U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center
8901 La Jolla Shores Drive • La Jolla, California 92037
(858) 546-7000

Project Instructions

Date Submitted: August 2, 2017

Platform: NOAA Ship *Reuben Lasker*

Project Number: RL-17-05 (1705 PIFSC)

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

Project Dates: 17 August to 9 December 2017

Prepared by: _____ Dated: 8/14/17
Jeff E. Moore, *Chief Scientist*
Marine Mammal and Turtle Division, California Current Marine Mammal Assessment Program Lead
Southwest Fisheries Science Center

Prepared by: _____ Dated: 8/14/17
Erin Oleson, *Chief Scientist*
Protected Species Division, Cetacean Research Program Lead
Pacific Islands Fisheries Science Center

Approved by: _____ Dated: 8/14/17
Kristen C. Koch
Acting Science Director
Southwest Fisheries Science Center

Approved by: _____ Dated: _____
Captain Keith W. Roberts, NOAA
Commanding Officer
Marine Operations Center - Pacific

Digitally signed by ROBERTS.KEITH.W.1042165537
Date: 2017.08.16 09:00:30 -07'00'

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 *Oscar Sette*, are covered separately.

NOAA Ship *Reuben Lasker*: 17 August – 09 December 2017

The Hawaiian Islands Cetacean and Ecosystem Assessment Survey (HICEAS) project is a marine mammal and seabird 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, whales, and seabirds found in the waters around the Hawaiian Islands. In addition, biopsy data and aerial photography (UAS) data will be collected from marine mammals to better understand population demography and genetic structure, and biological and oceanographic data will be collected to better characterize the study area environment.

B. Service Level Agreements

Of the _100_ DAS scheduled for this project, _100_ DAS are funded by an OMAO allocation, _0_ DAS are funded by a Line Office Allocation, _0_ DAS are Program Funded, and _0_DAS are Other Agency funded. This project is estimated to exhibit a _medium__ Operational Tempo.

- Total DAS = 100
- OMAO Allocated DAS = 100
- Line Office Allocated DAS = 0
- Program Funded Days (PFD) = 0
- Other Agency Funded DAS = 0

C. Operating Area

The operating area will include the 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 177ºE plus the round-trip transit from San Diego to Hawaii. Survey operations will take place during the transit.

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:

- Visual surveys of cetacean distribution, school size, and school composition to determine animal density and population size. Visual surveys for cetaceans will occur during daylight hours.
- Skin biopsies and satellite tagging of cetaceans for investigations of stock structure and phylogenetic relationships.
- Photo identification and aerial photographs (from UAS) to document geographic variation in

dolphin morphology, pigment patterns, health condition, school composition, and distribution of individual whales.

- 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.
- Deploy, recover, and redeploy Drifting Autonomous Spar Buoy Recorders (DASBRs) – a passive acoustic monitoring device -- offshore of the Main Hawaiian Islands to assess occurrence of deep-diving whales.
- Surveys of seabirds, and sampling of encountered prey fishes and squids to characterize the ecosystem in which these seabirds live.
- 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.
- Conduct ancillary projects for Visiting Scientists as time allows.

E. Participating Institutions:

NOAA NMFS Pacific Islands Fisheries Science Center (PIFSC)
NOAA NMFS Southwest Fisheries Science Center (SWFSC)
Bureau of Ocean Energy Management
U. S. Navy

F. Personnel/Science Party:

Science party members will stay aboard ship between survey legs.

Leg I: 17 August through 5 September 2017.

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Sex	Affiliation	Nationality
1	Jeff Moore	Chief Scientist/Cruise Leader	17-Aug-17	06-Sep-17	M	SWFSC	USA
2	Suzanne Yin	Sr. Marine Mammal Observer	16-Aug-17	--	F	OAI	USA
3	Juan Carlos Salinas	Sr. Marine Mammal Observer	16-Aug-17	--	M	OAI	Mexico
4	Heather Colley	Marine Mammal Observer	16-Aug-17	--	F	OAI	USA
5	Mark Cotter	Marine Mammal Observer	16-Aug-17	--	M	OAI	USA
6	Bernardo Alps	Marine Mammal Observer	16-Aug-17	--	M	OAI	Brazil (Permanent US Resident)
7	Jim Gilpatrick	Marine Mammal Observer	17-Aug-17	--	M	SWFSC	USA
8	Michael Force	Seabird Observer	16-Aug-17	--	M	OAI	Canada

9	Andy Bankert	Seabird Observer	16-Aug-17	--	M	OAI	USA
10	Shannon Coates	Sr. Acoustician	16-Aug-17	--	F	OAI	USA
11	Megan Slack	Acoustic Technician	16-Aug-17	--	F	OAI	USA
12	Jennifer Trickey	Acoustic Technician	16-Aug-17	07-Sep-17	F	UCSD	USA
13	Marie Hill	Data QA/QC	16-Aug-17	05-Sep-17	F	JIMAR	USA
14	Seth Sykora-Bodie	Visiting Scientist	16-Aug-17	08-Sep-17	M	Duke University	USA

Leg II: 11 September through 10 October 2017.

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Sex	Affiliation	Nationality
1	Eric Archer	Cruise Leader	05-Sep-17	10-Oct-17	M	SWFSC	USA
2	Suzanne Yin	Sr. Marine Mammal Observer	--	10-Oct-17	F	OAI	USA
3	Juan Carlos Salinas	Sr. Marine Mammal Observer	--	10-Oct-17	M	OAI	Mexico
4	Heather Colley	Marine Mammal Observer	--	--	F	OAI	USA
5	Mark Cotter	Marine Mammal Observer	--	--	M	OAI	USA
6	Bernardo Alps	Marine Mammal Observer	--	--	M	OAI	Brazil (Permanent US Resident)
7	Jim Gilpatrick	Marine Mammal Observer	--	11-Oct-17	M	SWFSC	USA
8	Michael Force	Seabird Observer	--	--	M	OAI	Canada
9	Andy Bankert	Seabird Observer	--	--	M	OAI	USA
10	Shannon Coates	Sr. Acoustician	--	--	F	OAI	USA
11	Megan Slack	Acoustic Technician	--	11-Oct-17	F	OAI	USA
12	Taiki Sakai	Acoustic Technician	10-Sep-17	11-Oct-17	M	OAI	USA
13	Brittany Hanser (CL trainee)	Visiting Scientist	6-Sep-17	11-Oct-17	F	SWFSC	USA

Leg III: 16 October through 9 November 2017.

