Pacific Marine Environmental Laboratory

Revised Draft Project Instructions

Date Submitted: March 23, 2015

Platform: NOAA Ship *Oscar Dyson*

Project Number: DY-15-04

Project Title: *EcoFOCI Spring Moorings*

Project Dates: **24 April – 10 May, 2015**

Prepared by: _____ Dated: _____
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NOAA-PMEL/JISAO

Approved by: _____ Dated: _____
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NOAA-PMEL

Approved by: _____ Dated: _____
Dr. Christopher L. Sabine
Director
NOAA-PMEL

Approved by: _____ Dated: _____
Captain Douglas D. Baird, Jr., NOAA
Commanding Officer
Marine Operations Center – Pacific

I. Overview

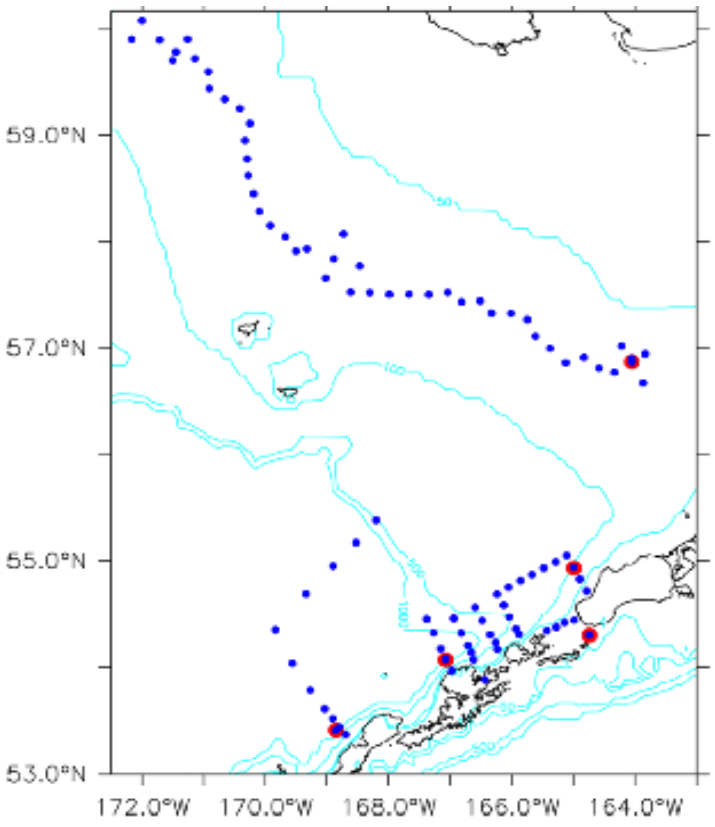
A. EcoFOCI Spring Moorings; April 24 – May 10, 2015

B. Days at Sea (DAS)

Of the 17 DAS scheduled for this project, 0 DAS are funded by an OMAO allocation, 17 DAS are funded by a Line Office Allocation, 0 DAS are Program Funded, and 0 DAS are Other Agency funded. This project is estimated to exhibit a High Operational Tempo.

C. Operating Area

Gulf of Alaska and Eastern Bering Sea - map shown below:



D. Summary of Objectives

The project is intended to perform hydrographic and zooplankton studies in the Bering Sea; recover 7 moorings and redeploy two; and conduct sampling in tandem with autonomous Saildrones.

Upon leaving Kodiak, the ship will recover the FOCI mooring at Pavlov Bay; no mooring will be deployed here.

The ship will then proceed towards the Bering Sea via Unimak Pass where two moorings will be recovered and a series of CTDs will be conducted, referred to as the "Unimak Box". Dependent upon weather and ice, the ship will then either conduct further CTDs along lines perpendicular to the Aleutian chain or proceed to "Site 2" to recover and deploy further moorings. At Site 2 there will also be further sampling with multiple CTDs, CalVETs and Bongo-tows.

In the vicinity of Site 2 the ship will rendezvous with the autonomous Saildrones and conduct joint operations with the drones. The Saildrones will be launched from Dutch Harbor into the Bering Sea prior to *Dyson*'s departure from Kodiak. Operations with the Saildrones are explained in Appendix II, "Saildrone SOP", attached.

Leaving "Site 2" the ship will then proceed north along the 70m isobath, conducting CTDs, CalVETs and bongos per the attached list, as far north as the ice permits. The Saildrones will also be proceeding north along the 70m isobath and we will attempt to coordinate operations with them.

Further CTD sampling will be conducted as time permits along the "Dog Leg Line" and at stations adjacent to the Aleutian Islands in the vicinity of Unalaska Island.

The ship will deploy two Argos Drifters in 2000-meter water along the "Dog Leg Line".

E. Participating Institutions

NOAA - Pacific Marine Environmental Laboratory (PMEL)
7600 Sand Point Way N.E., Seattle, Washington 98115-6439

Joint Institute for the Study of the Atmosphere and Oceans (JISAO)
University of Washington
3737 Brooklyn Ave. NE
Seattle, WA 98105-6715

NOAA - Alaska Fisheries Science Center (AFSC)
7600 Sand Point Way N.E., Seattle, Washington 98115-0070

University of Alaska (UAF)
505 South Chandalar Drive
Fairbanks, AK 99775

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

Name (Last, First)	**Title**	**Date Aboard**	**Date Disembark**	**Gender**	**Affiliation**	**Nationality**
Peter Proctor	Chief Sci.	TBD	TBD	M	JISAO/PMEL	USA
Steve Smith	Sci	TBD	TBD	M	PMEL	USA
David Strausz	Sci	TBD	TBD	M	JISAO/PMEL	USA

TBD	Sci	TBD	TBD	M	JISAO/PMEL	USA
Colleen Harpold	Sci	TBD	TBD	F	AFSC	USA
Lisa Eisner	Sci	TBD	TBD	F	AFSC`	USA
Adam Spear	Sci	TBD	TBD	M	AFSC	USA
Daniel Nabor	Sci	TBD	TBD	M	UAF	USA
Shaun Bell	Sci	TBD	TBD	M	JISAO/PMEL	USA

G. Administrative

1. Points of Contacts:

Peter Proctor (Chief Scientist), JISAO/PMEL, 7600 Sand Point Way NE, Bldg 3, Seattle WA 98115-0070, ph: (206) 526-6217; Peter.Proctor@NOAA.GOV

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Christian Meinig, PMEL, 7600 Sand Point Way NE, Bldg 3, Seattle, WA 98115-0070, ph (206) 526-6149; Christian.Meinig@NOAA.GOV

Richard Jenkins, Saildrone, Inc;

2. Diplomatic Clearances

None Required.

3. Licenses and Permits

None Required.

