U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Fisheries Science Center
1845 Wasp Blvd. Bldg. 176 • Honolulu, Hawaii 96818-5007
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Preliminary Project Instructions

Date Submitted: June 15, 2017

Platform: NOAA Ship (*Oscar Elton Sette*)

Project Number: SE-17-06 (PIFSC)

Project Title: Hawaiian Islands Cetacean and Ecosystem Assessment Survey (HICEAS)

Project Dates: 06 July to 10 October 2017

Leg I: 06 July – 02 August, 2017
Leg II: 08 August -- 05 September, 2017
Leg III: 11 September – 10 October, 2017

Prepared by: _____ Dated: 6/20/17
Erin Oleson, *Chief Scientist*
Protected Species Division, Cetacean Research Program Lead
Pacific Islands Fisheries Science Center

Approved by: _____ Dated: _____
Michael Seki, Ph.D.
Science Director
Pacific Islands Fisheries Science Center

Approved by: Matt Wingate CDR/NOAA Dated: 6/25/2017
Commander Matt Wingate, NOAA
Commanding Officer
Marine Operations Center - Pacific Islands

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I. Overview

A. Brief Summary and Project Period

The project is a cetacean and ecosystem assessment survey with two vessels. The activities of the other vessel, NOAA Ship *Reuben Lasker*, are covered separately.

Sette: 06 July – 10 October, 2017
Lasker: 17 August – 09 December, 2017

The Hawaiian Islands Cetacean and Ecosystem Assessment Survey (HICEAS) project is a marine mammal assessment survey of the waters of the Hawaiian Island Chain extending off shore to the limits of the U.S. Exclusive Economic Zone. The overall objective of the HICEAS project is to estimate the abundance and understand the distribution of dolphins and whales which are commonly found in the waters around the Hawaiian Islands. In addition, biological and oceanographic data will be collected to better characterize their environment.

B. Service Level Agreements

Of the 87 DAS scheduled for this project, 0 DAS are funded by the program and 87 DAS are funded by OMAO. This project is estimated to exhibit a Medium Operational Tempo.

C. Operating Area

Waters of the Hawaiian Island Chain extending off shore to the limits of the U.S. EEZ. The study area for this project covers waters from 15ºN and 151ºW to 32ºN and 184ºE.

D. Summary of Objectives

The ship will conduct scientific operations in the waters surrounding the Hawaiian Island Chain; the project takes a multidisciplinary approach. Shipboard operations will include support for the following data collection objectives:

1. Visual surveys of cetacean distribution, school size, and school composition to determine density and abundance. Visual surveys for cetaceans will occur during daylight hours.
2. Skin biopsies and satellite tagging of cetaceans for investigations of stock structure and phylogenetic relationships.
3. Photo identification and aerial photographs to document geographic variation in dolphin morphology, pigment patterns, health condition, school composition, and distribution of individual whales.
4. Passive acoustic monitoring for vocal cetaceans to augment assessments of distribution and abundance. Acoustic monitoring may be conducted 24 hours per day,

including use of towed hydrophone array while underway and sonobuoys while on station.

5. Oceanographic sampling to characterize habitat and its variation over time. The ship will collect oceanographic data from routine conductivity-temperature-depth (CTD) casts, conducted once each morning and once each night.
6. Surveys of seabirds, and sampling of encountered prey fishes and squids to characterize the ecosystem in which these cetaceans live.
7. Recover and redeploy a High-Frequency Acoustic Recording Package (HARP) at three offshore locations near Kona, Kauai, and Pearl and Hermes.
8. Recover and redeploy Drifting Autonomous Spar Buoy Recorders (DASBRs) offshore of the Main Hawaiian Islands to assess occurrence of deep-diving whales.
9. Conduct ancillary projects for Visiting Scientists as time allows.

E. Participating Institutions:

- NOAA NMFS Pacific Islands Fisheries Science Center (PIFSC)
- NOAA NMFS Southeast Fisheries Science Center (SEFSC)
- University of Hawaii at Manoa, Joint Institute for Marine and Atmospheric Research (JIMAR)
- Bureau of Ocean Energy Management (BOEM)
- Ocean Associates, Inc. (OAI)
- Duke University

F. Personnel/Science Party:

Please note that the names of participants are subject to change. Science party members noted with an asterisk (*) may stay aboard ship between survey legs.

Leg I:

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Sex	Affiliation	Nationality
1	Oleson, Erin	Chief Scientist, Project Leader	7/6/2017	8/2/2017	F	PIFSC	USA
2	Olson, Paula*	Visual Survey Lead	7/5/2017	-	F	OAI	USA
3	Vazquez Morquecho, Ernesto	Visual Survey Lead	7/5/2017	8/2/2017	M	OAI	Mexico
4	U, Adam*	Visual Survey	7/5/2017	-	M	OAI	USA
5	Ligon, Allan*	Visual Survey	7/5/2017	-	M	Contractor	USA
6	Bendlin, Andrea*	Visual Survey	7/5/2017	-	F	OAI	USA

7	Van Cise, Amy*	Visual Survey	7/5/2017	-	F	OAI	USA
8	Breese, Dawn*	Seabirds Survey	7/5/2017	-	F	OAI	USA
9	Hoefer, Christopher*	Seabirds Survey	7/5/2017	-	M	OAI	USA
10	Keating, Jennifer	Acoustic Survey Lead	7/6/2017	8/2/2017	F	JIMAR	USA
11	Norris, Erik	Acoustic Survey	7/6/2017	8/2/2017	M	JIMAR	USA
12	Coates, Shannon	Acoustic Survey	7/6/2017	8/2/2017	F	OAI	USA
13	Yano, Kym	Project Coordinator & Pilot-In-Charge	7/6/2017	8/2/2017	F	JIMAR	USA
14	DeSchryver, Staci	Teacher-At-Sea	7/5/2017	8/3/2017	F	NOAA Teacher-At-Sea Program	USA
15	Bradford, Amanda	Pilot-In-Charge	7/6/2017	8/2/2017	F	PIFSC	USA

Leg II:

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Sex	Affiliation	Nationality
1	Bradford, Amanda	Project Leader	8/8/2017	9/5/2017	F	PIFSC	USA
2	Olson, Paula*	Visual Survey Lead	-	-	F	OAI	USA
3	Bendlin, Andrea*	Visual Survey Lead	-	-	F	OAI	USA
4	U, Adam*	Visual Survey	-	-	M	OAI	USA
5	Ligon, Allan*	Visual Survey	-	-	M	Contractor	USA
6	Van Cise, Amy	Visual Survey	-	9/6/2017	F	OAI	USA
7	Driskell, Rory	Visual Survey	8/7/2017	9/5/2017	M	PIFSC	USA
8	Breese, Dawn*	Seabird Survey	-	-	F	OAI	USA
9	Hoefer, Christopher*	Seabird Survey	-	-	M	OAI	USA
10	Keating, Jennifer	Acoustic Survey Lead	8/8/2017	9/5/2017	F	JIMAR	USA
11	Norris, Erik	Acoustic Survey	8/8/2017	9/5/2017	M	JIMAR	USA
12	Bayless, Ali	Acoustic Survey	8/8/2017	9/5/2017	F	JIMAR	USA
13	Fader, Joseph	Visiting Scientist	8/7/2017	9/6/2017	M	Duke Univ.	USA

Leg III:

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Sex	Affiliation	Nationality
1	Hill, Marie	Project Leader	9/11/2017	10/10/2017	F	JIMAR	USA
2	Olson, Paula	Visual Survey Lead	-	10/10/2017	F	OAI	USA
3	Bendlin, Andrea	Visual Survey Lead	-	10/10/2017	F	OAI	USA
4	U, Adam	Visual Survey	-	10/10/2017	M	OAI	USA
5	Ligon, Allan	Visual Survey	-	10/10/2017	M	Contractor	USA
6	Sinclair, Carrie	Visual Survey	9/10/2017	10/10/2017	F	SEFSC	USA
7	Sanders, Greg	Visual Survey	9/10/2017	10/10/2017	M	BOEM	USA
8	Breese, Dawn	Seabird Survey	-	10/10/2017	F	OAI	USA
9	Hoefer, Christopher	Seabird Survey	-	10/10/2017	M	OAI	USA
10	Keating, Jennifer	Acoustic Survey Lead	9/11/2017	10/10/2017	F	JIMAR	USA
11	Norris, Erik	Acoustic Survey	9/11/2017	10/10/2017	M	JIMAR	USA
12	Driskell, Rory	Acoustic Survey	9/11/2017	10/10/2017	M	OAI	USA
13	Allan, Ann	Acoustic Survey	9/11/2017	10/10/2017	F	PIFSC	USA
14	Carpenter, Josh	Monk Seal Staff	10/7/2017	10/10/2017	M	JIMAR	USA
15	Farry, Shawn	Monk Seal Staff	10/7/2017	10/10/2017	M	JIMAR	USA
16	Guerin, Sean	Monk Seal Staff	10/7/2017	10/10/2017	M	JIMAR	USA
17	Northey, Allie	Monk Seal Staff	10/7/2017	10/10/2017	F	JIMAR	USA
18	Reininger, Alex	Marine Turtle Staff	10/7/2017	10/10/2017	F	JIMAR	USA

G. Administrative

1. Points of Contact

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Project Leaders (assumes role of Chief Scientist when underway)
Leg 1: Erin Oleson
See above, Chief Scientist

Leg 2: Amanda Bradford
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2. Diplomatic Clearances

None required.

3. Licenses and Permits

The Chief Scientist will oversee the submission of required permit applications with federal and state agencies in order to obtain approval to conduct all planned scientific operations in U.S. waters prior to the start of the project.

ESA and MMPA: Direct take research activities on cetaceans, including UAS flights over cetaceans, during this project will be conducted under the Marine Mammal Protection Act and Endangered Species Act scientific research permit for marine mammals (NMFS Permit No. 20311) **to be issued** to the Pacific Islands Fisheries Science Center by the National Marine Fisheries Service, Office of Protected Resources. This permit has not been issued yet, but is being processed and expected to be effective on July 1, 2017. If our permit isn't issued in time, we will use the NMFS Permit No. 19091 issued to the Southwest Fisheries Science Center.

Direct take research activities on seabirds during this project will be conducted under the Migratory Bird Treaty Permit (FWS Permit No. MB-033305-0) issued to the Southwest Fisheries Science Center by the U.S. Fish and Wildlife Service Migratory Bird Permit Office, Region 8.

