m | 70M49 | 61.0657 | -173.8293 | 61 | 3.9402 | -173 | 49.7598 | CTD | 79 |
| Isobath70m | 70M50 | 61.2498 | -173.7408 | 61 | 14.9898 | -173 | 44.4498 | CTD/BON | 75 |
| Isobath70m | 70M51 | 61.4107 | -173.7362 | 61 | 24.6402 | -173 | 44.1702 | CTD/BON | 75 |
| Isobath70m | 70M52 | 61.5602 | -173.7122 | 61 | 33.6102 | -173 | 42.7302 | CTD/BON | 72 |
| Isobath70m | 70M53 | 61.7273 | -173.8547 | 61 | 43.6398 | -173 | 51.2802 | CTD | 71 |
| Isobath70m | 70M54 | 61.8622 | -174.0943 | 61 | 51.7302 | -174 | 5.6562 | CTD/BON | 71 |
| Isobath70m | 70M55 | 61.9433 | -174.3642 | 61 | 56.5998 | -174 | 21.8502 | CTD/BON | 73 |
| Isobath70m | M8-S | 61.9750 | -174.6170 | 61 | 58.5000 | -174 | 37.0200 | CTD/BON | 70 |
| Isobath70m | 70M56 | 62.0265 | -174.6587 | 62 | 1.5900 | -174 | 39.5202 | CTD/BON | 74 |
| Isobath70m | M8-E | 62.2000 | -174.3000 | 62 | 12.0000 | -174 | 18.0000 | CTD/BON | 70 |
| Isobath70m | M8 | 62.2000 | -174.7500 | 62 | 12.0000 | -174 | 45.0000 | CTD/BON | 70 |
| Isobath70m | M8 | 62.2000 | -174.7500 | 62 | 12.0000 | -174 | 45.0000 | 3 CalVETs | 70 |
| Isobath70m | M8-W | 62.2000 | -175.2000 | 62 | 12.0000 | -175 | 12.0000 | CTD/BON | 80 |
| Isobath70m | M8-N | 62.4210 | -174.6987 | 62 | 25.2600 | -174 | 41.9200 | CTD/BON | 73 |
| Moorings | M2/17BSM-2A | 56.8677 | -164.0557 | 56 | 52.0600 | -164 | 3.3400 | Surface Mooring/recovery | 71 |
| Moorings | M2/17BSP-2A | 56.8691 | -164.0503 | 56 | 52.1430 | -164 | 3.0160 | Subsurface Mooring/recovery | 71 |
| Moorings | M2/17BS-ITAE | 56.8640 | -164.0523 | 56 | 51.8400 | -164 | 3.1400 | Surface Mooring/recovery | 71 |
| Moorings | M4/16BS-4B | 57.8969 | -168.8820 | 57 | 53.8110 | -168 | 52.9190 | Subsurface Mooring/recovery | 70 |
| Moorings | M4/16BSP-4A | 57.8945 | -168.8781 | 57 | 53.7270 | -168 | 52.6840 | Subsurface Mooring/recovery | 70 |
| Moorings | M5/16BS-5A | 59.9128 | -171.7361 | 59 | 54.7700 | -171 | 44.1640 | Subsurface Mooring/recovery | 68 |
| Moorings | M5/16BSP-5A | 59.9108 | -171.7309 | 59 | 54.6460 | -171 | 43.8540 | Subsurface Mooring/recovery | 68 |
| Moorings | M8/16BS-8A | 62.1936 | -174.6884 | 62 | 11.6150 | -174 | 41.3020 | Subsurface Mooring/recovery | 73 |
| Moorings | M8/16BSP-8A | 62.1985 | -174.6868 | 62 | 11.9080 | -174 | 41.2060 | Subsurface Mooring/recovery | 73 |
| Moorings | AL16\_AU\_BS1 | 61.5848 | -171.3188 | 61 | 35.0860 | -171 | 19.1300 | Subsurface Mooring/recovery | 52 |
| Moorings | AL16\_AU\_BS2 | 59.2415 | -169.4171 | 59 | 14.4880 | -169 | 25.0230 | Subsurface Mooring/recovery | 52 |
| Moorings | AL16\_AU\_BS3 | 57.6762 | -164.7164 | 57 | 40.5700 | -164 | 42.9810 | Subsurface Mooring/recovery | 52 |
| Moorings | AL16\_AU\_BS4 | 54.4279 | -165.2676 | 54 | 25.6740 | -165 | 16.0580 | Subsurface Mooring/recovery | 164 |
| Moorings | M2/17BS-2C | 56.8670 | -164.0500 | 56 | 52.0000 | -164 | 3.0000 | Subsurface Mooring/deployment | 72 |