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:

Departure: April 24, 2015, Kodiak, AK

Arrive: May 10, 2015, Dutch Harbor, AK

B. Loading and Unloading:

A container with equipment will be shipped directly from Seattle to Kodiak. Loading onboard ship will occur as appropriate prior to departure. The scientific party will arrive

at least two days early to assist with loading and preparation. The scientific party will be responsible for arranging vehicles for transporting themselves and equipment to the ship. Most of the equipment and recovered moorings will remain onboard the ship to be off-loaded in Kodiak at the end of the project after DY1504. To facilitate pre-project equipment assembly and set up, a crane operator may be needed for short periods during normal day work hours on April 21, 22 and 23.

C. Operations to be conducted:

Due to the time of year that this project occurs, the amount of mooring work accomplished and the sequence of operations will depend heavily upon ice conditions, weather and daylight. Decisions on which operations to be conducted will be made on a daily basis in consultation with the ship's command and Chief Scientist and based upon conditions and priorities. A full list of Station IDs including locations is provided as Appendix I.

The ship is scheduled to depart Kodiak on Friday, April 24, 2015.

a) **Pavlov Bay Mooring:** The subsurface mooring in Pavlov Bay will be recovered; no mooring will be deployed to replace it. A CTD will be taken prior to mooring recovery.
b) **Drifter Deployments:** Several satellite-tracked drifters, drogued at 40m, may be deployed at specified locations. Two Argos drifters will be deployed on the "Dog Leg Line". These will be deployed in water over 2000 meters deep and preferably greater than 20 nm from water shallower than 2000 meters. The floats in their box weigh 110 pounds and can be launched by two or three persons; no lifting equipment will be required.
c) **Unimak Pass Mooring 14UP-3A:** Subsurface mooring will be recovered during transit to Unimak Pass. A CTD will be taken prior to recovery.
d) **Unimak Box CTDs:** CTDs will be taken at each of 18 stations in a "box" around Unimak Pass. At each station within the pass a 20/60 cm bongo will be towed and at every other station on the sides and top of the box for the collection of mesozooplankton.
e) **Unimak Box Mooring 14UBP-1A:** The subsurface mooring on the Unimak Box "E" line will be recovered during the CTD sampling of the Unimak Box.
f) **FOCI Bering Site 2:** Depending upon arrival time the project will commence mooring operations or the CTD "box" around the site. Two subsurface moorings will be recovered and a subsurface and surface mooring will be deployed. Calibration CTDs will be taken prior to recovery of the moorings and subsequent to the deployment of the new moorings approximately 0.5 miles from the mooring site. Each CTD will consist of one or two casts depending upon requirements for sampling which will include nutrient and chlorophyll samples. Additionally a 20/60 cm bongo tow and triplicate CalVET tows will be conducted at the calibration site. At

four stations around Site 2 a CTD and 20/60 cm bongo tow will be completed.

g) **Saildrone: http://www.saildrone.com/** The PMEL engineering group will launch two autonomous Saildrones from Dutch Harbor on or about April 21, 2015. The cruise track of the drones will depend heavily on the extent of sea ice in the South Eastern Bering Sea. Ideally, the drones will proceed eastward towards Mooring Site 2 and the 70-meter isobath. The ship will rendezvous with the Saildrones as weather, ice conditions, time and location permit and the operation of the drones will be observed. The ship will also be available to potentially recover either or both of the drones in case of accident or malfunction. Using the ship's underway seawater sampling system, seawater samples in the vicinity of the drones will be collected; depending upon conditions, the ship may spend several hours per day over several days with them. If conditions permit, we may request the ship to launch a small boat to rendezvous with the drones to take pictures and visually inspect them. A map of area of operations for the Saildrones is shown in Appendix III.

h) **70 Meter Isobath Line:** A CTD cast with sampling for salinity, chlorophyll, nutrients and oxygen will be taken at each station along the 70-meter isobath. A 20/60 cm bongo tow will be conducted at every other station. Stations will commence at Site 2 and continue as far north as ice, weather and time permits.

i) **"Dog Leg" Line:** Up to 11 CTD stations may be sampled if time permits. Locations are in Appendix I. Additionally, two Argos drifters will be deployed in water over 2000 meters depth.

j) **FOCI Bering Sea Site 6:** The subsurface mooring, 14BSP-6A will be recovered, no new mooring deployed. CTD

k) **Unalaska Mooring:** The subsurface mooring on the Unalaska Transect will be recovered, no new mooring deployed. CTD

l) **Bering Canyon CTD Transects:** A CTD will be deployed at each of 15 stations (5 stations/3 lines). A Multinet will be deployed at 3 stations per line (9 Multinet stations total).

m) **Unimak Box W Transect:** A second occupation of the Unimak Box W transect will be done as time permits. A CTD will be deployed at each of 5 stations; a Multinet will be deployed at 3 stations.

n) **Multinet**: A Multinet (see Appendix III, midi size) will be deployed at select stations (locations listed in Appendix I). The Multi Plankton Sampler, MultiNet Type Midi, will be used at select stations to determine vertical distribution of fish larvae and zooplankton (.333 or .505-mm mesh). The sampling will be focused over Bering Canyon at approximately 12 stations. The exact number and location will be determined by the scientific party at sea and may be adjusted depending on conditions and project priorities.

We request assistance from the ship's Electronics Technician, Survey Technician and / or Deck Department as needed to help set up the electronic

and physical termination, rig the MultiNet for fishing, and help trouble shoot the MultiNet. We also request help switching between the Bongo and MultiNet on the aft hydrographic winch as needed during the project.

The MultiNet has a steel frame with a square mouth opening of .5 x .5 m that can be used with up to 5 nets to sample different water depths. This net requires a conducting cable and will be deployed off the aft hydrographic winch that the Bongo array is usually attached to. Before deployment of the Multinet, the SeaCAT and Bongo array will be detached and the MultiNet will be electronically and physically terminated to that conducting wire. For the stations over Bering Canyon, the MultiNet will be used in place of the Bongo (after the CTD). If we have gear problems with the Multinet, the Bongo will be used as a backup. When we are done using the MultiNet, the SeaCAT and Bongo Array will be re-connected to continue the rest of our routine sampling. The MultiNet plankton samples will be processed in a similar manner as those from the Bongo, filtered and preserved in 1.8% Buffered Formaldehyde.

Winch / Fishing Rates

-Ship Speed: ~2.5-3 knots (may need to be adjusted based on conditions)
-Wire Payout Rate: 20 m per. min.
-Wire Retrieval Rate: no more than 10 m per min., possibly slower TDB by scientific party based on how much water is being filtered.
-Target Wire Angle 55° (acceptable range 50°-60°)
-Maximum Gear Depth: ~ 300 m or 10m off bottom

MOA Buttons Needed for SCS
-In the water (surface)
-At Depth
-Net 1
-Net 2
-Net 3
-Net 4
-Net 5
-Out of the water (surface)

Approximate Sampling Intervals (may change depending on bottom depth and sampling needs):
0-25 m
25-50 m
50-100 m
100-200 m
200-300 m

o) **Primary production:** Experiments using stable (non-radioactive) isotopes (13C and 15N) will be conducted at a subset of stations. Water samples will be collected from Niskin bottles, isotope added, then incubated in a deck-board clear plastic tank cooled with surface seawater. At end of incubation, samples will be filtered and filters stored frozen at -20°C or cooler.

p) **The order of operations may change due to weather or the presence of sea ice.**

D. Dive Plan

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

Dives are not planned for this project.