Direct take research activities on turtles during this project will be conducted under two Endangered Species Act scientific research permits issued by the National Marine Fisheries Service, Office of Protected Resources. Research activities on green and hawksbill turtles will be conducted under the NMFS Permit No. 17022, issued to the Pacific Islands Fisheries Science Center. Research activities on loggerhead, leatherback and olive ridley turtles will be conducted under the NMFS Permit No. 19091, issued to the Southwest Fisheries Science Center.

NEPA: This project meets the requirements of NOAA Administrative Order (NAO) Series 216-6, Environmental Review Procedures, Sections 5.05 and 6.03c.3(a) for Categorical Exclusions (CE) for Research Programs (Memo for the Record in process). Direct take research activities have been evaluated under NEPA for their respective permits.

PMNM: Research conducted within the Papahānaumokuākea Marine National Monument boundaries will be conducted under the PMNM Research Permit (PMNM Permit No. **TBD**) **to be issued** to the Pacific Islands Fisheries Science Center by the PMNM Permit Office.

CITES: Should any biological specimens or samples be collected from beyond the Hawaii EEZ, all research activities will be conducted under a CITES permit issued by the U.S. Fish and Wildlife Service. All cetacean samples will be collected under the CITES Introduction from the Sea Permit (FWS Permit No. **TBD**) **to be issued** to the Pacific Islands Fisheries Science Center. This permit has not been issued yet, but is being processed and expected to be effective on July 6, 2017. If our CITES permit for cetacean samples isn't issued in time, we will use the CITES Introduction from the Sea Permit (FWS Permit No. **TBD**) issued to the Southwest Fisheries Science Center. All turtle samples will be conducted under the CITES Introduction from the Sea Permit (FWS Permit No. **TBD**) issued to the Southwest Fisheries Science Center.

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

The following operational plans can be considered only a guide as to how the Chief Scientist expects the surveys to progress without being able to predict the weather, operational and scheduling problems, and equipment failures. In particular, it should be noted that the transit time is approximate and may be altered based on weather or the progress of the survey.

Leg I:

6 Jul — 1500 Depart Ford Island for transit to survey trackline. Embark: Bendlin, Bradford, Breese, Coates, DeSchryver, Hoefer, Keating, Ligon, Norris, Oleson, Olson, Ü, Van Cise, Vazquez Morquecho, Yano. Begin visual and passive acoustic survey.

7 Jul-1 Aug: **90 minutes prior to sunrise**: Recover towed hydrophone array. CTD cast to 1000m depth. Cast only, no bottle samples.

Following CTD: Align ship along intended trackline, deploy towed array

Sunrise-Sunset: Begin visual and acoustic survey. Cetacean shipboard transects and near-island surveys within 200 nmi of the main Hawaiian Islands and Northwest Hawaiian Islands. Small boat launches for near island surveys or opportunistically as cetacean groups are sighted during transect surveys (opportunistic biopsy sampling, photo ID, satellite tag deployment, prey sample, etc.). Opportunistic APH-22 hexacopter operations as cetacean groups are sighted during transect surveys. Opportunistic sonobuoy deployments on baleen whale sightings. Secure visual survey at sunset, recover towed array.

After sunset: Deploy two sonobuoys for baleen whale monitoring 1 mile from CTD station (not every night- sampling randomized). Conduct CTD cast to 1000m. Cast only, no bottle samples.

After CTD: Deploy acoustic array for overnight acoustic survey. Acoustic team on-call, no real-time monitoring

Timing TBD:

- Recover and redeploy Kona HARP.
- Recover and redeploy DASBRs in Main Hawaiian Islands Stratum. Up to fifteen (15) DASBR will be simultaneously sampling.
- Recover and redeploy Ocean Noise Reference Station NRS04 north of Oahu.
- Small boat transfer to French Frigate Shoals (drop off fuel to field camp).

2 Aug: 0900 Arrive Ford Island. Disembark: Coates, DeSchryver, Oleson, Vazquez Morquecho, Yano. 10 Scientists continue on Leg II: Bendlin, Bradford, Breese, Hoefer, Keating, Ligon, Norris, Olson, Ü, Van Cise. Scientists staying aboard Sette during InPort between Leg I and II: **TBD**.

Leg II:

8 Aug: 0900 Depart Ford Island for transit to survey trackline. Embarked: *Bayless*, Bendlin, Bradford, Breese, *Driskell*, *Fader*, Hoefer, Keating, Ligon, Norris, Olson, Ü, Van Cise,. (3*New scientists will join Leg II; marked in italics.)* Begin visual and passive acoustic survey.

9 Aug-4 Sep: **90 minutes prior to sunrise**: Recover towed hydrophone array. CTD cast to 1000m depth. Cast only, no bottle samples.

Following CTD: Align ship along intended trackline, deploy towed array

Sunrise-Sunset: Begin visual and acoustic survey. Cetacean shipboard transects and near-island surveys within 200 nmi of the main Hawaiian Islands and Northwest Hawaiian Islands. Small boat launches for near island surveys or opportunistically as cetacean groups are sighted during transect surveys (opportunistic biopsy sampling, photo ID, satellite tag deployment, prey sample, etc.). Opportunistic APH-22 hexacopter operations as cetacean groups are sighted during transect surveys. Opportunistic sonobuoy deployments on baleen whale sightings. Secure visual survey at sunset, recover towed array.

After sunset: Deploy two sonobuoys for baleen whale monitoring 1 mile from CTD station (not every night- sampling randomized). Conduct CTD cast to 1000m. Cast only, no bottle samples.

After CTD: Deploy acoustic array for overnight acoustic survey. Acoustic team on-call, no real-time monitoring

Timing TBD:

- Recover and redeploy Kauai and/or Pearl & Hermes HARPs.
- Recover and redeploy DASBRs in Main Hawaiian Islands Stratum. Up to fifteen (15) DASBR will be simultaneously sampling.

4 Sept: **Night**: Simultaneous coordinated EK-60 sampling with R/V Lasker (see Other Projects). Lasker and Sette will conduct sampling along lines provided by Project Leader. Sampling will occur off Oahu so as not to interfere with morning inport.

5 Sept: 0900 Arrive Ford Island. Disembark: Bayless, Bradford, Fader, Van Cise. 9 Scientists continue on Leg III: Bendlin, Breese, Driskell, Hoefer, Keating, Ligon, Norris, Olson, Ü. Scientists staying aboard Sette during InPort between Leg II and III: **TBD**.

Leg III:

11 Sept: 0900 Depart Ford Island for transit to survey trackline. Embarked: *Allen*, Bendlin, Breese, Driskell, *Hill*, Hoefer, Keating, Ligon, Norris, Olson, *Sanders*, *Sinclair*, Ü. *(4 New scientists will join Leg III; marked in italics.)* Begin visual and passive acoustic survey.

12 Sep- 9 Oct: **90 minutes prior to sunrise**: Recover towed hydrophone array. CTD cast to 1000m depth. Cast only, no bottle samples.

Following CTD: Align ship along intended trackline, deploy towed array

Sunrise-Sunset: Begin visual and acoustic survey. Cetacean shipboard transects

and near-island surveys within 200 nmi of the main Hawaiian Islands and Northwest Hawaiian Islands. Small boat launches for near island surveys or opportunistically as cetacean groups are sighted during transect surveys (opportunistic biopsy sampling, photo ID, satellite tag deployment, prey sample, etc.). Opportunistic APH-22 hexacopter operations as cetacean groups are sighted during transect surveys. Opportunistic sonobuoy deployments on baleen whale sightings. Secure visual survey at sunset, recover towed array

After sunset: Deploy two sonobuoys for baleen whale monitoring 1 mile from CTD station (not every night- sampling randomized). Conduct CTD cast to 1000m. Cast only, no bottle samples.

After CTD: Deploy acoustic array for overnight acoustic survey. Acoustic team on-call, no real-time monitoring

Timing TBD:

- Recover and redeploy Kauai and/or Pearl & Hermes HARPs.
- Recover and redeploy DASBRs in Main Hawaiian Islands Stratum. Up to fifteen (15) DASBR will be simultaneously sampling.

7 October: 0900 Arrive French Frigate Shoals for monk seal and marine turtle camp pick-up. Launch SE-4 and SE-2; demobilize camp, load equipment and supplies, including one 17-ft Boston Whaler, one 6-m RHIB, ~5 pallet tubs, ~24 propane tanks, TBD empty 55 gallon drums, TBD full 55 gallon drums (good gas), numerous buckets. Embark: Carpenter, Farry, Guerin, Northey, Reininger.
Afternoon (approximately 1700) Depart and continue cetacean survey.

9 October: **Night**: Simultaneous coordinated EK-60 sampling with R/V Lasker (see Other Projects). Lasker and Sette will conduct sampling along lines provided by Project Leader. Sampling will occur off Oahu so as not to interfere with morning import.

10 October: 0900: Arrive Ford Island. Disembark all scientists.

B. Staging and Destaging

1. Staging

Assistance from the ship's personnel will be required to crane aboard big eye binoculars and stands, small boat fuel, small boat cradle, small boat, and acoustic array, and other project supplies. The Program requests the hydraulic connection to the towed array winch is checked and fully functional prior to sailing. The Program requests power, GPS, and data connections on the flying bridge are checked for

continuity and are fully functional prior to sailing. All power to critical electronic components such as the Simrad GPTs should be checked for clean power signals using the appropriate electronic testing apparatus. If the power is not adequately clean, a separate power cleaning device for the GPTs will be installed.

Prior to sailing the ship's crew will inspect the port- and starboard-side J-frames and associated oceanographic winches, conducting cable and DESH-5 winch for CTD operations, the thermosalinograph, the flow-through Turner 10-AU fluorometer, the Simrad EK60 echosounder, the Scientific Computing System (SCS), the Global Positioning System (GPS) navigational systems, and the scientific freezer to ensure that they are in proper working order. All transducer faces and propellers should be inspected and cleaned of marine life no sooner than 1 week prior to sailing using methods recommended by manufacturers (e.g., using a soft wood block to clean the Simrad EK60 transducer faces). The SeaBird 9/11+CTD system and frame, and the SEACAT portable CTD will be installed and inspected ensuring that they are fully operational. Electrical continuity of the J-frame conducting cable, the winch's slip ring assembly, and connections to the electronic laboratory will be confirmed by the Chief Electronics Technician before sailing. The scientific small boats will be operational and ready to be deployed prior to sailing.

Two hip tanks will be fueled prior to the project to re-supply as needed to the NOAA small boats during cetacean survey operations. Additional fuel drum storage will be required for Leg 1 to accommodate fuel drop-off at French Frigate Shoals and Leg 3 in the event that fuel returns to Honolulu from French Frigate Shoals.