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Sex	Affiliation	Nationality
1	Jim Carretta	Cruise Leader	10-Oct-17	09-Nov-17	M	SWFSC	USA
2	Paula Olson	Sr. Marine Mammal Observer	10-Oct-17	10-Nov-17	F	OAI	USA
3	Andrea Bendlin	Sr. Marine Mammal Observer	10-Oct-17	10-Nov-17	F	OAI	USA

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Sex	Affiliation	Nationality
4	Heather Colley	Marine Mammal Observer	--	--	F	OAI	USA
5	Mark Cotter	Marine Mammal Observer	--	--	M	OAI	USA
6	Bernardo Alps	Marine Mammal Observer	--	--	M	OAI	Brazil (Permanent US Resident)
7	Allan Ligon	Marine Mammal Observer	10-Oct-17	10-Nov-17	M	Independent contractor	USA
8	Michael Force	Seabird Observer	--	--	M	OAI	Canada
9	Andy Bankert	Seabird Observer	--	--	M	OAI	USA
10	Shannon Coates	Sr. Acoustician	--	--	F	OAI	USA
11	Anne Simonis	Acoustic Technician	15-Oct-17	10-Nov-17	F	OAI	USA
12	Rory Driskell	Acoustic Technician/Hexacopter Pilot	16-Oct--17	09-Nov-17	M	PIFSC	USA
13	Lauren Jacobsen	Visiting Scientist	15-Oct-17	10-Nov-17	F	Oregon State University	USA

Leg IV: 15 November through 9 December 2017.

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Sex	Affiliation	Nationality
1	Karin Forney	Cruise Leader	09-Nov-17	10-Dec-17	F	SWFSC	USA
2	Suzanne Yin	Sr. Marine Mammal Observer	12-Nov-17	10-Dec-17	F	OAI	USA
3	Juan Carlos Salinas	Sr. Marine Mammal Observer	12-Nov-17	10-Dec-17	M	OAI	Mexico
4	Heather Colley	Marine Mammal Observer	--	10-Dec-17	F	OAI	USA
5	Mark Cotter	Marine Mammal Observer	--	10-Dec-17	M	OAI	USA
6	Bernardo Alps	Marine Mammal Observer	--	10-Dec-17	M	OAI	Brazil (Permanent US Resident)
7	Charlotte Boyd	Marine Mammal Observer	14-Nov-17	10-Dec-17	F	AFSC	United Kingdom
8	Michael Force	Seabird Observer	--	10-Dec-17	M	OAI	Canada
9	Andy Bankert	Seabird Observer	--	10-Dec-17	M	OAI	USA
10	Shannon Coates	Sr. Acoustician	--	10-Dec-17	F	OAI	USA
11	Jennifer Keating	Acoustic Technician	15-Nov-17	10-Dec-17	F	JIMAR	USA
12	Jessica Crance	Acoustic	14-Nov-17	10-Dec-17	F	AFSC	USA

#	Name (Last, First)	Title	Date Aboard	Date Disembark	Sex	Affiliation	Nationality
		Technician					
13	Elizabeth Hetherington	Visiting Scientist	14-Nov-17	10-Dec-17	F	UCSD	USA
14	Michael Richlen	Visiting Scientist	14-Nov-17	10-Dec-17	M	HDR, Inc.	USA

G. Administrative

1. Points of Contact

Chief Scientists:
Erin Oleson
NOAA/IRC
Attn: NMFS/PIFSC/PSD/Erin Oleson
1845 Wasp Blvd., Bldg. 176, Room 1256
Honolulu, HI 96818
(808) 725-5712
Erin.Oleson@noaa.gov

Jeff Moore (*R/V Lasker*)
NOAA Fisheries/SWFSC/MMTD
8901 La Jolla Shores Dr.
La Jolla, California 92037
(858) 546-7161
Jeff.E.Moore@noaa.gov

Cruise Leaders (assumes role of Chief Scientist when underway)
Leg 1: Jeff Moore
See above, Chief Scientist

Leg 2: Eric Archer
NOAA Fisheries/SWFSC/MMTD
8901 La Jolla Shores Drive
La Jolla, CA 92037
(858) 546-7121
Eric.Archer@noaa.gov

Leg 3: Jim Carretta
NOAA Fisheries/SWFSC/MMTD
8901 La Jolla Shores Drive
La Jolla, CA 92037
(858) 546-7171
Jim.Carretta@noaa.gov

Leg 4: Karin Forney
NOAA Fisheries/SWFSC/MMTD
MLML Norte 7544 Sandholdt Road
Moss Landing, CA 95039
(831) 771-4155
Karin.Forney@noaa.gov

Survey Coordinators:
Annette Henry
NOAA/SWFSC/MMTD
8901 La Jolla Shores Dr.
La Jolla, California 92037
(858) 546-5672
Cell (858) 735-7733
Annette.Henry@noaa.gov

Kym Yano
NOAA/IRC
Attn: NMFS/PIFSC/PSD/Kym Yano
1845 Wasp Blvd., Bldg. 176
(808) 725-5501
Cell (808) 371-2614
Kym.Yano@noaa.gov

Ship Operations Officer:
LT James Europe, NOAA, Operations Officer
NOAA Ship *Reuben Lasker*
8901 La Jolla Shores Drive
La Jolla, CA 92037
(541) 272-9094
OPS.Reuben.Lasker@noaa.gov

2. Diplomatic Clearances

None required.

3. Licenses and Permits

a. NMFS Permit No. 20311, issued to the Pacific Islands Fisheries Science Center by the National Marine Fisheries Service, Office of Protected Resources
b. FWS Permit No. MB033305-0, issued to the Southwest Fisheries Science Center by the U.S. Fish and Wildlife Service Migratory Bird Permit Office, Region 8.
c. NMFS Permit No. 17022, issued to the Pacific Islands Fisheries Science Center
d. NMFS Permit No. 19091, issued to the Southwest Fisheries Science Center

e. PMNM Permit No. PMNM-2017-017-L, issued to Chief Scientists Oleson and Moore by the PMNM Permit Office
f. PMNM Permit No. PMNM-XXX-XXX-X, issued to NOAA Ship Reuben Lasker by the PMNM Permit Office
g. FWS Permit No. 17US81984A9, issued to the Pacific Islands Fisheries Science Center.
h. Flight Authorization for Pacific Islands Fisheries Science Center
i. AOC UAS Notification of Intent to Fly
j. ORM Concurrence

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

Leg I San Diego, California to Honolulu, Hawaii: 17 August – 5 September 2017
Inport: Ford Island, Hawaii: 6 – 10 September 2017