E. Applicable Restrictions

Conditions that preclude normal operations: Poor weather, equipment failure, unforeseen conditions and ice coverage would all preclude normal operations. Poor weather would have to be waited out or the project track would have to be modified to provide the best weather possible. A frame or winch failures would need to be addressed immediately for the project to continue. Ice coverage would negate the ability to pop moorings; these would have to be recovered later in the project (depending on ice forecasts) or by another vessel.

III. Equipment

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

- Hydrographic winch with slip rings and 3-conductor cable terminated for CTD,
- 12 KHz hull mounted Edgetech Acoustic release transducer,
- Hydrographic winch with slip rings and 3-conductor cable terminated for the SBE19plus for net tow operations,
- Sea-Bird Electronics' SBE 911plus CTD system with stand and dual temperature and Conductivity sensors, each CTD system should include underwater CTD, weights, and pinger. There should be a deck unit for the system,
- 5 or 10-liter Niskin sampling bottles for use with rosette (10 plus 4 spares); we request that at least 6 of the 10-liter bottles have silicon tubing springs rather than the black rubber springs which interferes with some of the experiments.
- Conductivity and temperature sensor package to provide dual sensors on the CTD (primary),
- For meteorological observations: 2 anemometers (one R. M. Young system interfaced to the SCS), calibrated air thermometer (wet-and dry-bulb) and a calibrated barometer and/or barograph,
- Freezer space for storage of biological and chemical samples (blast and storage freezers, -20° C and -80°C), turned on and operating,
- SIMRAD ES-60 and EK-60 echosounders,
- RD Instruments' ADCP written to disk,
- Scientific Computer System (SCS),
- Minimum of 2 computer workstations in the acoustic lab with Internet, printer and e-mail access,

- Removable stern platform (in place),
- Laboratory space with storage space,
- Underway flow-through seawater system with TSG
- Seawater hoses and nozzles to wash nets,
- Adequate deck lighting for nighttime operations,
- Navigational equipment including GPS and radar,
- Safety harnesses for working on quarterdeck and fantail,
- Ship's crane(s) used for loading and/or deploying.

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

- Sea-Bird Electronics' SBE-19plus SEACAT system,
- Fluorometer, light meter and dual oxygen sensors to be mounted on CTD,
- Conductivity and temperature sensor package to provide dual sensors on the CTD (backup),
- 60-cm bongo sampling arrays,
- 20 cm bongo sampling arrays,
- Manual wire angle indicator,
- CalVET net sampling array,
- Hydro-BIOS Multinet (midi) sampling system
- Surface mooring (FOCI biophysical platforms),
- Subsurface moorings,
- Equipment as needed to drag for moorings that fail to release,
- Miscellaneous scientific sampling and processing equipment,
- Chlorophyll and nutrient sampling equipment,
- Clear plastic incubator (modified aquarium) ~ 4'x 2'x 2' cooled with surface seawater for primary production experiments. It will be used on deck in an uncovered area with surface seawater available.
- Ocean Drifters--Argos
- Winkler Oxygen Analysis rig,
- pCO2 system installed in flow-through system,
- Dissolved oxygen sensor and fluorometer installed in flow-through system

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. The Chief of Operations, Marine Operations Center, will provide documentation regarding those requirements upon request.

Per OMAO procedure, the scientific party will include with their project instructions and provide to the CO of the respective ship 30 days before departure:

- List of chemicals by name with anticipated quantity
- List of spill response materials, including neutralizing agents, buffers, and absorbents
- Chemical safety and spill response procedures, such as excerpts of the program's Chemical Hygiene Plan or SOPs relevant for shipboard laboratories
- For bulk quantities of chemicals in excess of 50 gallons total or in containers larger than 10 gallons each, notify ship's Operations Officer regarding quantity, packaging and chemical to verify safe stowage is available as soon as chemical quantities are known.

Upon embarkation and prior to loading hazardous materials aboard the vessel, the scientific party will provide to the CO or their designee:

- An inventory list showing actual amount of hazardous material brought aboard
- An MSDS for each material
- Confirmation that neutralizing agents and spill equipment were brought aboard sufficient to contain and cleanup all of the hazardous material brought aboard by the program
- Confirmation that chemical safety and spill response procedures were brought aboard

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory showing that all chemicals were removed from the vessel. The CO's designee will maintain a log to track scientific party hazardous materials. MSDS will be made available to the ship's complement, in compliance with Hazard Communication Laws.
Scientific parties are expected to manage and respond to spills of scientific hazardous materials. Overboard discharge of hazardous materials is not permitted aboard NOAA ships.

B. Inventory

Dyson loaded 1/20 /2015 by FOCI and MACE personnel. All chemicals listed will be used for the entire 2015 Dyson field season. Chemical volumes will be reported to the Ops Officer and the designated contact for each survey will be required to report to chemical owners. The name of the group responsible for each of the chemicals is designated after the chemical name in the table. MSDS, chemical hygiene plan, and SOPs will be provided to the Dyson before the loading of the vessel.

Common Name	**Concentration**	**Amount**	**Spill Response (all FOCI/MACE/PMEL/EMA personnel)**	**Notes**
Dihydrogen Monoxide Property of		25 liters	Spill Control: W Gloves	Not a regulated chemical/solution. Used for oxygen titrations. Store in Chem

PMEL			Paper towels	Lab or Salinometer room
Ethanol Property of FOCI	100%	4 -1 gal. Plastic jugs	Gloves 3M Sorbent Pads Plastic bag	Store in Chem. Lab yellow flammables cabinet.
Ethylene Glycol Property of FOCI	100%	1 – 500 ml	Gloves Paper towels Plastic bag	Not a regulated chemical. Store in Spill Kit.
Formaldehyde Property of FOCI	37%	5 – 5 gal. barrels	Gloves Eye Protection Fan-Pads Formalex PolyForm-F Plastic bags	Store in Fish Lab flammable cabinets. Will need to place 2-3 in each cabinet.
Formaldehyde Property of MACE	37%	8 – 1 liter plastic bottles	Gloves Eye Protection Fan-Pads Formalex PolyForm-F Plastic bag	Store in Fish Lab flammable cabinet.
Glycerol/Thymol	50 %	2 – 5 gal.	Gloves	Not a regulated