Load and stage equipment starting on 26 June.

2. **Destaging**
   Destage and offload equipment on 10 and 11 October.

C. Operations to be Conducted

The following operational plans can be considered only a guide as to how the Chief Scientist expects the surveys to progress without being able to predict the weather, operational and scheduling problems, and equipment failures. In particular, it should be noted that the amount of time required at each of the working areas is approximate and may be altered based on weather or the progress of the survey.

The Chief Scientist has the authority to revise or alter the technical portion of the instructions as work progresses, provided that, after consultation with the Commanding Officer, it is ascertained that the proposed changes will not (1) jeopardize the safety of

personnel or the ship, (2) exceed the overall time allotted for the project, (3) result in undue additional expenses, and (4) alter the general intent of the project instructions. In addition, the Chief Scientist must notify the Office of the Director of the Pacific Islands Fisheries Science Center at the earliest opportunity prior to making: (1) deviations from the general project track or area of operations noted in the project instructions, (2) significant changes or additions of research operations to those specified in the project instructions, or (3) port calls not specifically identified in the project instructions.

1. **Visual Surveys:** Line-transect survey methods will be used to collect cetacean abundance data. A watch for cetaceans will be maintained on the flying bridge during daylight hours by six (6) mammal observers and two (2) seabird observers. Each mammal observer will work in 2-hour rotations, manning each of the following three stations on the flying bridge for 40 minutes: a port side 25 x 150 binocular station, a center-line data recorder position, and a starboard 25 x 150 binocular station. Each seabird observer will work in 2-hour rotations, and search for seabirds using handheld binoculars.

   Ship Speed, Order of Operations: During shipboard cetacean visual surveys, search effort should start on a trackline determined in advance in consultation between the Chief Scientist and the Command. The *Sette* should travel at 10 kt (speed over ground) along the designated trackline. While on search effort, if the ship's speed over ground should deviate from this by more than 1 kt, the bridge personnel will notify the mammal team on watch or the Project Leader.

   On sighting a cetacean group or other feature of biological interest, the Project Leader or observer team on watch may request that the vessel be maneuvered to approach the group or feature for investigation. Biopsy and photography operations may commence from the bow, based on directions from the Project Leader or Mammal Observers. In some instances, the Project Leader may request the deployment of a small boat for small boat surveys, biopsy, photography, hexacopter, or other operations.

   It may occasionally be necessary to divert the ship's course from the established trackline during regular effort due to glare or adverse sea conditions. Under these circumstances, the ship may divert up to 20 degrees from the established course. This deviation may continue until the ship is 5 nm from the trackline, at which point the ship should turn back toward the trackline at an angle of $\leq$ 20 degrees.

   When the observers have completed scientific operations for the sighting, the ship will return to the trackline either at or ahead of the previous sighting location. If the pursuit of the sighting ends within 5 nm from the trackline, the ship will return to the trackline at an angle of $\leq$ 20 degrees to the trackline and effort will resume

immediately after the initial sighting location is behind the beam of the ship. If the pursuit of the sighting has taken the ship more than 5 nm from the trackline, the observers should be notified. The Project Leader or Senior Observers may request that the ship either: 1) proceed directly toward the next waypoint; 2) take a heading of ≤ 20 degrees back toward the trackline, or 3) return to the position at which the ship diverted. Visual observation effort will resume once the ship is within 5 nmi of the trackline with the first two options.

Ship Equipment Required: The observation computers will be hooked up to the ship's global positioning system (GPS; for course, speed, and position information) and Scientific Computer System (SCS; for weather and heading information) via CAT5 cables. The observation computer systems will require 3-4 CAT5 cables that connect the Flying Bridge to the eLab. If the SCS goes down for any reason, the ship's Electronics or Survey Technician must manually restart the WINDACS event (in addition to the other events). A log of observation conditions, watch effort, sightings, and other required information will be entered into the observation computer. The Command need not maintain a log of visual or acoustic effort or sightings within SCS. Please note that it is very important that all science computers be connected to the same ship GPS.

Ship Personnel Requirements: Weather permitting, the observer team on the flying bridge will conduct visual watches for cetaceans and seabirds during all daylight hours (from sunrise to sunset). The Commanding Officer shall ensure that the flying bridge work area is free of tobacco smoke at all times when observers are on watch.

2. Passive Acoustics: Passive acoustic operations may occur during day or night.

a) **Towed linear array**: A towed hydrophone array will be deployed approximately 300 m behind the vessel. Acoustics personnel will monitor the array, record sounds made by cetaceans, and localize their positions to assist in other sampling operations.

Ship Speed, Order of Operations: The array will be retrieved for each daily CTD or when requested by acoustics personnel during other periods. Towed array retrieval and deployment protocols are detailed in the Ship Specific Instructions. The acoustics team must be informed of potential hazards, such as fishing gear, with the maximum lead time.

Ship Equipment Required: The array will be wound onto a hydraulic-powered winch supplied by the PIFSC. The winch and hoses will be provided by PIFSC; the ship will provide hydraulic power and connectors. Hookup to a ship-powered hydraulic system will be required. With the exception of the hydraulic winch

hookups and safety apparel, all of the necessary equipment will be supplied and operated by scientific personnel.

Ship Personnel Requirements: Ship personnel are needed to secure the acoustic winch to the deck using ship baxter bolts and then hook up the winch to the ship-powered hydraulic system. Needle gunning creates interference within the passive and active acoustics systems and is therefore generally not permitted during the project. Specific requests for needle gunning in specific spaces that are less likely to impact acoustics operations will be considered by the Project Leader and acoustics team. The bridge 12kHz echosounder should be secured during towed hydrophone array operations as it interferes with detection of cetacean sounds on the array.

b) **Towed tetrahedral array**: The acoustics personnel may test the towed 3-dimensional hydrophone array with tetrahedral hydrophone configuration. In comparison to the towed linear array, the towed tetrahedral array will be mostly a linear array but with the three-dimensional tetrahedral component connected within the linear array. The tetrahedral array is constructed using a three-dimensional aluminum frame and is no more than 1 m^2 in overall dimensions. It is lightweight and small enough to be handled by 1-2 acoustics personnel during deployment and retrieval. Acoustics personnel will be testing the tetrahedral array's overall performance, including how well it tows behind the ship at various speeds, detection and localization abilities, and noise levels. When the tetrahedral array is deployed, acoustics personnel may request the bridge to turn the ship in various directions at different speeds when possible. Specific directions will be communicated to the bridge.

Ship Speed, Order of Operations: Similar ship operations for deployment and retrieval of the standard linear hydrophone array are expected with one important exception. During retrieval, the ship will slow down to 3 knots and remain at this speed until the tetrahedral array is fully retrieved on deck. With the three-dimensional frame, additional considerations must be taken to minimize strain and tension on equipment. Any additional directions or necessary equipment will be communicated to the bridge and ship's personnel prior to operations.

Ship Personnel Requirements: Ship personnel may be needed to assist with the deployment and retrieval of the tetrahedral array, either for handling the array or operating the winch.

c) **Sonobuoys**: Two sonobuoys will be deployed each evening, each approximately 1 mile from the CTD station. Sonobuoys also may be deployed periodically from the ship on an opportunistic basis at the discretion of the Lead Acoustician. The acoustics personnel will contact the bridge to ask permission to deploy the sonobuoy prior to deployment. See Appendix F for sonobuoy

deployment and calibration instructions.

Ship Speed, Order of Operations: The acoustic personnel will contact the bridge to ask permission to deploy the sonobuoy. A chronological record of sonobuoy deployments will be kept by the ship with locations, dates, and times using SCS.

3. Oceanography: A chronological record of oceanographic stations will be kept by the ship with locations, dates, and times using SCS. The ship will provide a copy of SCS data and the Weather Log to the Chief Scientist at the completion of the project.

Ship Personnel Requirements: The collection of oceanographic samples and their processing will be conducted by the ship's Survey Technician with assistance from the Deck Department and Science Party as required.

a) **Daily CTD casts**: Conduct a CTD each morning before sunrise and each evening after sunset. The CTD will be equipped with both a WetLab profiling and Seapoint flow-through fluorometer (for comparison between flow-through and non-flow-through sensors), and redundant dissolved oxygen sensors. Standard CTD casts will not include any water samples.

Ship Speed, Order of Operations: All casts are to be engaged to a depth range of 1000 m, where bottom depths permit. When bottom depths are too shallow for the 1000-m cast, the Project Leader and ship's Survey Technician will determine a safe depth for the cast and notify the bridge prior to operations. Cast descent rates will be 30 m/min for the first 100 m of the cast, then 60 m/min after that, including the upcast. Cast times are subject to change given daily small boat and other operations schedules. Additional CTD stations may be requested by the Project Leader in areas of special interest. CTD stations may also be omitted due to time constraints or proximity to the last station.

Ship Equipment Required: The ship will provide the Sea-Bird CTD system, which will be maintained and operated by the ship's Survey Technician. The crew of the vessel will operate the winch and other deck equipment and will be responsible for the termination (and any necessary reterminations) of the CTD cable pigtail to the conducting cable of the winch. All instruments, their spares, and spare parts provided by the ship must be maintained in working order and, if applicable, have current calibrations (within the previous 12 months). The PIFSC will provide a set of sensors to be used on all casts; conducting CTD casts with dual sensors provides immediate feedback about the performance of the sensors and the validity of the data. To ensure longevity of the CTD, the CTD must be rinsed completely with fresh water after every cast, and the CTD and rosette must then be covered and secured.

Ship Personnel Requirements: The ship's Survey Technician will be responsible for the CTD operations and maintenance. . The Deck Department will provide the needed personnel to assist with CTD deployment.

b) **Active Acoustics**: The scientific EK60 depth sounder will be operated continuously at 38, 70, and 120 kHz. The Project Leader of acoustics team may request to secure some or all frequencies during encounters with cetaceans or certain other periods.

Ship Speed, Order of Operations: The vessel's navigational depth sounder may be used at the discretion of the Commanding Officer, but will normally operate in passive mode while underway in deep waters. The navigational depth sounder aboard NOAA Ship *Sette* nterferes with towed array cetacean detection operations. Since synchronization may not be possible, the navigational sounder should remain in passive mode. The Command will inform the Project Leader or Shipboard Operations Lead at any time the navigational depth sounders are used. The Project Leader or an acoustic technician may secure one or more channels of the EK60 to obtain higher quality passive acoustic recordings. The science party will request permission from the bridge in advance of securing an EK60 channel(s), and will notify the bridge when the channel(s) has been turned back on. There may be extended periods of non-operation.