Leg II: Honolulu, Hawaii to Honolulu, Hawaii: 11 September – 10 October 2017
Inport: Aloha Towers, Honolulu, Hawaii: 11 – 15 October 2017

Leg III: Honolulu, Hawaii to Honolulu, Hawaii: 16 October – 9 November 2017
Inport: Aloha Towers, Honolulu, Hawaii: 10 – 14 November 2017

Leg IV: Honolulu, Hawaii to San Diego, California: 15 November – 9 December 2017
End survey: San Diego, California

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:

17 August: Depart for transit to survey trackline. Cetacean shipboard transects in Eastern Pacific Ocean enroute to Hawaii. Visual teams (cetaceans and seabirds) will be on effort sunrise to sunset. Small boat launches will take place opportunistically as cetacean groups are sighted during transect surveys to conduct biopsy sampling and photo ID work. Opportunistic biopsy sampling will be conducted from the ship's bow as well. Acoustic towed array operations potentially on-effort 24-hours per day, except during CTD operations. One CTD following end of daily visual survey effort will be conducted.

~27 August: Begin survey in the Hawaiian Archipelago within 200 nmi of the main and Northwest Hawaiian Islands. Visual teams (cetaceans and seabirds) will be on effort sunrise to sunset. Small boat launches will take place for near island surveys or opportunistically as

cetacean groups are sighted during transect surveys to conduct biopsy sampling and photo ID work. Opportunistic biopsy sampling will be conducted from the ship's bow as well. Acoustic towed array operations potentially on-effort 24-hours per day, except during CTD operations. One CTD before sunrise and one CTD following end of daily visual survey effort will be conducted. Deploy 2 sonobuoys during evening CTD (not every night- sampling randomized). eDNA CTD casts over Cross Seamount will be conducted; repeated CTD casts will occur within the same night. Retrieve DASBRs offshore of the Main Hawaiian Islands according to Iridium tracking info.

4 September, night: Simultaneous coordinated EK60 sampling with NOAA Ship *Sette* (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 September, morning: Arrive Ford Island for inport.

Leg II:

11 September: Depart Ford Island for transit to survey trackline. Cetacean shipboard transects within 200 nmi of the main and Northwest Hawaiian Islands. Visual teams (cetaceans and seabirds) will be on effort sunrise to sunset. Small boat launches will take place for near island surveys or opportunistically as cetacean groups are sighted during transect surveys to conduct biopsy sampling and photo ID work. Opportunistic biopsy sampling will be conducted from the ship's bow as well. Acoustic towed array operations potentially on-effort 24-hours per day, except during CTD operations. One CTD before sunrise and one CTD following end of daily visual survey effort will be conducted. Deploy 2 sonobuoys during evening CTD (not every not every night- sampling randomized). eDNA CTD casts over Cross Seamount will be conducted; repeated CTD casts will occur within the same night. Retrieve and redeploy DASBRs offshore of the Main Hawaiian Islands according to Iridium tracking info.

9 October, night: Simultaneous coordinated EK60 sampling with NOAA Ship *Sette* (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.

10 October, morning: Arrive Aloha Towers for inport.

Leg III:

16 October: Depart Aloha Towers for transit to survey tracklines. Cetacean shipboard transects within 200 nmi of the main and Northwest Hawaiian Islands. Visual teams (cetaceans and seabirds) will be on effort sunrise to sunset. Small boat launches will take place for near island surveys or opportunistically as cetacean groups are sighted during transect surveys to conduct biopsy sampling and photo ID work. Opportunistic biopsy sampling from will be conducted from the ship's bow as well. Opportunistic APH-22 hexacopter operations may occur as cetacean groups are sighted during transect surveys. Acoustic towed array operations potentially on-effort 24-hours per day, except during CTD operations. One CTD before sunrise and one CTD following end of daily visual survey effort will be conducted. Deploy 2 sonobuoys during

evening CTD (not every not every night- sampling randomized). eDNA CTD casts over Cross Seamount will be conducted; repeated CTD casts will occur within the same night. Recover and redeploy DASBRs offshore of the Main Hawaiian Islands according to Iridium tracking info.

9 November, morning: Arrive Aloha Towers, Honolulu, Hawaii for inport.

Leg IV:

16 November: Depart Aloha Towers for transit to survey tracklines. Cetacean shipboard transects within 200 nmi of the main and Northwest Hawaiian Islands. Visual teams (cetaceans and seabirds) will be on effort sunrise to sunset. Small boat launches will take place for near island surveys or opportunistically as cetacean groups are sighted during transect surveys to conduct biopsy sampling and photo ID work. Opportunistic biopsy sampling will be conducted from the ship's bow as well. Opportunistic Acoustic towed array operations potentially on-effort 24-hours per day, except during CTD operations. One CTD before sunrise and one CTD following end of daily visual survey effort will be conducted. Deploy 2 sonobuoys during evening CTD (not every not every night- sampling randomized). Recover and redeploy DASBRs offshore of the Main Hawaiian Islands according to Iridium tracking info.

~29 November: Begin transit to San Diego. Cetacean shipboard transects in the Eastern Pacific Ocean between Hawaii and the US west coast. Visual teams (cetaceans and seabirds) will be on effort sunrise to sunset. Small boat launches will take place opportunistically as cetacean groups are sighted during transect surveys to conduct biopsy sampling and photo ID work. Opportunistic biopsy sampling will be conducted from the ship's bow as well. Acoustic operations potentially on-effort 24-hours per day, except during CTD operations. One CTD following end of daily visual survey effort will be conducted.

9 December, morning: Arrive San Diego for destaging. Scientists are expected to stay overnight on ship.

B. Staging and Destaging

1. Staging

Assistance from the ship's personnel will be required to crane aboard big eye binoculars and stands, acoustic array, and other project supplies to main deck, flying bridge, and bow. 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. Assistance from the ship's Chief ET will be required for setting up flying bridge computers and wireless connections.

Prior to sailing the ship's crew will inspect the starboard-side A-frames and associated oceanographic winches, conducting cable and winch for CTD operations, the thermosalinograph, the flow-through 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. The SeaBird Model SBE 9plus CTD/SBE 11plus V2 Deck Unit system and frame will be installed and inspected ensuring that they are fully operational. Electrical continuity of the A-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 RHIB provided by the ship will be operational and ready to be deployed prior to sailing.

Gasoline tanks will be fueled prior to the project to re-supply as needed for the NOAA small boats during cetacean survey operations. Alternative fuel storage and delivery means may be explored and utilized as deemed necessary.