Solution Property of MACE		buckets	Paper towels Kitty litter	chemical/solution. Store in Fish Lab under sink.
Lithium 3v Batteries Property of FOCI		12	NA	Store in Survey Office for Spring Mooring Multi-Net use
Lithium 9v Batteries Property of PMEL		8	NA	In SeaBird and WET Lab instruments
Lithium AA Batteries Property of PMEL		96	NA	In SeaBird instruments and MicroCAT Saft LS14500
Lithium D Cell Batteries Property of PMEL		150	NA	In RCM9 & Peggy Mooring
Lithium Transponder Batteries Property of MACE		3	NA	Avoid heat and moisture during storage. MACE will provide storage container.
Manganese	3M	1 liter		Not a regulated

Chloride Property of PMEL				chemical/solution. Used for oxygen titrations. Store in Chem Lab acid locker
Potassium Iodate Property of PMEL	0.00167 M	1 liter	Spill Control: PI Gloves Plastic bag	Used for oxygen titrations. Store in Chem Lab acid locker
Sodium Borate Solution Property of FOCI	5-6%	1 – 5 gal.	Gloves Paper towels Plastic bag	Not a regulated chemical. Working container will be secured on Fish Lab counter.
Sodium Borate Powder Property of FOCI	100%	1 – 500 g	Gloves Wet paper towels Plastic bag	Not a regulated chemical. Stored in Spill Kit.
Sodium Iodide/NaOH Solution Property of PMEL	0.11M	1 liter	Spill Control: B	Used for oxygen titrations. Store in Fish Lab flammable cabinet.
Sodium Thiosulfate Property of	0.11 M	1 liter	Spill Control: ST	Used for oxygen titrations. Store in Chem Lab acid locker

PMEL				
Sulfuric Acid Property of PMEL	5 M	1 liter	Spill Control: A	Used for oxygen titrations. Store in Chem Lab acid locker

Decontamination Concentrate Solution Property of FOCI	5.25 %	40 ml	Spill Control A	For use in cleaning flow cytometer Store in Chem lab cabinets
Bacteriostatic Concentrate Solution Property of FOCI		36 ml	Spill control A	For use in cleaning flow cytometer Store in Chem lab cabinets
Extended Flow Cell Clean Property of FOCI	5 %	8 ml	Spill Control: A	For use in cleaning flow cytometer Store in Chem lab cabinets
Citric Acid, anhydrous Property of FOCI	>99%	25 gm	Spill Control: A	For use in cleaning flow cytometer Store in Chem lab cabinets
Cleaning Concentrate Solution Property of FOCI	10-30%	37 ml	Spill Control: A	For use in cleaning flow cytometer Store in Chem lab cabinets

C. Chemical safety and spill response procedures

Formaldehyde Spill Kit Contents	**Amount**	**Use**	**Total Spill Volume Controllable**	**Notes**
Formalex	1 – 5 gallon 2 -1 gallon	Formaldehyde cleanup (all concentrations)	1:1 control	Formalex will be used in conjunction with Fan-Pads to reduce spill volume.
Fan-Pads	2 rolls (50 sheets each roll)	Formaldehyde cleanup (all concentrations)	50 sheets = 50 - 150 ml spills	Formalex will be used in conjunction with Fan-Pads to reduce total spill volume.
PolyForm-F	5 – 1 gal. plastic jugs	Formaldehyde cleanup (all concentrations)	1:1 control	Pour onto spill immediately to deactivate formaldehyde.
3 M Pads	10 pads	Ethanol cleanup	10 pads=10- 250ml spills	Pads may be reused if dried out under fume hood.
Nitrile Gloves	8 pairs each S,M,L,XL	For all cleanup procedures	N/A	Each survey group will restock gloves.
Eye Protection	4 pairs goggles 1 face shield	Formaldehyde cleanup	N/A	Eye protection will be cleaned before re-use.
Tyvex Lab Coats	2 coats	Formaldehyde cleanup	N/A	Coats will be cleaned with Fan-Pads and

				Formalex before reuse.
Plastic Bags	2	Formaldehyde cleanup/Fan Pads	N/A	Bags may be packed full and sealed.

Acid-Base Spill Kit Contents	**Amount**	**Use**	**Total Spill Volume Controllable**	**Notes**
Spilfyter Acid Neutralizer	1 box	Clean up acid spill—H_2SO_4	1.5l of 5M Sulfuric Acid	
Spilfyter Base Neutralizer	1 box	Clean up base spill--NaOH	2.0l of Sodium Hydroxide	
Vinyl Gloves	1 box	Protect hands during cleanup	N/A	
Foxtail/Dustpan	1 each	Pick up absorbed neutralizer	N/A	
Rubber apron	1 each	Protect during cleanup	N/A	
Paper Towels	1 roll	Absorb liquids	N/A	
Goggles	**2 pair**	**Protect eyes**	**N/A**	
Chemical absorbent	1 liter	Absorb liquids	0.5l	
Plastic Bags	2 each	Contain used absorbents/waste	N/A	

SPILL CONTROL

A: ACID

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

☐ Ventilate closed spaces before entering them.

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

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

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

☐ Never return spills in original containers for re-use.

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

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

B:Base

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

☐ Ventilate closed spaces before entering them.

☐ Neutralize with dilute acid such as HCl if possible.

☐ Absorb with cat litter or vermiculite.

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

☐ Do not breath dust.

☐ Do not get water on spilled substances.

F: Formalin/Formaldehyde

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

☐ Wear appropriate personal protective equipment.

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

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

☐ Do not use combustible materials, such as saw dust.

PI:Potassium Iodate

☐ Wear appropriate protective equipment and clothing during clean-up.

☐ Avoid Contact with combustibles (wood, paper, clothing, etc).

☐ Absorb with cat litter or vermiculite.

☐ Keep substance damp with water spray.

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

ST: Sodium Thiosulfate

☐ Ventilate area of leak or spill.

☐ Wear protective gloves and clean body-covering

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

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

W: Water

☐ Absorb the liquid and wash with water

☐ Wear PPE

E: Ethanol

☐ 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.

A. Radioactive Materials

No radioactive isotopes are planned for this project.

V. Additional Projects

A. Supplementary ("Piggyback") Projects

No supplementary projects are planned.

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 Classifications:

a. OMAO Data

b. Program Data - At the end of the project, the Chief Survey Technician will provide the Chief Scientist with copies of data from the ship's SCS system, barometer measurements, log sheets, TSG data, rain sensor data, wind speed and direction data, ship's navigation log data, speed logs, winch system, ADCP, Fluorometer data, ADCP data, and any other logged scientific data. The number of copies of each data set will be worked out between the Chief Scientist and Chief Survey Technician.

B. Responsibilities: Chief Scientist will distribute data to Program Principle Investigators as appropriate.

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 http://www.omao.noaa.gov/fleeteval.html and provides a "Submit" button at the end of the form. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the ships, specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served three 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 that 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 e-mail and the Very Small Aperture Terminal (VSAT) link. Standard VSAT bandwidth at 128kbs is shared by all vessel's 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 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 these requirements prior to boarding the ship is required.
Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within three days of embarking.