Ship Equipment Required: The EK60 will be interfaced to a data acquisition system to estimate micronekton biomass between 0 and 1,000 m.

Ship Personnel Requirements: Needle gunning creates interference within the passive and active acoustics systems and is therefore generally not permitted during the project. Specific requests for needle gunning in specific spaces that are less likely to impact acoustics operations will be considered by the Project Leader and acoustics team.

d) **Thermosalinograph Sampling**: The ship will provide and maintain a thermosalinograph (TSG) for continuous measurement of surface water temperature and salinity. The TSG will continuously collect surface water temperature and salinity from the ship's clean seawater system.

4. Small boat launches: Small boat operations will use SE-6 or SE-4; operations will be conducted when weather permits and in adhering to GAR assessments. When small boat operations are anticipated, a meeting will be held each morning to discuss that day's small boat operations and to assess the conditions likely to be encountered on the water that day. A small boat meeting may not be required each day, and in the event a small boat launch is necessary on a day without a morning meeting, a safety meeting will be conducted immediately prior to small boat launch. Small boat

deployments will occur as cetacean groups of interest are encountered. Cetacean survey operations may include collection of photographs, water samples for eDNA, prey samples, biopsy samples, and/or deployment of satellite tags on cetacean groups. Cetacean survey operations will use Program-provided coxswain.

Ship Equipment Required: The ship will provide the crane, hard hats, and PFDs necessary for small boat operations.

Ship Personnel Requirements: Ship personnel are required for launching the lab's small boat and for participating in introductory small boat briefing. If SE-4 is requested for cetacean sampling launches, ship coxswain (Mills Dunlap or other coxswain experienced with operating around cetaceans) and crew will be required to operate SE-4. The Science Party may be able to provide qualified crew to support SE-4 operations if needed.

5. Autonomous acoustic hardware deployments

a) **High-Frequency Acoustic Recording Package (HARP) Recovery and Deployment**:

Three (3) HARPs will be recovered and redeployed at three offshore locations near Kona, Kauai, and Pearl and Hermes. The timing of each HARP operation is TBD. The current HARP locations are:

Kona: 19 34.990'N, 156 00.931'W
Kaua'i: 21 56.952'N, 159 53.273'W
PHR: 27 44.459'N, 175 33.627'W

Ship Speed, Order of Operations: Deployment may occur during day or night. Recovery must occur during daylight hours.

Ship Equipment Required: The ship will provide the crane.

Ship Personnel Requirements: The Deck Department will provide the needed personnel to assist with deployment and recovery operations.

b) **Drifting Autonomous Spar Buoy Recorders (DASBRs) Deployment**: Fifteen (15) DASBRs are planned to be deployed, recovered, and possibly redeployed over the duration of the survey. Retrieval of DASBRs may also take place on the R/V *Lasker*. DASBRs consist of a black ABS spar buoy, bungee and nylon line, a submerged recorder and hydrophone system, and a 15-lb weight at 150 m depth. Both systems include sub-surface floats for additional buoyancy. The spar buoys will be attached to a secondary round buoy using a 10 m floating line to aid in detection and retrieval. Buoys will also be fitted with reflective tape. DASBRs will be deployed and

retrieved during the survey by a member of the acoustics team and a member of the ship's crew. Deployment will be from the stern of the vessel and must occur at vessel speed no greater than 1.5 kts, and buoy deployed such that it drifts away from the vessel. This will require communication with the bridge immediately prior to deployment to discuss expected drift and preferred location of deployment. Nighttime and daytime deployments are expected. Retrieval of buoys will be from the side station or starboard quarter. Buoys will be tracked with a satellite geolocator; when at close range (< 5 nm), they will be re-located visually with the assistance of observers on big-eye binoculars. The DASBRs and buoys include a ring of reflective tape at the top, and the ship's spotlight will be necessary to locate buoys at night. Nighttime and daytime retrievals are anticipated. Deployment and retrieval (once buoys are located) should each require approximately 30 minutes.

c) **Recovery and redeployment of Hawaii's Ocean Noise Reference Station:** The NRS04 will be recovered and redeployed at the monitoring site north of Oahu during leg 1, at location 22^{o} 20.0'N, 157^{o} 40.0'W.

Ship Speed, Order of Operations: Recovery and redeployment will occur during the day. The towed acoustic array and winch must be relocated prior to the recovery operation and repositioned following the ONRS deployment. Recovery and redeployment is anticipated to take 4-6 hours.

Ship Equipment Required: The ship will provide the A-frame and net reel.

Ship Personnel Requirements: The Deck Department will provide the needed personnel to assist with deployment and recovery operations.

6. Salvage of Marine Mammals, Birds, and Turtles: Marine mammal body parts and/or birds and/or turtles may be salvaged on an opportunistic basis at the discretion of the Project Leader. This includes whale and dolphin ivory and carcasses, and whole bird or turtle specimens. In the event that this occurs, scientific freezer space will be used to store the salvaged material. Permits to salvage and import marine mammal parts and birds or turtles will be present on the vessel. All marine mammal specimens obtained will be archived at the PIFSC or SWFSC but may be released on extended loan to recognized research institutions according to existing guidelines.

7. Hexacopter operations: The APH-22 hexacopter will be launched and recovered from Sette or the small boat (SE-6 or SE-4) to collect aerial imagery on an opportunistic group of cetaceans. The decision to conduct hexacopter operations will

be at the discretion of the Project Leader in consultation with the Pilot In Command and the Operations Officer. The hexacopter will remain within visual line of sight (its range should not exceed 0.5 nm from the Pilot in Command) and operate below 400 AGL (Above Ground Level) at all times. There will be at least two designated personnel focused on hexacopter operations for the full duration of each flight (Pilot in Command and Ground Station Operator). The duration of the flight is highly dependent on the hexacopter's lithium battery, typically less than 20 minutes, which may require multiple launch and recovery operations while working one group of cetaceans.

Ship Speed, Order of Operations: Hexacopter operations will occur during daylight hours only and with windspeeds less than **15 kts**. If operations take place on the Sette, it will most likely take place on the bow of the ship. If operations take place on the small boat, then it will require a small boat launch from the ship.

Ship Equipment Required: If operations take place on the Sette, a the hexacopter operation area will need to be roped off, in addition to a designated safety bucket of seawater and shovel nearby.

Ship Personnel Requirements: . If hexacopter operations commence using SE-4, ship's crew will be required to coxswain (Mills Dunlap or other coxswain experienced with operating around cetaceans) and crew the small vessel launch.

D. Dive Plan

No SCUBA diving will be conducted for this project.

E. Applicable Restrictions

1. Mitigation Measures for Protected Species during Scientific Operations

Monitoring Methods

The officer on watch, Project Leader (or other designated member of the Scientific Party), and small boat crew will visually scan for marine mammals, sea turtles, and other ESA-listed species (protected species) during all fishing and over-the-side operations. The member of the crew designated to stand watch for marine mammals is dedicated to that function and visually scans the waters surrounding the vessel prior to the planned start of the CTD or other over-the-side operations (with the exception of visual survey or passive acoustic operations).

Operational Procedures

"Move-On" Rule. If any marine mammals or sea turtles are sighted anywhere around the vessel in the 30 minutes before setting any gear, the vessel may be moved away from the animals to a different section of the sampling area if the

animals appear to be at risk of interaction with the gear at the discretion of the officer on watch in consultation with the Project Leader. Small moves within the sampling area can be accomplished without leaving the sample station. After moving on, if marine mammals or sea turtles are still visible from the vessel and appear to be at risk, the officer on watch may decide, in consultation with the Project Leader, to move again or to skip the station. The officer on watch will first consult with the Project Leader or other designated scientist and other experienced crew as necessary to determine the best strategy to avoid potential takes of these species based on those encountered, their numbers and behavior, position and vector relative to the vessel, and other factors. For instance, a whale transiting through the area and heading away from the vessel might not require any move or only require a short move from the initial sampling site while a pod of dolphins gathered around the vessel may require a longer move from the initial sampling site or possibly cancellation of the station if they follow the vessel. In most cases, trawl gear is not deployed if marine mammals have been sighted from the ship in the previous 30 minutes unless those animals do not appear to be in danger of interactions with the trawl, as determined by the judgment of the Project Leader and officer on watch. The efficacy of the “move-on” rule is limited during night time or other periods of limited visibility; although operational lighting from the vessel illuminates the water in the immediate vicinity of the vessel during gear setting and retrieval.

Cetacean visual and acoustic survey operations, including approach and sampling of cetaceans during this project are permitted under NMFS Take Permit 20311 (**still to be issued**, otherwise we’ll use SWFSC’s NMFS Take Permit 19091) and do not require “move on” mitigation during daytime operations.

2. “Take” of Protected Species

a) Under the Marine Mammal Protection Act and Endangered Species Act it is unlawful to take a protected species. The MMPA defines take as "harass, hunt, capture, kill or collect, or attempt to harass, hunt, capture, kill or collect." The ESA defines take as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." An incidental take is one that incidental to, but not the purpose of, otherwise lawful activities. Science activities listed in these Instructions are covered for directed take under NMFS Take Permit 20311, 19091, and 17022.

b) In the event of an incidental take of a marine mammal or federally listed threatened or endangered species during the project, the Project Leader will report

the incident to the Chief Scientists, PIFSC Director and Deputy Director IMMEDIATELY via IRIDIUM, INMARSAT, and email. Samples should not be collected from any incidentally taken marine mammals, sea turtles, or seabirds. Photos of the incidentally caught animal should be taken to properly identify the species, but the process of taking the photos must not contribute to the further injury of the animal. These photos are for the purposes of internal NMFS verification only, and must not be shared outside of PIFSC or the Office of Protected Resources (i.e., do not post the photos on the internet).

c) As described at II. E. 1. (above, "Mitigation Measures for Protected Species during Scientific Operations "), PIFSC has developed mitigation measures for our fisheries and ecosystem research projects to avoid take and comply with the Lecky, Murawski, and Merrick guidance. A copy of these documents is also available at https://sites.google.com/a/noaa.gov/pifsc-science-operations/home/nepa-permits/protected-species-mitigation-measures and on the ship's bridge.