SWFSC will load and stage equipment on NOAA Ship *Lasker* beginning on 14 August and continue through 16 August 2017.

During the Honolulu inports, a 12v Line puller to retrieve DASBRs will be loaded on the ship between legs 1 and 2, and sonobuoy pallets will need to be craned aboard.

2. **Destaging**
   Destage and offload equipment on **9 December**. If all equipment is not offloaded on that day, remaining equipment will be offloaded on 11 December.

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 and seabird 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 and seabird visual surveys, search effort should start on a trackline determined in advance in consultation between the Chief Scientist and the Command. The *Lasker* should travel at 10 kts (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 Cruise Leader.

On sighting a cetacean group or other feature of biological interest, the Cruise 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 Cruise Leader or Mammal Observers. In some instances, the Cruise 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 ≤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 ≤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 Cruise 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 Acoustics Lab. Further, two temporary network cables will be dropped from the port side of the flying bridge to the Chem Lab for connections between the Science Intranet Routers. 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. 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 from a winch placed on the stern grating. 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. To retrieve the array, the ship will first slow down to 5 kts and maintain its current heading. During array retrieval and deployment, the ship's course and speed must be maintained. During acoustic survey operations, the vessel must maintain forward motion, and turning must not exceed 180˚. The officer on watch must be mindful of the cable angle and reduce rudder commands if concerned about the cable angle or as requested by the acoustic personnel. 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 SWFSC. The winch and hoses will be provided by SWFSC; 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 and then connect 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 Cruise Leader and acoustics team. The bridge 12 kHz 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 aluminum 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, 2 miles from each other and approximately 1.5 mi 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. More details on the configuration and schedule for sonobuoy deployments are provided in Appendix D.

Ship Speed, Order of Operations: The acoustic personnel will contact the bridge to ask permission to deploy the sonobuoy. During evening sonobuoy operations acoustics personnel will request a countdown for deployment of the second buoy at 2 miles distance from the first (see Appendix D). A chronological record of sonobuoy deployments will be kept by the ship with locations, dates, and times using SCS.

e) **Drifting Autonomous Spar Buoy Recorders (DASBRs) Deployment**: Ten (10) DASBRs are planned to be deployed during Legs 1 and 2 from NOAA Ship *Oscar Sette*. Retrieval of DASBRs will take place during Legs 1, 2, and 3 from the NOAA Ship *Reuben Lasker*. Re-deployment and retrieval of recovered units may take place on Legs 2 through 4. DASBRs consist of a black ABS spar buoy, bungee and nylon line, a submerged recorder and hydrophone system, an 11" sub-surface buoy, and a 30-lb weight at 100-150 m depth. 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 include an Iridium geo-locator (inside the spar buoy) and will be marked 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 at a vessel speed no greater than 1.5 kts or speed necessary to achieve minimal steerage. This will require communication with the bridge immediately prior to deployment to discuss expected drift and preferred location of deployment. Nighttime and daytime deployments and retrievals are expected. Retrieval of buoys will be from the side station and requires use of the ship's grappling hooks. Retrieval will require assistance from ship's crew and ship's crew will be in charge of using grappling hooks. A 12-volt line-puller may be used to aid retrieval. Buoys will be tracked with a satellite geolocator. During daytime, they will be re-located visually with the assistance of observers on big-eye binoculars (typically at 5 nmi range). At night, they will be re-located visually using the ship's spotlight and reflective tape on the buoys (typically at 0.5 nmi range). Deployment and retrieval (once buoys are located) should each require approximately 30 minutes. DASBR retrieval requires the scientists to work with the deck crew to establish the best method of grappling for the line between the spar buoys and the orange floats. Extreme care is needed to ensure that the vessel does not drift over the top of the line.

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 ship's Survey Technician will conduct the collection of oceanographic samples and their processing with assistance from the Deck Department and Science Party as required.

   a) **Daily CTD Casts**: A morning CTD station will be completed 15 minutes before sunrise. A second CTD station will be occupied each night no earlier than one hour after sunset and after sonobuoy deployments. No bottle samples will be collected except for eDNA project. The CTD will be equipped with a WetLab profiling sensors, and redundant dissolved oxygen sensors.

      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 Cruise 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 operations schedules. Additional CTD stations may be requested by the Cruise 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 ship will provide two sets 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 and bottles, the CTD must be rinsed completely with fresh water after every cast, and the CTD and rosette must be 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) **eDNA Casts**: Conduct a shipboard CTD cast to collect eDNA water samples on an opportunistic basis at the discretion of the Cruise Leader over Cross Seamount. An acoustic recording device will be attached to the CTD.

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 Cruise 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 between bottles. Cast for the purposes of collecting eDNA will generally occur at night and several casts may occur within the same night. Bottles will be triggered at TBD depths during the upcast. Two 1-L water samples will be retained from each triggered bottle, labeled with station location and depth, and then frozen for later analysis. A Visiting Scientist will filter water samples during leg 3.

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 ship will provide two sets 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 and bottles, the CTD must be rinsed completely with fresh water after every cast, and the CTD and rosette must then be secured.

Ship Personnel Requirements: The ship's Survey Technician will be responsible for the CTD operations and maintenance. Other designated scientists can assist as needed, particularly with collection and labeling of collected seawater. The Deck Department will provide the needed personnel to assist with CTD deployment.

c) **Active Acoustics**: The scientific EK60 depth sounder will be operated at all times at 38,

70, 120, and 200 kHz. The Acoustics team or Cruise Leader may request it to be secured during specific sightings or other times of interest.

Ship Speed, Order of Operations: The vessel's navigational depth sounder may be used at the discretion of the Commanding Officer, but will normally remain off while underway in deep waters. The navigational depth sounder aboard NOAA Ship *Lasker* is known to interfere with the EK60 scientific sounder and with towed array cetacean detection operations. The command will inform the Cruise Leader at any time the navigational depth sounders are used. The Cruise 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 1000 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 Cruise 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 Operations:** Small boat operations will be conducted when weather permits using NOAA Ship *Reuben Lasker's* RHIB. When small boat operations are anticipated, a meeting will be held 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 may be conducted immediately prior to small boat launch. Small boat deployments will occur as cetacean groups of interest are encountered. Small boat survey operations include collection of photographs, water samples for eDNA, prey samples, biopsy samples, and deployment of satellite tags on cetacean groups. Small boat deployment will be requested by the Cruise Leader on an opportunistic basis during all daylight hours, possibly multiple times in a single day, providing the Command concurs that operating conditions are safe.