F. Foreign National Guests Access to OMAO Facilities and Platforms

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

Appendix I: Station list

	Sta Name	Activity	Water Depth (m)	lat.dd	lon.dd
	Depart Kodiak	DEPART		53.881	166.432
Pavlov Bay	14PA-1A	CTD	100	55.182	161.687
Pavlov Bay	14PA-1A	Recover Subsurface Mooring	100	55.182	161.687
UP mooring	14UP-3A	Recover Subsurface Mooring	80	54.302	164.748
	UP-3A	CTD	80	54.302	164.748
Unimak Box	UBS1	CTD/BON	42	54.441	164.985
	UBS2	CTD/BON	110	54.419	165.141
	UBS3	CTD	203	54.375	165.277
	UBS4	CTD/BON	91	54.342	165.429
	UBW1	CTD/BON	91	54.358	165.929
	UBW2	CTD/BON	511	54.472	166.039
	UBW3	CTD	402	54.583	166.129
	UBW4	CTD/BON	329	54.688	166.237
	UBN1	CTD/BON	183	54.751	166.051
	UBN2	CTD/BON	168	54.813	165.858
	UBN3	CTD	153	54.868	165.671

	UBN4	CTD/BON	139	54.930	165.480
	UBN5	CTD	124	54.987	165.287
	UBN6	CTD/BON	110	55.049	165.107
	UBE1	CTD/BON	88	54.937	164.996
	UBE2	CTD	67	54.827	164.894
	UBE3	CTD/BON	46	54.716	164.784
Unimak Box mooring	14UBP-1A	Recover Subsurface Mooring	88	54.944	165.004
BS Site 2	14BS-2C	Recover Subsurface Mooring	70	56.869	164.063
	14BSP-2B	Recover Subsurface Mooring	70	56.871	164.055
	15BSM-2A	Deploy Surface Mooring	70	56.8	164.0
	15BSP-2A	Deploy Subsurface Mooring	70	56.8	164.0
	70M2/M2	3 CalVETs	72	56.900	164.053
	70M2/M2	CTD/BON	72	56.900	164.053
	CTD -M2N	CTD/BON	69	57.017	164.217
	CTD - M2E	CTD/BON	69	56.942	163.834
	CTD -M2S	CTD/BON	72	56.667	163.867
	CTD - M2W	CTD/BON	75	56.767	164.333

70 m isobath	70M3	CTD	73	56.808	164.583
	70M4	CTD/BON	72	56.909	164.828
	70M5	CTD	73	56.859	165.123
	70M6	CTD/BON	72	56.994	165.378
	70M7	CTD	70	57.107	165.613
	70M8	CTD/BON	70	57.262	165.747
	70M9	CTD	70	57.321	166.011
	70M10	CTD/BON	70	57.322	166.326
	70M11	CTD	70	57.438	166.513
	70M12	CTD/BON	70	57.429	166.812
	70M13	CTD	70	57.522	167.038
	70M14	CTD/BON	71	57.499	167.344
	70M15	CTD	72	57.501	167.665
	70M16	CTD/BON	71	57.501	167.986
	70M17	CTD	79	57.520	168.304
	70M18	CTD/BON	78	57.524	168.614
	70m19-M4S	CTD/BON	75	57.653	169.020
	CTD - M4E	CTD/BON	74	57.767	168.467
	70M21/M4	3 CalVETs	73	57.833	168.887
	70M21/M4	CTD/BON	73	57.833	168.887
	70M22 - M4W	CTD/BON	71	57.927	169.322
	CTD - M4N	CTD/BON	71	58.067	168.730

	70M23	CTD	70	57.907	169.500
	70M24	CTD/BON	69	58.042	169.673
	70M25	CTD	71	58.147	169.918
	70M26	CTD/BON	72	58.282	170.095
	70M27	CTD	73	58.446	170.186
	70M28	CTD/BON	72	58.617	170.276
	70M29	CTD	71	58.774	170.294
	70M30	CTD/BON	72	58.948	170.327
	70M31	CTD	69	59.107	170.247
	70M32	CTD/BON	68	59.247	170.412
	70M33	CTD	70	59.335	170.656
	70M34	CTD/BON	81	59.436	170.906
	70M35	CTD	80	59.595	170.923
	70M36	CTD/BON	79	59.716	171.140
	70M37	CTD/BON	78	59.777	171.450
	M5E	CTD/BON	81	59.898	171.258
	CTD - M5S	CTD/BON	80	59.700	171.500
	70m38/ M5	3 CalVETs	79	59.892	171.711
	70m38/ M5	CTD/BON	79	59.892	171.711
	70M38 - M5N	CTD/BON	77	60.075	172.000
	70M39 M5W	CTD/BON	76	59.898	172.167
	70M40	CTD/BON	74	59.912	172.435
	70M41	CTD	68	59.978	172.746

	70M42	CTD/BON	70	60.037	173.007
	70M43	CTD	70	60.101	173.317
	70M44	CTD/BON	70	60.252	173.522
	70M45	CTD	60	60.425	173.592
	70M46	CTD/BON	68	60.572	173.640
	70M47	CTD	72	60.739	173.648
	70M48	CTD/BON	83	60.907	173.825
	70M49	CTD	79	61.066	173.829
	70M50	CTD/BON	75	61.250	173.741
	70M51	CTD	75	61.411	173.736
	70M52	CTD/BON	72	61.560	173.712
	70M53	CTD	71	61.727	173.855
	70M54	CTD/BON	71	61.862	174.094
	70M55	CTD	73	61.943	174.364
	70M56	CTD/BON	74	62.027	174.659
	CTD-M8S	CTD/BON	70	61.975	174.617
	M8	CTD/BON	70	62.200	174.750
	M8	CALVETS	70	62.200	174.750
	CTD-M8N	CTD/BON	80	62.422	174.700
	CTD-M8W	CTD/BON	80	62.200	175.200
	CTD-M8E	CTD/BON	70	174.300	62.200
L-Line	LL3	CTD	200	55.380	168.199
L-Line	LL5	CTD	1000	55.170	168.525
L-Line	LL6	CTD	300	54.950	168.899