| Moorings | M2/17BSP-2A | 56.8670 | -164.0500 | 56 | 52.0000 | -164 | 3.0000 | Subsurface Mooring/deployment | 72 |
| Moorings | M4/17BS-4B | 57.8670 | -168.8830 | 57 | 52.0000 | -168 | 53.0000 | Subsurface Mooring/deployment | 72 |
| Moorings | M4/17BSP-4A | 57.8670 | -168.8830 | 57 | 52.0000 | -168 | 53.0000 | Subsurface Mooring/deployment | 72 |
| Moorings | M5/17BS-5A | 59.9100 | -171.7000 | 59 | 54.6000 | -171 | 42.0000 | Subsurface Mooring/deployment | 72 |
| Moorings | M5/17BSP-5A | 59.9100 | -171.7000 | 59 | 54.6000 | -171 | 42.0000 | Subsurface Mooring/deployment | 72 |
| Moorings | M8/17BS-8A | 62.1930 | -174.6670 | 62 | 11.6000 | -174 | 40.0000 | Subsurface Mooring/deployment | 72 |
| Moorings | M8/17BSP-8A | 62.1930 | -174.6670 | 62 | 11.6000 | -174 | 40.0000 | Subsurface Mooring/deployment | 72 |
| Moorings | AL17\_AU\_BS1 | 61.5848 | -171.3188 | 61 | 35.0860 | -171 | 19.1300 | Subsurface Mooring/deployment | 52 |
| Moorings | AL17\_AU\_BS2 | 59.2415 | -169.4171 | 59 | 14.4880 | -169 | 25.0230 | Subsurface Mooring/deployment | 52 |
| Moorings | AL17\_AU\_BS3 | 57.6762 | -164.7164 | 57 | 40.5700 | -164 | 42.9810 | Subsurface Mooring/deployment | 52 |
| Moorings | AL17\_AU\_BS4 | 54.4279 | -165.2676 | 54 | 25.6740 | -165 | 16.0580 | Subsurface Mooring/deployment | 164 |
| Unimak Box | UBS1 | 54.4395 | -164.9807 | 54 | 26.3700 | -164 | 58.8400 | CTD/BON | 46 |
| Unimak Box | UBS2 | 54.4240 | -165.1352 | 54 | 25.4400 | -165 | 8.1100 | CTD/BON | 130 |
| Unimak Box | UBS3 | 54.3792 | -165.2783 | 54 | 22.7500 | -165 | 16.7000 | CTD | 166 |
| Unimak Box | UBS4 | 54.3383 | -165.4348 | 54 | 20.3000 | -165 | 26.0900 | CTD/BON | 156 |
| Unimak Box | UBW1 | 54.3615 | -165.9335 | 54 | 21.6900 | -165 | 56.0100 | CTD/BON | 475 |
| Unimak Box | UBW2 | 54.4742 | -166.0380 | 54 | 28.4500 | -166 | 2.2800 | CTD/BON | 534 |
| Unimak Box | UBW3 | 54.5813 | -166.1228 | 54 | 34.8800 | -166 | 7.3700 | CTD | 415 |
| Unimak Box | UBW4 | 54.6863 | -166.2398 | 54 | 41.1800 | -166 | 14.3900 | CTD/BON | 293 |
| Unimak Box | UBN1 | 54.7535 | -166.0563 | 54 | 45.2100 | -166 | 3.3800 | CTD/BON | 219 |
| Unimak Box | UBN2 | 54.8118 | -165.8617 | 54 | 48.7100 | -165 | 51.7000 | CTD/BON | 165 |
| Unimak Box | UBN3 | 54.8653 | -165.6667 | 54 | 51.9200 | -165 | 40.0000 | CTD | 143 |
| Unimak Box | UBN4 | 54.9307 | -165.4833 | 54 | 55.8400 | -165 | 29.0000 | CTD/BON | 124 |
| Unimak Box | UBN5 | 54.9860 | -165.2843 | 54 | 59.1600 | -165 | 17.0600 | CTD | 116 |
| Unimak Box | UBN6 | 55.0465 | -165.1117 | 55 | 2.7900 | -165 | 6.7000 | CTD/BON | 113 |
| Unimak Box | UBE1 | 54.9370 | -164.9928 | 54 | 56.2200 | -164 | 59.5700 | CTD/BON | 93 |
| Unimak Box | UBE2 | 54.8273 | -164.8895 | 54 | 49.6400 | -164 | 53.3700 | CTD | 76 |
| Unimak Box | UBE3 | 54.7170 | -164.7825 | 54 | 43.0200 | -164 | 46.9500 | CTD/BON | 48 |
| Oculus glider #1 |  | 57.8670 | -168.8830 | 57 | 52.0000 | -168 | 53.0000 | Recovery | 72 |