PMEL

Pacific Marine Environmental Laboratory

Project Instructions

Date Submitted: July 11, 2013

Platform: NOAA Ship *Fairweather*

Project Number: FA-13-01

Project Title: *West Coast Ocean Acidification Survey*

Project Dates: **July 29 30 2013 – August 29, 2013**

Prepared by: _____ Dated: 7/11/2013
Dr. Simone R. Alin
Chief Scientist
NOAA-PMEL

Approved by: _____ Dated: 7/11/2013
Dr. Richard A. Feely
Chief Scientist
NOAA-PMEL

Approved by: _____ Dated: 7/18/2013
Dr. Christopher L. Sabine
Director
NOAA-PMEL

Wade J Blake Digitally signed by BLAKE.WADE.JAMES.1025936538
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Approved by: _____ Dated: _____
Captain Wade J. Blake, NOAA
Commanding Officer
Marine Operations Center – Pacific

I. Overview

A. NOAA Ship *Fairweather* will participate in multiple deployments and recoveries of a CTD and 24-position Niskin bottle rosette in support of ocean acidification research, along transect lines and at moored sensor locations. There will be additional ancillary projects, including continuous underway pCO_2 monitoring via the ship's scientific uncontaminated seawater line, deployment of Argo floats, collection of phytoplankton and zooplankton by net tows with winch, and on-board incubations of phytoplankton and zooplankton.

B. Service Level Agreements
Of the 30 DAS scheduled for this project, 0 DAS are funded by the program and 30 DAS are funded by OMAO. This project is estimated to exhibit a Medium Operational Tempo.

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

The cruise will start out from Seattle, WA, and proceed northward to offshore British Columbia where the water column sampling will commence. We have planned a series of approximately 16 transect lines of varying length roughly orthogonal to the Pacific Coast of the North American continent, from middle Vancouver Island, British Columbia, Canada, to northern Baja California, Mexico. Full water column CTD stations will be occupied at specified locations along the planned transects. We will occupy as many of these planned stations as time and conditions allow. The water collected will be analyzed for a variety of physical, chemical, and biological parameters. During the in-port in San Francisco dividing legs one and two of the project, we will exchange several science party team members (7 science team members will depart, and 6 will board). Other than personal items, we do not plan to load or unload any equipment. At the end of the proposed sampling plan, the ship will dock in San Diego to disembark/de-stage.

Cruise waypoints and station locations are listed in a Microsoft Excel file, jpg file, and coastal navigator (nob) file that can be found here: http://www.pmel.noaa.gov/co2/dg/Fairweather_2013/index.html

Final decisions on station locations and sample sequence will be determined on a day-by-day basis by the chief scientist in consultation with the Captain and officers of the *Fairweather* as weather and shipboard circumstances permit.

D. Summary of Objectives:

Cruise Overview: In support of NOAA's Ocean Acidification Program, NOAA will conduct a cruise along the Pacific coast to survey ocean acidification (OA) conditions on the continental shelf. The major objectives of the cruise are:

1) To characterize ocean acidification (OA) conditions on the U.S. west coast;
2) To conduct inter-calibration measurements near other OA observing assets in the study area, such as moorings, allowing inter-calibration of these autonomous assets with high-quality, ship-based measurements;
3) To provide calibration data needed to develop predictive models for aragonite saturation state, pH, and other important OA indicators in the California Current System, based on widely measured parameters such as salinity, temperature, and oxygen concentration;
4) To provide quantitative assessment of phytoplankton, zooplankton, and harmful algal bloom activity in conjunction with OA measurements; and
5) To provide scientific information on OA conditions and trends for resource management and decision support.

The California Current System, running along the North American west coast from British Columbia to Baja California, is a region where seasonal upwelling brings old, nutrient and CO_2-rich and O_2-poor waters to the surface. It is an area of intense biogeochemical cycling, with high rates of primary production, air-sea CO_2 exchange, and carbon export to the open ocean and sediments. Retention and recycling of material on the continental shelf are particularly high in the northern part of the California Current System, and these features predispose ecosystems in this region to being particularly susceptible to the impacts of decreased calcium carbonate saturation resulting from a combination of ocean acidification and natural processes along the west coast (upwelling, river inputs, seasonal development of hypoxia). Understanding the progression of OA in our coastal oceans in the context of these other natural processes is critical for developing management, mitigation, and adaptation strategies for coastal resources. The cruise will also provide a large-scale picture of ocean acidification along the North American west coast that will give many other observing assets in the coastal ocean a larger context, including existing and planned moorings, repeat glider transects, and tests of wave gliders and other new technologies.

E. Participating Institutions:

- NOAA Pacific Marine Environmental Laboratory (PMEL)
  7600 Sand Point Way N.E., Seattle, Washington 98115-6439
- University of Washington Joint Institute for the Study of the Atmosphere and Ocean (JISAO)
- UW School of Oceanography (UW)
- NOAA Northwest Fisheries Science Center (NWFSC)
- Oregon State University (OSU)
- OSU Cooperative Institute for Marine Resources Studies (CIMRS)
- University of South Florida (USF)

- Institute of Ocean Sciences, Department of Fisheries and Oceans, Canada (IOS)
- University of British Columbia (UBC)
- Universidad Autónoma de Baja California (UABC)
- University of Alaska Fairbanks (UAF)
- NOAA Ocean Acidification Program (OAP)
- NOAA National Ocean Data Center (NODC)
- National Research Council Postdoctoral Program (NRC)
- Sea Grant Knauss Postdoctoral Program (SGK)
- Universidad Nacional Autónoma de Mexico (UNAM)