L-Line	**LL7**	**CTD**	**985**	**54.690**	**169.337**
L-Line	**DL7/LL8**	**CTD**	**1900**	**54.350**	**169.833**
L-Line	**DL6/LL9**	**CTD**	**1850**	**54.037**	**169.560**
L-Line	**DL5/LL10**	**CTD**	**1575**	**53.783**	**169.267**
L-Line	**DL4/LL11**	**CTD**	**1800**	**53.610**	**169.035**
L-Line	**DL3/LL12**	**CTD**	**1500**	**53.520**	**168.903**
L-Line	**DL2/LL13**	**CTD**	**340**	**53.440**	**168.793**
L-Line	**DL1/LL15**	**CTD**	**340**	**53.368**	**168.692**
BS6 mooring	**14BSP-6A**	**CTD**	**1000**	**53.408**	**168.851**
BS6 mooring	**14BSP-6A**	**Recover 14BSP-6A**	**1000**	**53.408**	**168.851**
BC mooring	**14ULP-1A**	**Recover 14ULP-1A**	**1000**	**54.066**	**167.068**
Bering Canyon Transects	**UT5**	**CTD/MNET**	**100**	**53.970**	**166.970**
	UT4	**CTD**	**1300**	**54.085**	**167.067**
	UT3	**CTD/MNET**	**1700**	**54.175**	**167.150**
	UT2	**CTD**	**1100**	**54.322**	**167.267**
	UT1	**CTD/MNET**	**650**	**54.452**	**167.380**
	AW5	**CTD/MNET**	**550**	**54.458**	**166.938**
	AW4	**CTD**	**750**	**54.320**	**166.818**
	AW3	**CTD/MNET**	**1350**	**54.205**	**166.710**
	AW2	**CTD**	**900**	**54.140**	**166.652**

	AW1	**CTD/MNET**	**100**	**54.072**	**166.620**
	AE1	**CTD/MNET**	**90**	**54.168**	**166.233**
	AE2	**CTD**	**700**	**54.233**	**166.263**
	AE3	**CTD/MNET**	**900**	**54.305**	**166.350**
	AE4	**CTD**	**550**	**54.437**	**166.480**
	AE5	**CTD/MNET**	**450**	**54.562**	**166.593**
	UBW4	**CTD/MNET**	**82**	**54.688**	**166.237**
	UBW3	**CTD**	**81**	**54.583**	**166.129**
	UBW2	**CTD/MNET**	**80**	**54.472**	**166.039**
	UBW1	**CTD**	**79**	**54.358**	**165.929**
	UBW0	**CTD/MNET**	**50**	**54.310**	**165.883**
	Arrive Dutch Harbor	**ARRIVE**	**650**	**53.881**	**166.432**

Appendix II: Saildrone SOP

Saildrone SOP

Saildrone Basic Information

- Length: 19 ft
- Width: 7 ft
- Height: 20 ft above water surface
- Draft: 6 ft below water surface
- Average speed: 3-5 knots
- Maximum speed: 14 knots
- Approx. Weight: 500 lbs (60 lb for wing (sail), most of weight in lead weight on keel)

- Various modes of operation: Can be trimmed for speed, tracking a course, holding station, etc.
- Controlled by a remote operator on shore

Objective

- Compare data from ship based measurements as closely as possible with Saildrone systems. This will generally require the Dyson following alongside or behind a Saildrone as closely as conditions and operations safely allow.
-

General Guidelines

- The ship will follow behind or alongside the Saildrone when following a track line.
- The ship will maintain a nominal distance of 500m from the Saildrone. The ship may approach closer at the discretion of the CO as conditions allow. The nominal distance may also be adjusted at the discretion of the CO after operations with the Saildrone are evaluated.
- Any changes to either the ship's or Saildrone's operating protocol will be communicated between the remote operator and ship via Iridium or VOIP.
- Operations will only occur during daylight hours.
- Only one Saildrone will be used at a time for near-ship comparisons

SOP

- Before the start of the project, the remote operator will be provided with the Dyson's station waypoints and track lines. The Dyson will later be provided with various potential Saildrone track lines and waypoints based off the ship's stations (Saildrone track lines and waypoints may have different parameters, such as track width or spacing between waypoints to plan for variable conditions.)
- Before commencing Saildrone comparison operations, the Operations Officer and Chief Scientist will communicate with the remote operator via Iridium or VOIP to establish a protocol for the Saildrone. This may involve the Saildrone following a track parallel to the ship's course, proceeding along the ship's track directly ahead of it, or similar procedure.
- After approval by the OOD, the remote operator will initiate the Saildrone's protocol, at which point the ship will attempt to follow the Saildrone as conditions and operations allow.
- The bridge will monitor the Saildrone continuously, both visually and via a read-only web interface that will provide the Saildrone's updated GPS position and status approximately every 5 minutes. (If high solar conditions allow, the Saildrone's AIS transmitter may be turned on for a short time, but power requirements make doing so for long periods unfeasible).
- The remote operator will contact the ship via Iridium or VOIP before making any changes to the Saildrone's protocol or in the event of an equipment malfunction. The ship will also contact the remote operator if the protocol needs to be adjusted for any reason.

Emergency Recovery

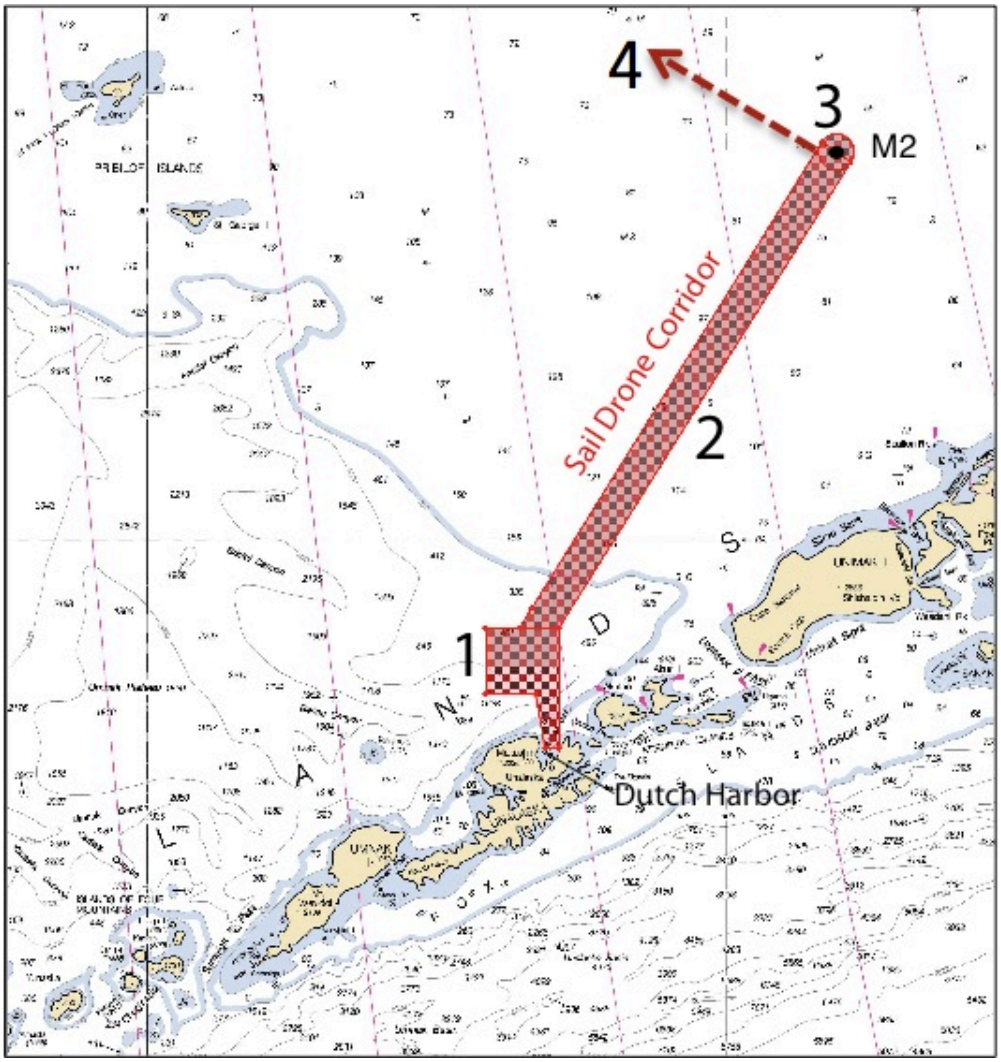
- In the rare event of a catastrophic failure of a Saildrone that renders one inoperable, the Dyson may be asked to recover any surviving parts. If an emergency recovery takes place, the primary goal will be to get as much of the Saildrone on board in the safest manner possible for later damage assessment – NOT necessarily to recover the vehicle in working condition. The Saildrone weighs approximately 500 lbs and is fitted with two pick points for easy recovery. The 20 ft wing (sail) above the surface is constructed of carbon fiber and weighs approximately 60 lbs. Most of the weight of the Saildrone is contained in a lead weight on the 6 ft keel. During recovery, the primary dangers are the length of the vehicle causing it to swing out of control and the possibility of carbon fiber splinters from broken parts. Personnel should use taglines and wear hard-hats and gloves.