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

Ship Personnel Requirements: Ship personnel are required for launching the small boat, participating in introductory small boat briefing and operating the small boat.

5. **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 Cruise 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.

6. **Hexacopter Operations:** The APH-22 hexacopter will be launched and recovered opportunistically from NOAA Ship *Lasker* or the small boat to collect aerial imagery on groups of cetaceans. The decision to conduct hexacopter operations will be at the discretion of the Cruise Leader in consultation with the Pilot In Command and the OOD. 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 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 wind speeds less than **15 kts**. If operations take place on NOAA Ship *Lasker*, it will most likely take place from the ship's bow. If operations take place on the small boat, then a small boat launch from the ship will be required.

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

   Ship Personnel Requirements: None anticipated.

D. Dive Plan

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

Dives are not planned for this project.

E. Applicable Restrictions

1. **Mitigation Measures for Protected Species during Scientific Operations**
   Cetacean visual and acoustic survey operations, including approach and sampling of cetaceans and sea turtles during this project are permitted under PIFSC's NMFS Take Permit 20311 or 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. However, SWFSC has incidental take permit in case of this unlikely event occurring. Should take occur, the procedure outlined in SWFSC Protected Species Incidental Take Reporting Protocol -PSIT-001.02 will be followed. 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.

III. Equipment

A. Equipment and Capabilities Provided by the Ship

- Seabird 9/11+ CTD system including rosette with Niskin bottles (2.5 L, 10 bottles)
- Bottom depth checking during CTD casts and all net tows in depths less than 2000 m.
- Starboard A-frame and block for CTD
- Supplies necessary for at least two re-terminations of the A-frame conducting cable
- Oceanographic winches and cables
- Thermosalinograph
- EK60 echosounder system at the frequencies of 38, 70, 120, and 200 kHz
- GPS navigational system
- Depth sounders and recorders
- Scientific -20 °C freezer
- Ultra-low scientific -80 ˚C freezer
- Up to three (3) two-way radios for communication from the electronics lab to the winch operator
- Operational Scientific Computing System (SCS)
- Navigational equipment and course plotter
- Deck hose with fresh water to rinse equipment
- Iridium phone
- Network folder for science access
- CAT-5 (or better) cabling from CPUs in acoustic and chem labs to the flying bridge consoles
- Power, ship's GPS, and ship's SCS connections to CPUs running the flying bridge consoles (please note that it is very important that all science computers be connected to the same ship's GPS)
- Canopy on flying bridge
- Small boat with GPS tracking, including spare parts, for biopsy sampling, photography, seabird collection and marine turtle research
- Small boat fuel
- Refrigerator space for biological and oceanographic samples and satellite tags
- Copy machine
- Network access to a printer
- Internet access, with notification if privileges are removed

- Space on aft deck for four (4) sonobuoy crates, and up to five (5) fish boxes
- Space on bow for two (2) fish boxes
- Space on flying bridge for up to six (6) fish boxes
- Two (2) ship's GPS connections to the dry lab for acoustics computers (please note that it is very important that all science computers be connected to the same ship's GPS).
- Fume hood
- Biopsy platform at bow and attachment straps (harness gear for biopsiers and photographers)
- Grappling hook and line for DASBR retrieval
- Spotlight to find DASBRs at night
- Hydraulic power unit for passive acoustic winch
- Hansen Coupling Division female LL6-HKP/LL8-HKP ends to quick connect style connectors on hose from hydraulic power supply for acoustic winch
- Space on the aft deck for the acoustic winch (6' x 6' footprint)
- Sonobuoy antenna and coax cable to the acoustic lab
- Permission for the scientific party to ready scientific spaces (e.g. set up computer server, acoustic array work station and battery bank, etc.) during the week prior to departure from San Diego
- Assistance from the ship's deck department with the crane for staging and destaging
- Assistance from ship's Chief ET with computer and wireless networking
- Lunches provided from the stewards department for small boat operations

B. Equipment and Capabilities Provided by the Scientists

- Five (5) 7 x 5 handheld binoculars
- Four (4) 25 x 150 "big eye" binoculars and stands
- One (1) 20 x 60 handheld gyro-stabilized binoculars
- Video camera
- Three digital cameras, lenses, and accessories
- Seven (7) handheld radios
- Four (4) laptop computers for Cruise Leader, photography team, marine mammal database, biopsy and backup unit for the Chem Lab
- Three desktop computers mounted in acoustic room with CAT5 (or better) KVM extension units at CPUs and remote console units on flying bridge
- Portable GPS unit
- 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 (1) laptop computer for biopsy data entry and two printers
- Permits for specimen collection
- Four pallets of sonobuoys (48 in x 40 in x 60 in, 1200 lbs when full) - additional sonobuoys will be loaded in Honolulu
- Hydrophone arrays
- Hydraulic winch for hydrophone array, 6' x 6' footprint

- 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 desktop computers (4), and accessory equipment.
- Ten (10) fish boxes (acoustic equipment, survey gear, biopsy gear, DASBRs retrieved)
- Battery bank for hydrophone array
- Satellite tagging gear (leg 3 only)
- Oceanographic data logs and books
- Computer data storage media for data including EK60 (flash drives and external hard drives)
- Sonobuoy receivers with rack-mounted recording systems
- DASBRs (will be retrieved during the survey)
- 12v Line puller to retrieve DASBRs (to be loaded on ship in Hawaii)
- Class D fire extinguisher, metal container, and shovel

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 ships 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.

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory of hazardous material indicating all materials have been used or 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 scientific chemicals is not permitted during projects aboard NOAA ships.

B. Inventory

Common Name of Material	Quantity	Notes	Trained Individual	Spill Control
Cetylcide	1 Liter	Stored in Wet Lab HazMat cabinet	Juan Carlos Salinas/Allan Ligon	C
Isopropyl (70%)	1 Liter	Stored in Wet Lab HazMat cabinet	Juan Carlos Salinas/Allan Ligon	F
Bleach	1 Gallon	Stored in Wet Lab HazMat cabinet	Juan Carlos Salinas/Allan Ligon	C
Ethanol (70%)	1 Liter	Stored in Wet Lab HazMat cabinet	Juan Carlos Salinas/Allan Ligon	F
Li-Po Batteries (leg 3 only)	12	Stored in fireproof sleeves in location designated by the Command	Rory Driskell	F
Epoxy resin	1 Quart	Stored in the Acoustics Dry Lab	Shannon Coates	F
Carbon Dioxide cartridges (leg 3 only)	10 Cartridges (each 45 grams)	Stored in Wet Lab Tagging Rifles	Allan Ligon	F
AGM Batteries	4	Acoustic battery bank. Stored in Acoustics lab.	Shannon Coates	C
CO_2 and Li-Ion batteries	200	Watch battery and small CO_2 within internal guts of each sonobuoy	Shannon Coates	F

Corrosive - "C"

- 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.