III. Equipment

A. Equipment Provided by the Ship

- CTD system and heavy duty cage assembly
- Starboard J-frame and block for CTD
- Oceanographic winches and cables
- SEACAT portable CTD with backup
- Deck cranes with for SafeBoat deployment/recovery
- Thermosalinograph
- EK60 echosounder system at the frequencies of 38 kHz, 70 kHz, and 120 kHz
- GPS navigational system
- Depth sounders and recorders
- Scientific freezer, kept between -30° and -20°C at all times
- Net reel
- Two-way radios for communication from the electronics lab to the winch operator
- Operational Scientific Computing System (SCS)
- Navigational equipment and course plotter
- Supplies necessary for at least two re-terminations of the J-frame conducting cable
- Adequate fresh water for gear wash down
- Iridium phone
- A network folder for science access
- Canopy covering all 4 bigeye mounts on flying bridge
- Small boat SE-4, including spare parts

- SE-2 for French Frigate Shoals camp pick-up
- Two hip tanks and fuel rack for storage of six 50 gallon barrels
- Copy machine
- Laminating machine
- Network access to a printer
- Internet access, with notification if privileges are removed
- Space on aft deck for the acoustic winch and all scientific equipment
- Six (6) ship's GPS connections to the dry lab for observer and acoustics computers (please note that it is very important that all science computers be connected to the same ship's GPS. Three connections are needed at the forward desk and 3 near the starboard side aft desk.
- Four (4) CAT5 connections from the dry lab forward desk to the flying bridge.
- Two (2) CAT5 connections from the dry lab forward table to the Chief Scientist stateroom.
- Space on flying bridge for 2 fish boxes of mammal equipment
- Space on bow for one box biopsy equipment
- Spotlights for nighttime retrieval of DASBRS
- Grappling hooks (at least 2) for DASBR retrieval
- Space in the trawl house for UAS battery recharging equipment
- Safety equipment for UAS operations (i.e., shovel, metal bucket for salt water, bucket for sand, Class D fire extinguisher, etc.)

B. Capabilities: It is requested that the ship provide the following:

- Permission for the scientific party to ready scientific spaces (e.g. set up computer server, acoustic array work station and battery bank, etc.) prior to departure from Ford Island (beginning June 26, 2017)
- Assistance from the ship's deck department with the crane for staging and destaging
- Lunches provided from the stewards department for small boat operations
- Request ship provide coxswain and crew for SE-4.
- Deck department will provide the needed personnel to assist with the retrieval and deployment of HARPs.

C. Equipment and Capabilities Provided by the Scientists

- WetLabs profiling fluorometer
- Redundant dissolved oxygen sensors
- Computers, monitors, and external hard drives for data collection, processing, and archiving, set up in E-Lab and Survey Office
- Fuel for SafeBoats
- Visual survey equipment (hand-held binoculars, deck-mounted binoculars and stands,

video camera, digital SLR cameras, handheld radios, portable GPSs)

- Three desktop computers mounted in the E-lab with CAT5 KVM extension units at CPUs and a remote console unit on the flying bridge
- Wireless routers for remote communication of data collection iPads from the flying bridge and bow
- Crossbows, biopsy darts and tips, sample vials, and long-handled dip nets
- One liquid nitrogen dewar (34 L) for biopsy sample preservation with MSDS
- Permits for specimen collection
- Three pallets of sonobuoys (48 in x 40 in x 60 in, 1200 lbs when full)
- Three pallets of DASBRs
- Hydrophone arrays (four linear arrays; one tetrahedral array)
- Hydraulic winch for hydrophone array
- Hansen Coupling Division male LL6-HKP/LL8-HKP ends to quick connect style connectors on 50-ft hose to hydraulic power supply for acoustic winch
- Acoustics recording equipment, including four desktop computers, and accessory equipment.
- ~Five pallet tubs (Steel Toe supplies, acoustic equipment, survey gear, biopsy gear)
- 19-ft Safeboat w/frame and cradle
- Battery bank for hydrophone array
- 3 HARPs with floats and 600lbs of weights
- Satellite tagging gear
- Ocean Noise Reference Station recovery and redeployment gear (~4 pallets)
- Small refrigerators for scientific staterooms

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 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. Radioactive Isotopes - N/A

No Radioactive Isotopes are planned for this project.

C. Chemical Inventory

Common Name of Material	Quantity	Notes	Trained Individual	Spill Control
Cetylcide	1 Liter	Stored in Wet Lab HazMat cabinet	Allan Ligon	C
Isopropyl (70%)	1 Liter	Stored in Wet Lab HazMat cabinet	Allan Ligon	F
Bleach	1 Gallon	Stored in Wet Lab HazMat cabinet	Allan Ligon	C

Common Name of Material	Quantity	Notes	Trained Individual	Spill Control
Ethanol (70%)	1 Liter	Stored in Wet Lab HazMat cabinet	Allan Ligon	F
Gasoline, unleaded	200 Gallons	Stored in Hip Tanks	Erik Norris	F
Lithium Metal Batteries	3 battery packs	Stored in HARP pressure cases	Erik Norris	F
Epoxy	1 Quart	Stored in the Acoustics Dry Lab	Erik Norris	F
Liquid Nitrogen	27 Liters	Stored in Wet Lab Dewar	Allan Ligon	
Carbon Dioxide cartridges	20 Cartridges (each 45 grams)	Stored in Wet Lab Tagging Rifles, sonobuoys, and PFD rearming kits	Allan Ligon, Erik Norris	F
AGM batteries	4	Acoustic battery bank. Stored in water tight, ventilated case on winch deck.	Erik Norris	C

C: Corrosive

- Wear appropriate protective equipment and clothing during cleanup.
- Ventilate closed spaces before entering them.
- Never mix chlorine bleach with any other household cleaners.
- 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 water. Collect in a non-combustible container for prompt disposal.

F: Flammable

- 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.

Inventory of Spill Kit supplies

Product Name	Amount	Chemicals it is useful against	Amount it can clean up
N/A			

V. Additional Projects

A. Supplementary ("Piggyback") Projects

Opportunistic sea turtle observations: During normal cetacean and seabird visual surveys, the observers will also watch for sea turtles along the trackline. If a turtle is sighted, the observers will record the GPS location and collect photographs for species identification.

Disentangle sea turtles and/or seabirds: Efforts to disentangle sea turtles or seabirds may be conducted on an opportunistic basis at the discretion of the Project Leader. Permits to disentangle sea turtles and/or seabirds will be present on the vessel. All disentangled sea turtles or seabirds will be released back to the ocean.

Lasker-Sette EK-60 system comparison (background and weather induced noise)- Leg 2 and 3, last night prior to in-port: Tests should be conducted simultaneously when the two vessels are in near proximity to each other, once in protected waters and once in unprotected waters (choppy, wind-driven), into and along seas. Water depth should be at least 400-500 m for calm waters and min 1,200-1,500 m for rough waters. For all tests, all transducers should be operating at their max power and with max ping rate. All data should be recorded to 1,500 m in .raw format.

For each vessel

a) in calm waters (min 400-500 m water depth) 10-min recordings @ 1.024 pulse width in milliseconds (ms) at 0, 30, 60, 90, 120, 150, 180 RPM (engine revolutions). Total time requirement: 7 10-min (1 hr 10 min) period of simultaneous recording, excluding transit time.
b) in rough waters once along and once into seas (min 1,200-1,500 m depth) 20-minute recordings @1.024 then repeat @ .512 ms (all @max power for each transducer and with max ping rate): 4 kts speed followed by 10-11 kts speed (or max typical travel speed). Time requirement: 8 20-min (2 hrs 40 min) period of simultaneous recording, excluding transit time.

Log vessel occurrence in Papahanaumokuakea: The Marine National Monument has requested a log of vessels encountered while surveying Monument waters. The ship's Command should log the time and location of the vessel observation, as well as the ship's identity and direction of travel if known.

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned

VI. Disposition of Data and Reports

Disposition of data gathered aboard NOAA ships will conform to NAO 216-101 *Ocean Data Acquisitions* and NAO 212-15 *Management of Environmental Data and Information.* To guide the implementation of these NAOs, NOAA's Environmental Data Management Committee (EDMC) provides the *NOAA Data Documentation Procedural Directive* (data documentation) and *NOAA Data Management Planning Procedural Directive* (preparation of Data Management Plans). OMAO is developing procedures and allocating resources to manage OMAO data and Programs are encouraged to do the same for their Project data.

A. Data Responsibilities

The bridge will keep track of all scientific station operations (e.g., each small boat launch and retrieval, CTDs, DASBRs, HARPs). The Bridge will use the SCS system to event mark the deployment location, as well as recovery locations for DASBRs. For small boat operations, the same station number will be used for both launch and recovery. The Survey Tech and scientists will collect the more detailed primary data associated with each of the station operations.

Data Disposition: The Chief Scientist shall be considered to be the representative of the NMFS PIFSC Science Director for purposes of data disposition. A single copy of all data gathered by the vessel will be delivered to the Chief Scientist upon request who will be responsible for checking in a complete copy of this data to the PIFSC Scientific Information Services (SIS) Data Services group.

VII. Meetings, Vessel Familiarization, and Project Evaluations

A. 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.

B. 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.

C. Post-Project Meeting: The Commanding Officer is responsible for conducted a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and short comings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.

D. Project Evaluation Report

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

VIII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least 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 - Tuberculosis Screening Document in compliance with OMAO Policy 1008 (Tuberculosis Protection Program).

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

The participant can mail, fax, or email the forms to the contact information below. Participants should take precautions to protect their Personally Identifiable Information (PII) and medical information and ensure all correspondence adheres to DOC guidance (http://ocio.os.doc.gov/ITPolicyandPrograms/IT_Privacy/PROD01_008240).
The only secure email process approved by NOAA is Accellion Secure File Transfer which requires the sender to setup an account. Accellion's Web Users Guide is a valuable aid in using this service, however to reduce cost the DOC contract doesn't provide for automatically issuing full functioning accounts. To receive access to a "Send Tab", after your Accellion account has been established send an email from the associated email account to accellionAlerts@doc.gov

requesting access to the "Send Tab" function. They will notify you via email usually within 1 business day of your approval. The 'Send Tab" function will be accessible for 30 days.

Contact information:
Regional Director of Health Services
Marine Operations Center – Pacific
2002 SE Marine Science Dr.
Newport, OR 97365
Telephone 541-867-8822
Fax 541-867-8856
Email 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

All foreign national access to the vessel shall be in accordance with NAO 207-12 and RADM De Bow's March 16, 2006 memo (http://deemedexports.noaa.gov). National Marine Fisheries Service personnel will use the Foreign National Registration System (FNRS) to submit requests for access to NOAA facilities and ships. The Departmental Sponsor/NOAA (DSN) is responsible for obtaining clearances and export licenses and for providing escorts required by the NAO. DSNs should consult with their designated Line Office Deemed Export point of contact to assist with the process.