Proposed cruise track for Saildrone operations:

1. An area, extending approximately 40 nm north of Dutch Harbor, bounded by
    i. 53° 57.00' N, 166° 27.00' W

ii. 54° 33.50’ N, 166° 27.00’ W
iii. 54° 33.50’ N, 167° 05.00’ W
iv. 54° 13.50’ N, 167° 05.00’ W
v. 54° 13.50’ N, 166° 39.00’ W

2. A corridor, approximately 10 nm wide, extending from Unalaska Bay to Mooring “M2”, bounded by
   i. 54° 33.500’ N, 166° 27.000’ W
   ii. 56° 49.674’ N, 163° 56.028’ W
   iii. 56° 55.497’ N, 164° 10.905’ W
   iv. 54° 33.500’ N, 166° 47.376’ W
3. A circle, approximately 10 nm in diameter at Mooring “M2”, located at
   i. 56° 52.00’ N, 164° 03.00’ W



Appendix III: Multi-net

HYDRO-BIOS

MultiNet®

Multi Plankton Sampler

Features:

- **Combined online/offline use (standard)**
- **Bi-directional communication**
- **Standard depth range 3000 m**
- **Long distance FSK-telemetry (> 10000m)**
- **Low power consumption**
- **Battery operated Underwater Unit, max. voltage of 5 V at the conductor cable**
- **Electronics operate from -40°C up to +85°**
- **EC-conformity (CE) EN 50081-1, EN 50082-1**
- **expandable range of sensors**

phone: +49-431-36960-0 fax: +49-431-36960-21 e-mail: info@hydrobios.de web: www.hydrobios.de

The System

Sampling sea and ocean at its best - with the improved MultiNet® generation of the Multiple Plankton Sampler, the worlds leading sampling system for horizontal and vertical collections in successive water layers.

New: for combined online/offline use

Equipped with 5 resp. 9 net bags the MultiNet® can be delivered in 4 sizes (apertures) : Mini (0.125 m²), Midi (0.25 m²), Maxi (0.5 m²) and Mammoth (1 m²).

The system consists of a mains powered Deck Command Unit and a stainless steel frame with canvas part to which 5 (9) net bags are attached by means of zip fasteners. The net bags are opened and closed by means of an arrangement of levers which are triggered by a battery powered Motor Unit. The commands for actuation of the net bags are given via single or multi-conductor cable (not included in our scope of delivery) between the Underwater Unit and the Deck Command Unit.

A wide selection of mesh sizes for the net bags is available to meet the requirements of all standard and non-standard applications. For common horizontal collections a mesh size of 300 microns (mesh sizes from 100 to 500 microns available) is recommended, for vertical collections mesh sizes from 55 to 500 micron are applicable.

An integrated Pressure Sensor (measuring range according to customer´s requirements) allows continuous supervision of the actual operating depth which is indicated together with all relevant system data at the LCD-display of the Deck Command Unit.

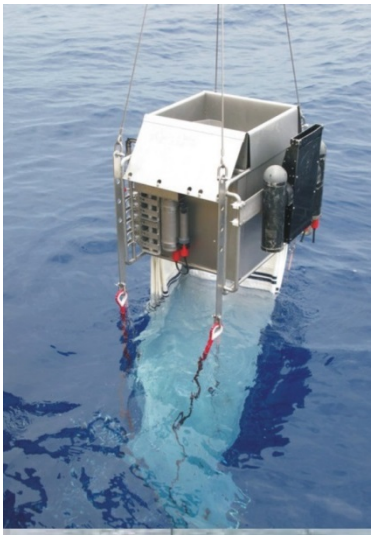
Two Electronic Flow Meters with automatic angle compensation are mounted to the Underwater Unit: one inside the opening of the Underwater Unit for the determination of the amount of water passing through the opened nets, one outside the opening for the determination of clogging effects.

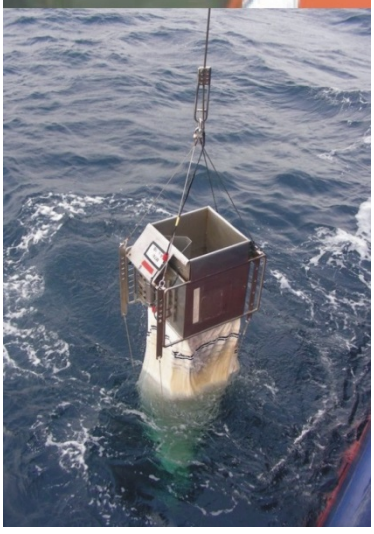
For horizontal collections the MultiNet® is used with a V-Fin Depth Depressor, to carry out vertical collections, a stainless steel support is securely attached to the bucket holder and enables a quick lowering to depth.