Flammable "F"

- 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 sawdust.

Inventory of Spill Kit supplies

Product Name	Amount	Chemicals it is useful against	Amount it can clean up
N/A	Absorbent material and vermiculite	Cetylcide, Alcohol, Bleach	2 ga

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 Cruise 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* EK60 system comparison** (background and weather induced noise)- Leg 1 and 2, 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. *Sette* and *Lasker* should traverse the same line one behind the other.

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.

B. NOAA Fleet Ancillary Projects

Ancillary tasks will be accomplished in accordance with the NOAA Fleet Standing Ancillary instructions as long as they do not interfere with primary mission objectives.

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, CTD cast, and DASBR retrieval, sonobuoy launch). Each of these station operations will be assigned a unique station number using a sequential number sequence starting with Station #1 for the first scientific station operation. Each station number will have a start and end position, date, time, and depth over water. The Bridge will use the SCS system to event mark the start and end time of each station operation. For small boat sampling 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 conducting a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and shortcomings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.

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.

VII. 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.

The completed form should be sent to the Regional Director of Health Services at Marine Operations Center. The NHSQ and Tuberculosis Screening Document, if required, should reach the Health Services Office no later than 4 weeks prior to 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. Scientists must fully complete each form and indicate which 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 e-mail and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128 kbs 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 it must be arranged through the ship's Commanding Officer at least 30 days in advance.

E. IT Security

Any computer that will be connected to the ship's network must comply with the *NMAO 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 these requirements prior to boarding the ship is required.
Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within 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 NMFS Deemed Exports point of contact to assist with the process.

Full compliance with NAO 207-12 is required.

Responsibilities of the Chief Scientist (or Cruise Leader if the Chief Scientist is not aboard):

1. Provide the Commanding Officer with the e-mail generated by the Servicing Security Office granting approval for the foreign national guest's visit. (For NMFS-sponsored guests, this e-mail will be transmitted by FNRS.)This e-mail 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 Regional 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 NMAO approval 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 e-mail 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 Officer.

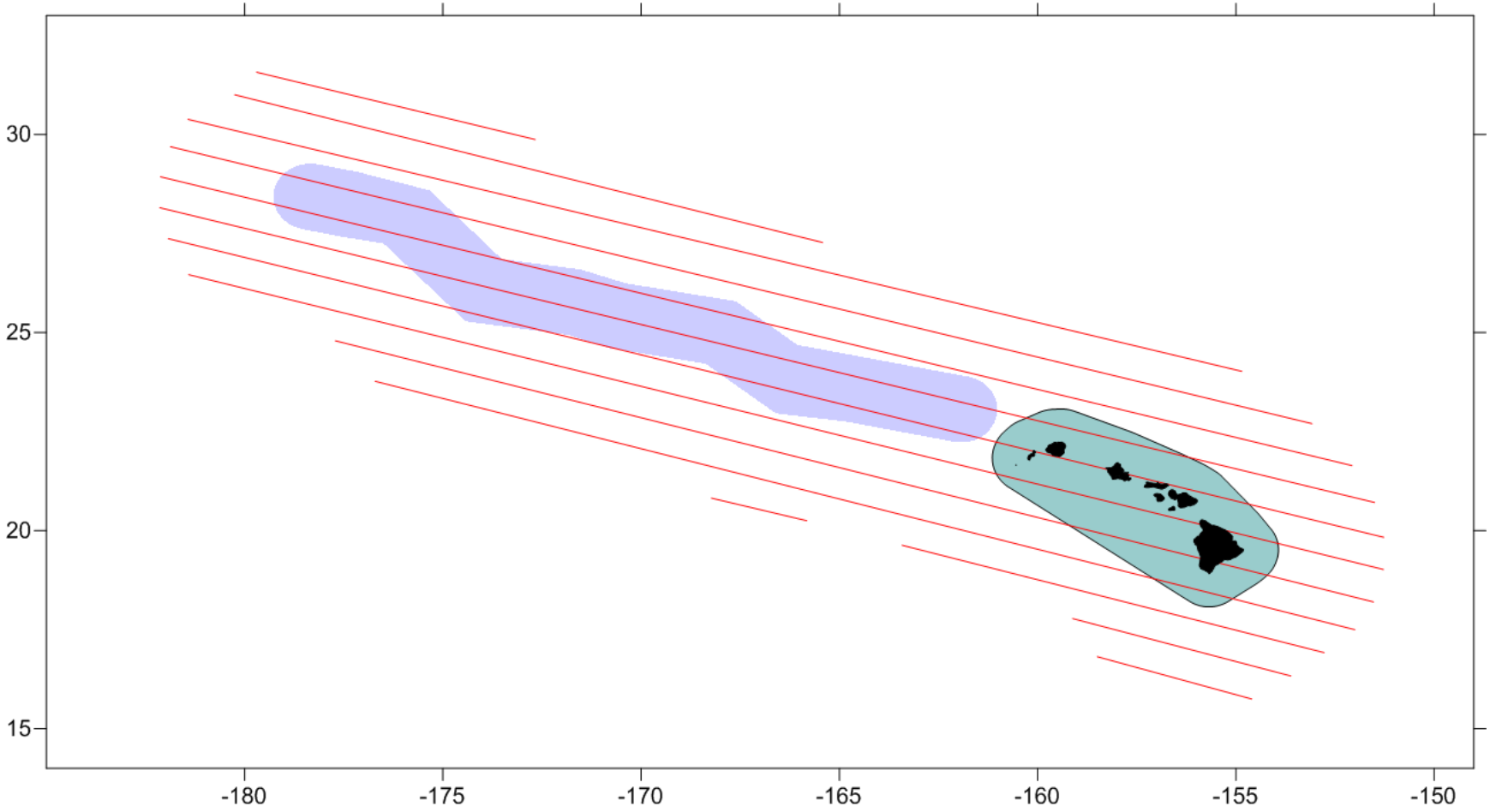
Responsibilities of the Foreign National Sponsor:

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, 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. Waypoints for each leg will be provided via email for import to Coastal Explorer.
B. DASBR deployment and recovery instructions
C. DASBR diagram
D. Sonobuoy station deployment and communication procedures

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 - Iridium**. All DASBRs have an Iridium geo-locator device 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 boson, 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.