Full compliance with NAO 207-12 is required.

Responsibilities of the Chief Scientist:

1. Provide the Commanding Officer with the email generated by the Servicing Security Office granting approval for the foreign national guest's visit. (For NMFS-sponsored guests, this email will be transmitted by FNRS.) This email will identify the guest's DSN and will serve as evidence that the requirements of NAO 207-12 have been complied with.

2. Escorts – The Chief Scientist is responsible to provide escorts to comply with NAO 207-12 Section 5.10, or as required by the vessel's DOC/OSY Regional Security Officer.

3. Ensure all non-foreign national members of the scientific party receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.

4. Export Control - Ensure that approved controls are in place for any technologies that are subject to Export Administration Regulations (EAR).

The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.

Responsibilities of the Commanding Officer:

1. Ensure only those foreign nationals with DOC/OSY clearance are granted access.

2. Deny access to OMAO platforms and facilities by foreign nationals from countries controlled for anti-terrorism (AT) reasons and individuals from Cuba or Iran without written approval from the Director of the Office of Marine and Aviation Operations and compliance with export and sanction regulations.

3. Ensure foreign national access is permitted only if unlicensed deemed export is not likely to occur.

4. Ensure receipt from the Chief Scientist or the DSN of the FNRS or Servicing Security Office email granting approval for the foreign national guest's visit.

5. Ensure Foreign Port Officials, e.g., Pilots, immigration officials, receive escorted access in accordance with maritime custom to facilitate the vessel's visit to foreign ports.

6. Export Control - 8 weeks in advance of the project, provide the Chief Scientist with a current inventory of OMAO controlled technology onboard the vessel and a copy of the vessel Technology Access Control Plan (TACP). Also notify the Chief Scientist of any OMAO-sponsored foreign nationals that will be onboard while program equipment is aboard so that the Chief Scientist can take steps to prevent unlicensed export of Program controlled technology. The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.

7. Ensure all OMAO personnel onboard receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the Servicing Security Office.

Responsibilities of the Foreign National Sponsor:

1. Export Control - The foreign national's sponsor is responsible for obtaining any required export licenses and complying with any conditions of those licenses prior to the foreign national being provided access to the controlled technology onboard regardless of the technology's ownership.

2. The DSN of the foreign national shall assign an on-board Program individual, who will be responsible for the foreign national while on board. The identified individual must be a U.S. citizen and a NOAA or DOC employee. According to DOC/OSY, this requirement cannot be altered.

3. Ensure completion and submission of Appendix C (Certification of Conditions and Responsibilities for a Foreign National

VIII. Appendices

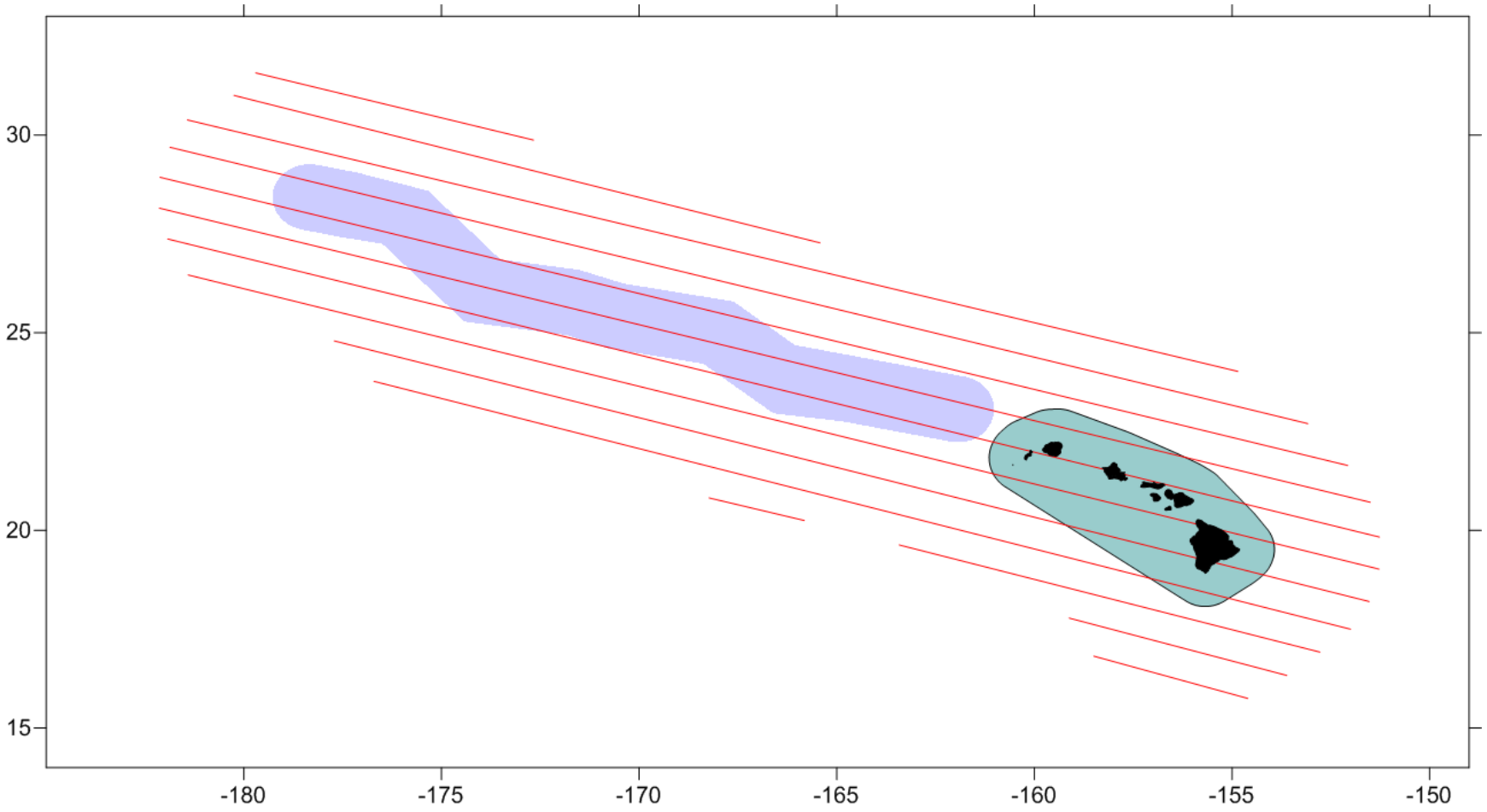
A. Map of operational area, including Main Hawaiian Islands survey Stratum, original Monument boundary (where Monument regulations occur), and survey tracklines

B. DASBR deployment and recovery instructions

C. DASBR diagram

D. Ocean Noise Reference Station recovery and redeployment instructions
E. Ocean Noise Reference Station mooring diagram
F. Sonobuoy deployment and calibration instructions (forthcoming)

A. Map of operational area, including Main Hawaiian Islands survey Stratum (green), original Monument boundary (blue; where Monument regulations occur), and survey lines (red). Survey line endpoints and draft tracklines for each leg will be provided for direct upload to Coastal Explorer.



B. DASBR Deployment and Retrieval Instructions

INTRODUCTION

Drifting Acoustic Spar Buoy Recorders (DASBRs) include two main types: Soundtraps (150 m) and SM3M (100 m). Deployment/retrieval occurs at specific locations, and therefore may occur at various times of day or night. This requires that preparation for deployment/retrieval should be considered ~ 1 day prior to the activity.

- **Black Spar Buoy**. The spar buoys are made of black ABS plastic and have a subsurface recorder (a Wildlife Acoustics SM3M 2-channel recorder or a Soundtrap 4300 4-channel recorder). They are labeled #B1-15, where 'B' is for black, and the #s are the buoy #s. Lines are stored in plastic buckets.
- **Satellite Tracker- Iridum**. All DASBRs have an Iridum geo-locator devices in their spar buoys that each transmit GPS locations every 2 hours.
- **Bucket**. Bucket contains lid, line, bungee, and (for some) hydrophone arrays.
- **Anchor**. A 30-lb mushroom anchor is attached to reduce the movement of the array in rough seas.
- **Bungees**. Black DASBRs have a 30-m section of 3/8" bungee immediately below the buoy, again to reduce movement of the hydrophones.
- **Hydrophones**. All DASBRs have two hydrophones configured as a vertical array with 10-m separation at 100 m depth. Hydrophones are stored in buckets (for Black DASBRs using Soundtrap recorders), or in SM3M crates (for Black DASBRs using SM3M recorders).
- **Depth/Tilt Sensors**. Some of the Black DASBRs have a depth and tilt sensor (Loggerhead OpenTag) attached immediately below the lower hydrophone. All Soundtrap recorders have an internal tilt sensor but not a depth sensor.

DEPLOYMENT

Make sure that all personnel involved with deployment (including scientists, deck crew, and officers) have a clear idea of the deployment procedure and their roles. Have a meeting with the bos'n, deck crew and officers who will be on watch before attempting any deployments. Remember that personnel safety is the highest priority. Equipment can be replaced. Make sure the bridge crew knows **to never back down when line is in the water**. During deployments, ask for one deck crew to be stationed next to you to relay messages to the bridge. Experience has shown that the safest way to deploy is off the stern while the vessel is moving forward slowly. Resist any suggestion that you deploy mid-ships, explain that there will be loose line in the water that will be sucked into the props.

Each type of DASBR has its own deployment protocol. None of the equipment is designed to be dropped or thrown into the water. Lower the equipment carefully on lines. This includes the

anchor weight which will crack the bucket lid if dropped. Only the orange buoy can be tossed in the water.

Black DASBRs with Soundtrap Recorders

These are the lightest and easiest to deploy.