Operation
In its initial position the MultiNet® is brought to water with all net bags closed. The water flows freely through the frame allowing to lower it to the greatest desired depth with high paying out speed where the first net bag is opened by push button control from the Deck Command Unit. At the end of the desired period of horizontal collection resp. after passing the desired depth interval in case of vertical operation, the first net bag is closed by a second command. The second net is opened simultaneously. This procedure is repeated for the remaining net bags, while the Deck Command Unit indicates the number of the active net bag. During operations of Mini and Midi versions the last net (no. 5) remains open, it collects plankton from the smallest desired depth up to the water surface. During operations of the Maxi and Mammoth versions the last net (no. 9) can be closed before reaching the water surface.









The Specialties

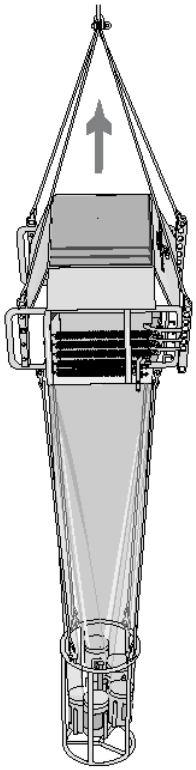
Offline Use
In case that a conducting cable is not available on board of the vessel, the required sampling depth can be pre-programmed via personal computer. During offline use the activation of the net bags is carried out automatically according to the pre-selected depth intervals. All measuring data are stored inside the internal data memory of 16 MByte during the operation and can be read by a PC when the MultiNet® is back on board.

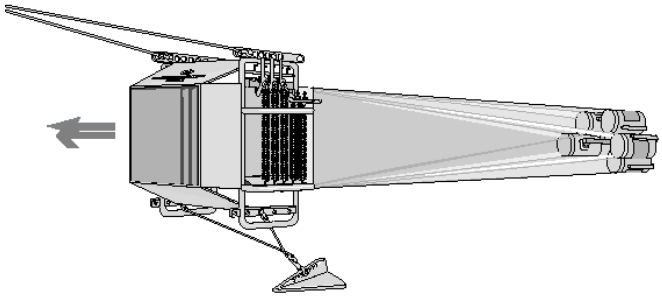
Options

CT-Set
Together with the optional CT-Set the system offers the full capability of a state-of-the-art oceanographic Multi Parameter Probe. The CT-Set consists of one conductivity sensor, one temperature sensor and an additional electronics board which are completely integrated into the Motor Unit of the MultiNet®. From the CTD data the system computes salinity, density and sound velocity according to UNESCO formulas.

CT-Set for MultiNet®
Conductivity sensor: 0 ... 65 ± 0.01 mS/cm,
Temperature sensor: -2 ... +32 ± 0.005°C
Data rate : 1 Hz (1 data set per second)

No. 450 500





- **./** Additional sensors of various parameters
- **./** Special version for operational depths down to 6000 metres
- **./** Pitch and Roll sensor (standard for the Mammoth)

Technical Data

Underwater Unit:	Type Mini No. 438 120	Type Midi No. 438 130	Type Maxi No. 438 140	Type Mammoth No. 438 180
Dimensions (w x l x h):	65 cm x 90 cm x 80 cm	80 cm x 90 cm x 95 cm	120 cm x 110 cm x 135 cm	150 cm x 120 cm x 160 cm
Net opening:	35.5 cm x 35.5 cm = 0.125 m²	50 cm x 50 cm = 0.25 m²	71 cm x 71 cm = 0.5 m²	100 cm x 100 cm = 1 m²
Net Bags:	5 pcs., length: 160 cm	5 pcs., length: 250 cm	9 pcs., length: 365 cm	9 pcs., length: 550 cm
Standard mesh size:	300 microns	300 microns	300 microns	300 microns
Net Buckets:	5 pcs., 11 cm dia.	5 pcs., 11 cm dia.	9 pcs., 11 cm dia.	9 pcs., 11 cm dia.
	5 pcs. Soft Net Bucket	5 pcs. Soft Net Bucket	9 pcs. Soft Net Bucket	9 pcs. Soft Net Bucket
Weights:				
Net Frame:	approx. 75 kg	approx. 100 kg	approx. 260 kg	approx. 390 kg
Stainless Steel Support:	approx. 30 kg	approx. 50 kg	approx. 70 kg	approx. 100 kg
V-Fin Depth Depressor:	approx. 22 kg	approx. 22 kg	approx. 70 kg	approx. 70 kg
Overall length ready for operation (from bridle to net bucket):	470 cm	560 cm	800 cm	1000 cm
Materials:				
Net frame:	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Motor Unit and Battery Housing:	Titanium	Titanium	Titanium	Titanium
Net Bags:	Polyamide	Polyamide	Polyamide	Polyamide
Net Buckets:	PVC/ Canvas	PVC/ Canvas	PVC/ Canvas	PVC/ Canvas
V-Fin Depth Depressor:	Aluminium, lead-weighted	Aluminium, lead-weighted	Aluminium, lead-weighted	Aluminium, lead-weighted
Operational Depth:	Standard 3000 metres	Standard 3000 metres	Standard 3000 metres	Standard 3000 metres
Pressure Sensor:	Standard 3000.0 dbar ± 0.1% f.s. (other ranges on request)	Standard 3000.0 dbar ± 0.1% f.s. (other ranges on request)	Standard 3000.0 dbar ± 0.1% f.s. (other ranges on request)	Standard 3000.0 dbar ± 0.1% f.s. (other ranges on request)
Connection Plug:	SUBCONN BH 2 M	SUBCONN BH 2 M	SUBCONN BH 2 M	SUBCONN BH 2 M
Cable Counter Plug:	SUBCONN IL 2 F	SUBCONN IL 2 F	SUBCONN IL 2 F	SUBCONN IL 2 F
Cable connection:	Single- or multi-conductor cable, one pole can be in contact with sea water			
Breaking load: for shallow water applications (up to 500 m):	approx. 1500 kg	approx. 2000 kg	approx. 4000 kg	approx. 8000 kg
for deep sea applications (from 500 m up to 3000 m):	approx. 5000 kg	approx. 8000 kg	approx. 12000 kg	approx. 18000 kg
Max. cable resistance (go-and-return line):	1000 Ohms	1000 Ohms	1000 Ohms	1000 Ohms
Deck Command Unit:	Metal housing for use in 19" rack or as table housing, not for use on deck; push button control for net changing; indication of net number, pressure, battery status, ... Supertwist LCD-display with LED backlight; Interface for Personal Computer (RS 232)			
Power Supply:				
Underwater Unit:	3 Lithium Batteries DL 123 A/3V, sufficient for approx. 100 hours operation			
Deck Command Unit:	85 - 260 VAC	85 - 260 VAC	85 - 260 VAC	85 - 260 VAC
Towing Speed:				
Recommended for nets with 300 microns standard mesh size:				
Horizontal Collections:	max. 4 knots	max. 4 knots	max. 4 knots	max. 4 knots
Vertical Collections	max. 1 m per sec.	max. 1 m per sec.	max. 1 m per sec.	max. 1 m per sec.
	The single- or multi-conductor cable is not included in our scope of delivery.			