<u>Black DASBRs with SoundTrap Recorders</u>

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 DASBRs 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.

<u>Special instructions for Black DASBRs with Wildlife Acoustics SM3M Recorders</u>

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 boson, 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.

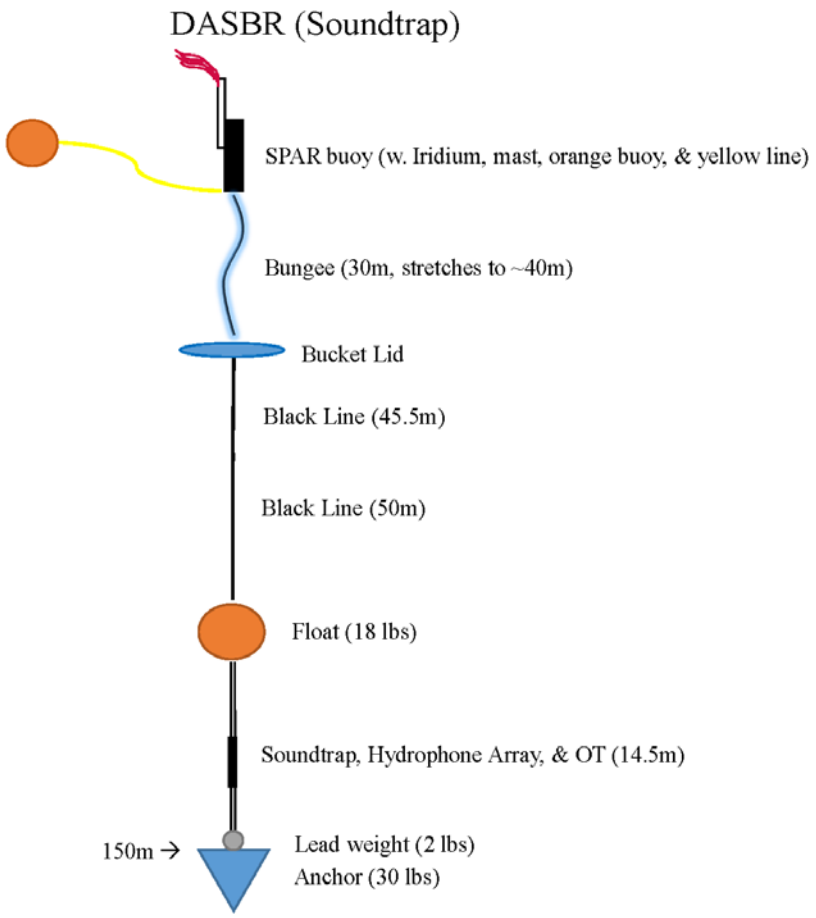
You will need to work with the deck crew to establish the best method of grappling for the line between the spar buoys and the orange floats. The best retrieval location may be from a mid-ship station, but extreme care is needed to ensure that the vessel does not drift over the top of the line. Try approaching 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.

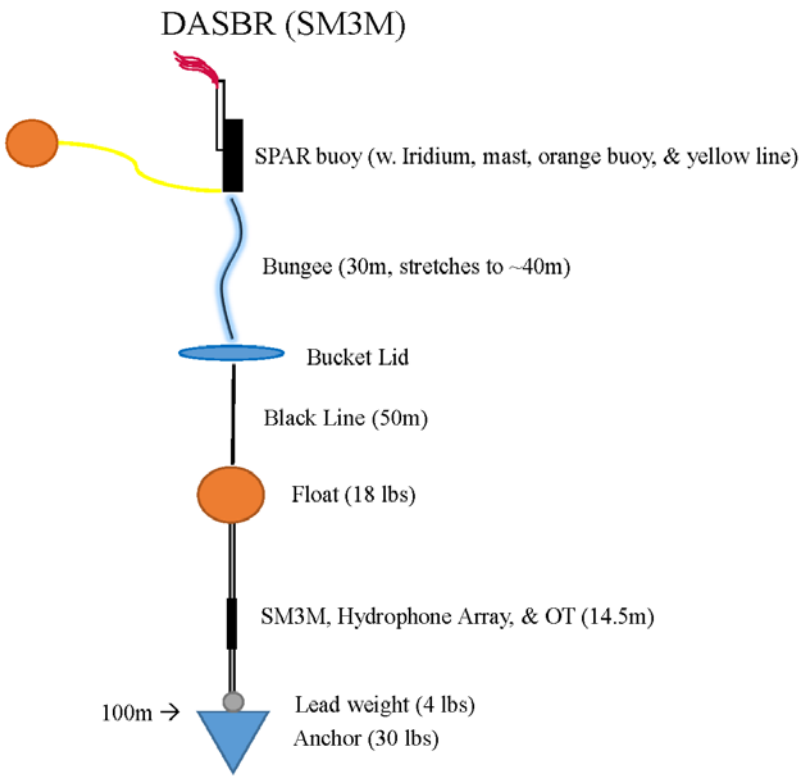
In rough weather, it might not be practical to turn broadside to wind and waves. The alternative is to approach in an upwind direction and to maintain station next to the buoy as it is retrieved. This requires a more skilled vessel operator to avoid the wind catching the bow and pushing the ship over 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. A bucket with 1000 ft of ¼" nylon line to attach to the grappling hook has been provided. 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: A line puller will be placed aboard the ship during the first Hawaii inport to aid in DASBR retrieval. The unit is a "stand-alone" device powered by its own 12V car battery. It is directly

connected to the battery with lug connectors and a 80-amp circuit breaker. 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. Sonobuoy Station Protocol

Sonobuoy stations will be conducted during evening CTD operations; data will be used for call density estimation. It is imperative that the protocol is strictly applied. Sonobuoy deployment and calibration will begin when the visual survey team goes off effort at the end of the day, will continue while the towed array is being retrieved, and be completed prior to stopping for the evening CTD station. Successful implementation will require an initial meeting with all acousticians and any officers/crew that may participate in sonobuoy stations. The movements of the ship are important as the ship is acting as a sound source to calibrate the bearing angles derived from the sonobuoy sensors.

REQUIREMENTS

There are insufficient sonobuoys to conduct stations *every* night; station dates will be pre-selected (to avoid sampling bias). Sonobuoy station protocol will be followed for each evening in which the sonobuoy station is assigned unless cancelled by Cruise Leader or OOD.

To reduce radio interference, all shipboard communications should use handheld radios during all sonobuoy recordings.