- **Meeting**. Meet w/ officers, crew, etc. to discuss protocol for deploying buoy off the stern. Identify person responsible for deck communications, and ideally an independent person to deploy.
- **Prep Gear on Back Deck**. Ensure that all gear is secured in place (spar buoy, mast, float, bungee, bucket, array w/ Soundtrap, and lid w/ anchor. Make sure there are no loops or tangles. ATTACH WEIGHT TO YELLOW FLOAT LINE WITH LIFESAVER.
- **Double check that SoundTrap in ON (see buoy preparation guide)**.
- **Dead Slow & Wind at Ship's Beam**. As you approach the deployment site, ask the officers to bring the ship to dead slow and to tell you by radio when they reach 1-2 kts speed. If possible, have the wind at the beam (to help blow the float away from the spar buoy & mast).
- **Anchor Ready**. Have one person hold onto the line w/ the anchor, and lower until the weight is over the water but close to railing level. Use an extra black line to loop through the anchor as a leash. They should not lower the buoy into the water until all of the line is paid out.
- **Lower Spar Buoy**. Once the ship is at dead slow, one scientist should lower the black DASBR buoy into the water using the **Yellow** line. [The DASBR will lay horizontally until the anchor applies tension to the line.] Throw out the orange buoy **downwind** of the spar buoy so that its line does not tangle with the DASBR's mast. Hold the bungee and do your best to guide the spar buoy such that the float line does not entangle with the mast. Hopefully, the weight on the yellow line will lower it in the water below the level of the mast, and the wind will blow the float away from the spar buoy.
- **Pay out Line**. Pay out line (first bungee cord and then ¼" black nylon line) only as fast as the vessel moves away from the buoy (avoid loose line in the water that could get sucked into the propellers). A second scientist can lower the anchor and hydrophone array over the side until it is just above the water's surface, but should not lower it into the water until all the line is paid out. Once all the line is paid out, the anchor can be lowered and the array released- but try to not let the recorder splat into the water.
- **Confirm that Spar Buoy goes Upright**. As the anchor sinks, it will help the spar buoy float vertically. Confirm that this happens. This is easier done in daylight, of course.
- **Enter Deployment in Pamguard**. It will be a few minutes late, but that is ok (the overall locations will use the satellite data). Check on the SPOT devices to ensure that you are receiving updates on those buoys.

Special instructions for Black DASBRs with Wildlife Acoustics SM3M Recorders

The SM3M recorders are heavy and harder to deploy. Plan ahead and have at least **two** scientists available for first deployment.

- **Lower SM3M recorders on a line looped through the stainless-steel cage on top.** The recorder will float when it is in the water. Remove loop of line by letting go of one end. Otherwise, deploy as with Soundtrap recorders.

RETRIEVAL

Make sure that all personnel involved with retrieval (including scientists, deck crew, and officers) have a clear idea of the procedure and their roles. Have a meeting with the bos'n, deck crew and officers who will be on watch before attempting any retrievals. Remember that personnel safety is the highest priority. Equipment can be replaced. Wear gloves. During retrievals, ask for one deck crew to be stationed next to you to relay messages to the bridge. You will need to work with the deck crew to establish the best method of grappling for the line between the spar buoys and the orange floats. The best retrieval location may be from a mid-ship station, but extreme care is needed to ensure that the vessel does not drift over the top of the line. Try approaching slowly from an upwind direction (going downwind). Toss the grappling hook and snag the **Yellow** floating line. Ask the vessel to turn broadside to the wind with the buoy on the upwind side of the vessel, so that you will drift away from the buoy.

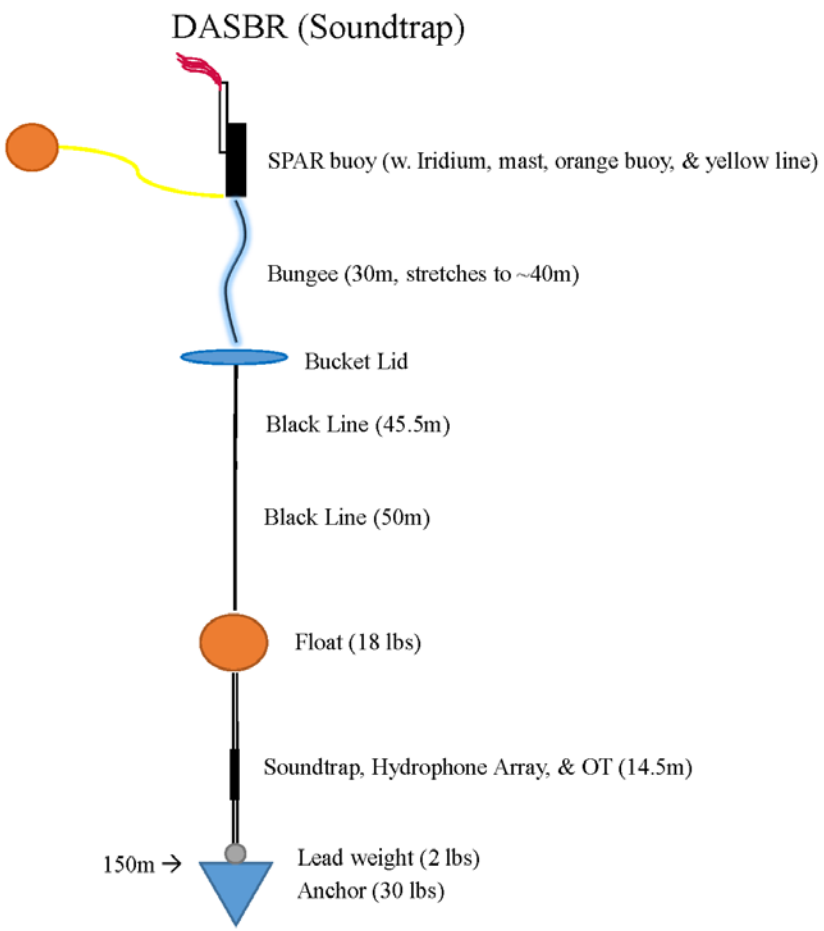
In rough weather, it might not be practical to turn broadside to wind and waves. The alternative is to approach in an upwind direction and to maintain station next to the buoy as it is retrieved. This requires a more skilled vessel operator to avoid the wind catching the bow and pushing the ship over the top of the line being retrieved. If the officer in charge is inexperienced, it may be better to ask the Captain to intervene or just to wait until a more skilled officer is on watch.

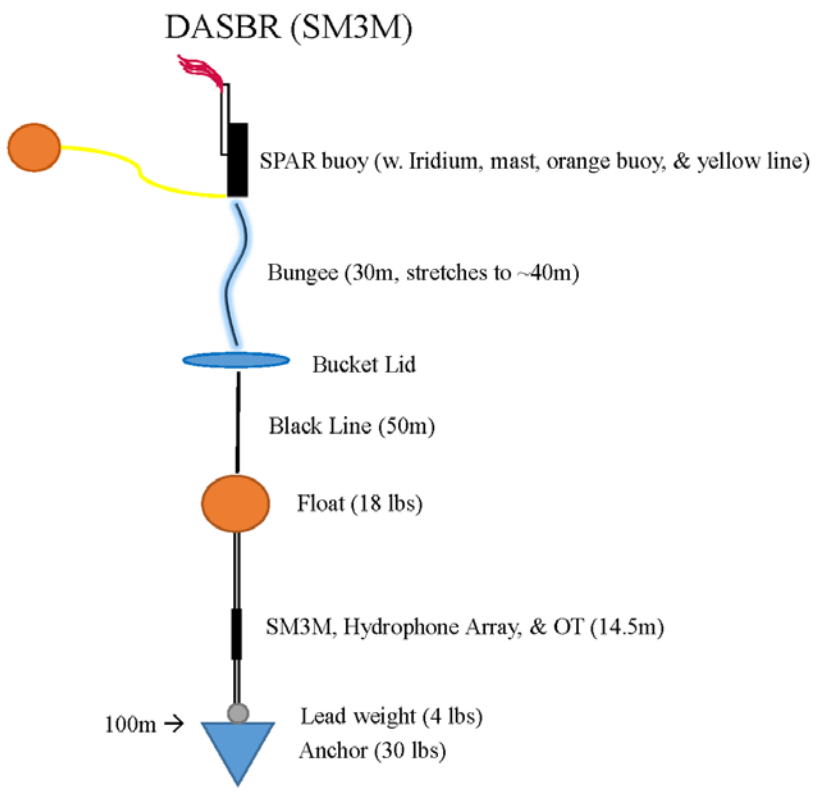
It is very important not to cleat-off the line on the grappling hook. The full force of the ship pulling on the line is likely to break the bungee cord and result in loss of equipment and data. I have provided a bucket with 1000 ft of ¼" nylon line to attach to the grappling hook. Attach a float on the other end of the ¼" line in case it is necessary to let go of the grappling hook line. Pay out this line if you cannot easily hold it by hand. When the ship has come to a stop, one or two people should be able to pull in the line.

- **Ship approaches last known location.** Give bridge last Iridium location so they can position ship to intercept buoy.
- **Prepare ahead and have two scientists for every retrieval.** Have three scientists to retrieve White DASBRs.
- **Aid in location of buoy using binoculars.** The buoys can be located easily using big-eyes during daylight hours. If flashers are working, buoys can be located at night with hand-held binoculars. If flashers have failed, use spotlight (the ship's or spare scientist spotlight) to illuminate reflective tape.
- **Grapple for the Yellow floating line.** Do not cleat-off the grappling hook.

- **Retrieve the grappling hook, orange float, and Yellow line**. Pulling by hand with gloves.
- **Bring spar buoy aboard.** Lift over rail and set on deck.
- **Retrieve bungee cord, then black ¼" line, then hydrophone array.** Hold hydrophone array away from vessel lip as you are retrieving it. Avoid bumping the hydrophone elements against the ship. Lift the recorders gently over the rail.
- **Retrieve anchor**.
- **Restack in bucket after retrieval.**
- **Wash, clean and dry all equipment.** Remove any marine fouling and rinse everything with fresh water. White buckets have drain holes in the bottom, so you can fill them with fresh water and they will drain. Stack line on a dry deck in the sun to dry. Return recorders to their storage cases.
- **Note: We may install a line puller onto the side of one of the ships. Power wires are backwards, so don't be alarmed when they are hooked up this way.**

C. DASBR diagram





Note: Weights of the anchors are in air and will 10-15% less in water.

D. Ocean Noise Reference Station (NRS04) Recovery and Redeployment Instructions

RECOVERY PROCEDURES:

Prep:
- foams/boxes for recovered hydrophone and release
- something to lower/secure float onto
- tools for removing cotter pins and shackles
- wrapping for hardware if going on to winch or net reel
- handheld GPS, mooring diagram, log sheets

Release
Maneuver ship to a location approximately ½ km from the mooring location. The mooring technician will then lower the transducer and enable and range to the acoustic release. Once enabled, signal the acoustic release to drop the anchor, releasing the mooring from the seafloor. The float ascends at 200m/min and typically surfaces within 5 minutes of release. The mooring is a low drag design with a small cross section, so it is not strongly affected by the currents while it is surfacing. It will surface almost directly over the surveyed anchor point. The mooring will however begin to drift almost immediately upon reaching the surface.

Capture of the Float
Fairlead a line of suitable strength to lift 2500kg (order of magnitude safety margin - the heaviest piece of the mooring is the float at 250 kg) through a block with a shive capable of accepting a 5/8" shackle or larger attached to the a-frame. The float at the top of the mooring (1m syntactic foam sphere) has a 10m floating line spliced into a loop attached to the top of the float. The loop is used to attach a lifting line to, either by maneuvering the ship close enough to throw a grappling hook, or by using a small boat to take a lifting line out to the float and manually attach it.

Recovery
Refer to the mooring diagram to get familiar with the components of the mooring. Begin the recovery by bringing the float aboard. Lift the float up to the A-frame and bring the A-frame inboard. Lower the float onto the deck and secure it to the deck. Transfer the lifting line to the 50m ¾" nylon line attached to the bottom of the float and recover the 50m piece directly onto the deck or empty spool (this section of line will need to be moved to the other end of the mooring for redeployment). The hydrophone is located at the bottom of the 50m line. When the phone is recovered, secure it to the deck and transfer the lifting line from the top of the ¾" nylon line to the sling link on the bottom of the hydrophone. Recover the following yalex or vectran segments using net reel, winch, or capstan and spools; wrap hardware to protect line if recovering with winch or net reel. At the bottom of the final section of yalex/vectran are the 10m ¾" nylon line and the acoustic release. Bring these on board, disconnect, and secure all recovered mooring equipment.

DEPLOYMENT PROCEDURES:

Anchor Drop Point

When deploying a hydrophone mooring, you must first determine the approximate location where you want the final anchor position to be. After determining where the target anchor location is, you must then determine the approximate anchor drop point. Due to the design of the mooring, we deploy the float first and stream the mooring out behind the ship. Since the floatation has more drag than the anchor has, when the anchor is dropped, it does not descend straight down to the bottom. Instead, the anchor swings back toward the float while the float is heading (at ~ 5kts) toward the anchor. This results in the anchor landing on the bottom quite a ways behind where it was dropped. This "fall back" of the anchor follows a predictable rate. The anchor will end up ~1/7 the mooring line length behind the drop point. So if you have a mooring with 4200m of line on it, you need to drop the anchor 600m PAST the target anchor position. The anchor will swing back to the target location. The amount of "fallback" is not purely a function of line length, line tension is a factor as well. If the ship is approaching the drop point slowly with the line slack or with little tension, the fallback will be less than if the line is under moderate tension. The amount of fallback is generally between $1/7^{th}$ and $1/10^{th}$ of the mooring line length.

Starting position of the ship

With an experienced crew (one that has done at least one hydrophone mooring) it is safe to estimate 45-90 minutes deployment time for at 3000m to 4200m mooring. For the first deployment estimate 90-120 minutes deployment time.

The speed the ship deploys at is subject to modification in the field, however, start out at 2.5-3 kts after deploying the float. The speed of deployment is important for a couple of reasons. It allows you to estimate how far down range to begin the deployment, since you know the duration of the deployment, speed of the ship, and the anchor drop point. Another important aspect of the deployment speed translates to the distance over ground covered during the deployment (crucial to avoid missing your drop point). Our mooring is designed to be low drag to reduce strumming noise; the drawback to this design is that without some drag, the mooring line does not deploy swiftly and smoothly unless the ship is going fast enough. This is counter-intuitive, but the faster the ship deploys at (speed through water) the shorter the distance both through the water and over the ground covered during the deployment. The reason for this is simple though not necessarily obvious, since the mooring has little drag, at slow deployment speeds, the float simply follows along after the ship. The difference is dramatic, if you deploy a 4000m mooring at < 2kts it will take ~2 to 2.5 hours and the distance over ground may be as much as 5 NM or more. If you deploy the same 4000m mooring at 4-5 kts, the deployment time will be ~ 45 minutes (or less) and the cover 3 to 4 NM (or less) over ground.

There are other considerations to mooring speed, however it is important the mooring be deployed under tension to eliminate potential tangling of the mooring line with itself. As a general rule of thumb, deploy as fast as can be done safely, with a maximum speed of 5 kts.

Mooring Set-up (refer to mooring diagram in Appendix E)

Deck Prep:
- test, cock, and disable new release in lab
- bring release and hydrophone out to deck
- new hardware and cotter pins
- tools for shackles and cotter pins

Pre-deployment

The mooring can be treated as two moorings, the top and the bottom, and can be built independently of each other. If possible get the anchor moved into position on the fantail, beneath the A-frame before operations begin. This eliminates having to use the crane during the deployment operation and allows the tech to begin building the bottom of the mooring while the mooring line is being deployed.

Building the top of the mooring

The float can either be deployed right side up with a quick release attached to a 5/8” shackle (can be an old/reused shackle), or upside down by lifting it with the 50m ¾” nylon through the block.

On the bottom loop of the float, attach a 1/2m section of chain using a 5/8” shackle (pin through the chain, not the float).

Attach 50m piece of ¾” nylon with a thimble bushing, to the bottom of the 1/2m chain using another 5/8” shackle. The pin goes through the nylon not the chain.

Flake the 50m piece of line out on the deck so it can go overboard without tangling.

Attach the 50m ¾” nylon to the top of the hydrophone. This attachment is done using a 5/8” shackle connected to the nylon, with a thimble bushing, hooked with a ½” shackle to the top of the hydrophone.

Inspect all nylon isolator bushings (wrap with tape) and shackles and verify they are in place.

Insert cotter pins to all shackles (use new cotter pins, never re-use the pins that come in the shackle, they are cheap galvanized and need to be replaced with stainless steel pins).

Preparing to deploy

When using an A-frame, capstan/winch configuration

If the ship only has one method of lifting the mooring, and or only one block in the A-frame, you will need to do a "double pick-up”.
This involves feeding the ship’s lifting line through the block and attaching it to the float via a quick release. While the ship is at all stop, lower the float into the water and release it. While the 50m ¾” nylon line is slowly going overboard, feed the yalex/vectran through the block and attack it to the bottom of the hydrophone using a ½” shackle attached to a 5/8” sling link and

another ½" shackle to the hydrophone. The 5/8" sling link is critical for stopping off the mooring on the subsequent recovery operation.

Lift the hydrophone off the deck with the yalex/vectran line through the block on the A-frame

Have the bridge bring the ship up to deployment speed, start at 2 kt, as the ship accelerates, the 50m nylon line will begin paying off the deck into the water as it is pulled off by the drag from the float. When the line is pulled tight, begin paying out the line and the hydrophone will go into the water as smoothly as possible. After the hydrophone is deployed, ship can speed up to 5 knots. Stop off and replace hardware and cotter pins at all connections.

If the ship has two methods of lifting and two blocks attached to the A-frame, set-up similar to previously described.
Run the yalex/vectran line through one block and attach it to the bottom of the hydrophone. Run the ship's "lifting line" through the other block to the quick release attached to the top of the float. This is the preferred method since the mooring is attached to the ship at all times during the deployment and there is no transferal of lines under strain to deal with.

Lift the float with the lifting line, then lift the hydrophone with the line attached to the bottom of the hydrophone. Then lower the float into the water, release it, allow the 50m ¾" nylon to deploy and when the line comes under tension, lower the hydrophone into the water. After the hydrophone is deployed, ship can speed up to 5 knots. Stop off and replace hardware and cotter pins at all connections.

If the ship has a crane/snatchblock and a capstan the mooring can easily be deployed over the side. After lifting the float over the side and booming out ~5-6m the mooring can be deployed through a snatch block on the crane. This method requires the capstan to provide the lifting while the crane is used similar to the a-frame or as a support for the block the line is going through. This method is preferred when working on the R/V Atlantis, since the A-frame is dedicated to Alvin no mooring work is allowed to use the A-frame.
The mooring deployment procedure is the same as above except we use the crane/capstan rather than the A-frame/capstan combo.

While the mooring line is being deployed by the deck force/assistant build the bottom of the mooring.

Building the bottom of the mooring

Preparing the Acoustic Release for deployment.

EG&G/Edgetech 8242;	Attach the detachable link, cock the release using the cocking tool included with the release

Attach a 2m chain to the anchor using a 5/8" shackle.

Attach a 5/8” shackle (old/reused shackle ok here) to the middle of the 2m chain; this is where you will attach the quick release to for lifting the anchor into the water.

For NRS04, next attach 10m wire and 0.5m chain here.

Attach the upper end of the chain to the detachable link on the acoustic release using a 5/8” shackle.

Attach a 5/8” shackle to the top of the acoustic release looped through a ½” shackle attached to the 1 1/2 ton swivel, (writing on the side of the swivel should be upright after the mooring is deployed).

Lay another ½” shackle near the top of the swivel it will be used to make the final connection between the bottom of the mooring line and the top of the swivel.

When you are nearing the end of the last piece of yalex/vectran mooring line going into the water, attach the 10m ¾” nylon piece, with thimble bushings, to the bottom of the yalex/vectran line using a 5/8” / ½” shackle combination.

Attach the 1m chain to the bottom of the 10m ¾” nylon using a 5/8” shackle, attach the other end of the chain to the ship’s “lifting line”.

The lifting line must be strong enough to support all dynamic forces generated by the anchor, 80 lb release and tension on the line.

At this point have the ship slow to 2 kts through the water.

Attach a drop line/strap to the 1m chain. The drop line must be long enough to reach the deck from the A-frame block the mooring line is being deployed through with enough left over to grab onto and haul in on. 8-12m is probably sufficient.

As you deploy the last of the mooring line, the 10m ¾” nylon, you will observe the drop line hanging free from the 1m chain, After the drop line has passed through the block on the A-frame, stop the deployment. Haul the line back in until you can grab the drop line while standing on the fantail. Use the drop line in conjunction with the release of a little additional line to get the 1m chain down to the deck and stop it off to the deck. Transfer the tension from the lifting line to the deck. Detach the lifting line from the 1m chain and attach the 1m chain to the swivel using a ½” shackle.

Attach the lifting line to the quick release attached to the 5/8” shackle, mid way on the 2m chain between the anchor and the release. This is your pick-up point. Tow the mooring until you get to the anchor drop point.

When you are approaching 5 minutes from the drop point, detach the 1m chain from the deck and lower the release into the water. Lift the anchor off the deck, go out on the A-frame, lower the anchor to the water’s edge and wait for the bridge to give the order to drop the anchor.

E. Ocean Noise Reference Station mooring diagram