METHODS

1. **Schedule:** Confirm that it is a Sonobuoy Station Positive date (see schedule, at end).
2. **Preparation:** Prepare 3 sonobuoys set to the channels shown in Table 1 (only two will be used, the third is a prepared backup). Confirm that there are no other sources of interference. Acoustician will open and prepare PAMGuard software according to channel designation shown in Table 1 and following detailed instructions.

Table 1. Channel configuration for sonobuoy stations.

Sonobuoy No.	Sonobuoy Channel	WinRadio Channel	FireFace Channel	PAMGuard Channel
1	56	1	1	0
2	60	2	2	1
3	54	TBD	TBD	TBD

* TBD - To be determined; backup sonobuoy will use the WinRadio/ FireFace/PAMGuard channel of the buoy it is replacing.

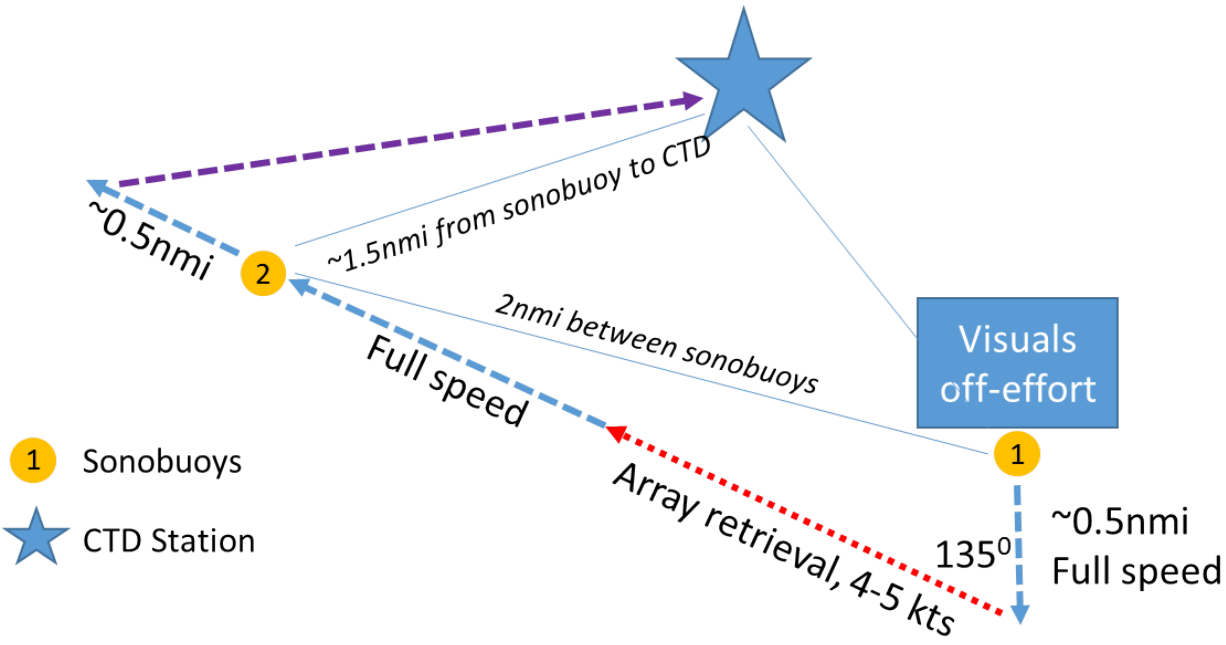
3. **Deployment:** To ensure that calibration is completed before the CTD station, it is imperative that the sonobuoy protocol begins as soon as possible after cessation of daytime effort. All sonobuoys should be deployed at the same location on the vessel. When the Visual Team radios that they are going off effort, the Acoustics Team should be prepared to deploy the first sonobuoy. Deployment of the 2 sonobuoys will proceed as follows:
    a. **Visual Team Off-Effort for the day**- Acoustic Team deploys sonobuoy #1. Acoustician in lab will immediately hit the 'DEPLOY' button in the DIFAR interface in PAMGuard. OOD on watch will mark the position on the navigation screen.
    b. **Straight Line Calibration #1**: Continue in a straight line at full speed (blue line). Acousticians will conduct straight-line calibration in PAMGuard. When complete (after ~0.5 mi) radio to the Bridge to turn 135^{o} (OOD can choose direction based on prevailing conditions, hazards, etc.) and slow to 4-5 kts.

c. **Angular Calibration #1 & Array Recovery:** Once steadied up on new course and slowed to appropriate speed, begin recovering towed hydrophone array (red line). OOD determine location of sonobuoy #2 along this track to position sonobuoy #2 2 nmi from sonobuoy #1.

d. **Ensure 2 nmi distance between sonobuoys:** Once array recovery is complete return to full speed (blue line). OOD will provide a 2-minute warning to Acoustics Team of upcoming sonobuoy station, and then a countdown to the deployment location. Acoustics Team will deploy sonobuoy #2 at location indicated by OOD.

e. **Straight Line Calibration #2**: Continue in a straight line at full speed (blue line). Acousticians will conduct straight-line calibration in PAMGuard. OOD will determine location of upcoming CTD to ensure it is equidistant to the two deployed sonobuoys at a distance of approximately 1.5 mi to each.

f. **Angular Calibration #2 & positioning for CTD:** When straight-line calibration complete (after ~0.5 mi) radio to the Bridge to turn toward the CTD station (purple line). Continue to CTD station at full speed. Acoustician should ensure they have adequate sonobuoy radio signal and maintain recordings for the duration of the CTD.



Sonobuoy Station Schedule

Deploy sonobuoys on the dates listed below during the evening CTD station. See Sonobuoy protocols for deployment details. If you skip the CTD for whatever reason, skip the sonobuoy as well.

NOAA Ship *Lasker*

There are no sonobuoy stations during transits to/from the west coast.

Leg 1	Leg 2	Leg 3	Leg 4
8/26	9/12	10/17	11/18
8/27	9/13	10/18	11/21

Leg 1	Leg 2	Leg 3	Leg 4
8/29	9/14	10/19	11/22
8/30	9/16	10/20	11/23
8/31	9/17	10/21	11/24
9/1	9/18	10/22	11/25
9/2	9/19	10/23	11/26
9/3	9/20	10/25	11/27
	9/21	10/26	11/28
	9/22	10/27	11/29
	9/23	10/28	
	9/24	10/29	
	9/25	10/30	
	9/27	10/31	
	9/28	11/1	
	9/30	11/2	
	10/1	11/4	
	10/2	11/6	
	10/3	11/7	
	10/4	11/8	
	10/7		