F. Personnel/Science Party:

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation	Nationality
Feely, Richard	Chief Scientist	07/30/2013	8/15/2013	Male	PMEL	US
Alin, Simone	Chief Scientist	08/15/2013	08/29/2013	Female	PMEL	US
Greeley, Dana	Co-chief Scientist	08/15/2013	08/29/2013	Male	PMEL	US
Sutton, Adrienne	Co-chief scientist	07/30/2013	08/15/2013	Female	JISAO	US
Peacock, Cynthia	Scientist	07/30/2013	08/29/2013	Female	JISAO	US
Cross, Jessica	Scientist	07/30/2013	08/29/2013	Female	UAF	US
Garcia, Hernan	Scientist	07/30/2013	08/29/2013	Male	NODC	US
Williams, Nancy	Scientist	08/15/2013	08/29/2013	Female	UW	US
Ombres, Erica	Scientist	07/30/2013	8/15/2013	Female	SGK, OAP	US
Meinvielle, Marion	Scientist	08/15/2013	08/29/2013	Female	NRC, PMEL	France
Purkey, Sarah	Scientist	07/30/2013	08/15/2013	Female	UW	US
Gradoville, Rosie	Scientist	07/30/2013	08/29/2013	Female	OSU	US
Liu, Xuewu	Scientist	07/30/2013	08/29/2013	Male	USF	US
Douglas, Nora Katie	Scientist	07/30/2013	08/29/2013	Female	USF	US
Wojcieszek, Dominika	Scientist	07/30/2013	08/29/2013	Female	USF	Poland
Bednarsek, Nina	Scientist	07/30/2013	08/29/2013	Female	NRC, PMEL	Slovenia
Fisher, Jennifer	Scientist	07/30/2013	8/15/2013	Female	CIMRS	US
Wright, Elizabeth	Scientist	07/30/2013	8/15/2013	Female	NWFSC	US
Moore-Maley, Ben	Scientist, Canadian representative	07/30/2013	8/15/2013	Male	UBC, IOS	US
Norzagaray, Orion	Scientist, Mexican representative	8/15/2013	08/29/2013	Male	UABC	Mexico
Avila, Carmen	Scientist, Mexican representative	8/15/2013	08/29/2013	Female	UABC	Mexico

G. Administrative

1. Points of Contacts

Chief Scientists:
Dr. Richard A. Feely (1st half), Dr. Simone Alin (2nd half)
NOAA PMEL
7600 Sand Point Way NE, Bldg 3
Seattle, WA 98115
Richard: (206) 526-6214, richard.a.feely@noaa.gov
Simone: (206) 526-6819, simone.r.alin@noaa.gov
Fax: (206) 526-6744

LCDR Dan Simon
NOAA PMEL
Seattle, WA 98115
(206) 526-4485, pmel.dir.ops@noaa.gov

2. Diplomatic Clearances

Canada (IDR0393/12) Mexico (DSC08938)

3. Licenses and Permits

Not required for sites within NOAA National Marine Sanctuaries, as we do not have any equipment that will touch bottom or be left at the surface or in the water column beyond when the ship is physically present at the site.

II. Operations

A. Project Itinerary

More detailed itinerary can be found here:
http://www.pmel.noaa.gov/co2/dg/Fairweather_2013/index.html
An overview is presented here:

Start	Stop	Operation
Jul. 30	Jul. 31?	Transit to first CTD station in the vicinity of 49.7°N and 128.5°W. Sampling of CO_2 and other parameters from the ship's underway seawater line will commence. Net tows will begin along this line of stations.
Jul. 31?	Aug. 14	CTD stations, underway sampling, and net tows.
Aug. 15	Aug. 15	Transfer of chief scientists (Dr. Alin to replace Dr. Feely) and several other science team members in San Francisco.
Aug. 16	Aug. 28?	CTD stations, underway sampling, and net tows continue to last CTD station in the vicinity of 26.1°N and 112.8°W, or as far as we are able to get in the available time.
Aug. 28?	Aug. 29	Transit to San Diego (underway sampling continues).

B. Staging and De-staging

Staging: The NOAA Ship *Fairweather* will arrive at NOAA's Western Regional Campus port facility in Seattle, WA, on July 15 or soon thereafter. We would like to commence all staging activities described below as soon thereafter as agreeable to the ship. These activities include:

- Loading one van and two CTD units onto the ship.
- Connecting the Van with required utilities. The van is a standard 8' x 20' shipping container converted to a sea-going laboratory. It will weigh approximately 13,000 lbs on board. It will require 480 power and uses a 15KVA Transformer, fresh water, ethernet, phone, and compressed air.
- Loading the following equipment with either the ship's crane or a rented crane: a fish tote (47" x 44" x 33" w/ approx. weight of 200 lbs), bongo frame, and the ~80 lb weight used for the nets plus two pallets with oxygen analysis equipment. *We also hope there is one or more hand trucks from the ship that we could utilize.*
- The scientific party will work to prepare analytical systems for the cruise during normal work hours to the extent possible, given the early arrival of the ship at the WRC port facility.
- The remaining scientific equipment will be brought onboard by hand throughout the staging period.
- Installing the underway pCO_2 measurement system in one of the equipment cages identified by Tim Smith and Geoff Lebon as appropriate for this system. The equipment requires power (120V, 15A), running seawater (6 L/min at 15 psi), and drainage for seawater. Additional requirements associated with this system are described in section IIIA below. We are also attaching a PDF describing this installation in more detail, in case the ship has any questions about the system or its footprint onboard.
- Install water tanks for incubating zooplankton caught during the cruise in the 'O' lab wire lockers. There would be water tanks on three levels of existing shelving, with plumbing connecting the different tanks to each other and to gas cylinders stored on deck. It would be helpful to have the tank with 16 gas cylinders secured on deck near this laboratory, for ease of access. This work will involve a lot of seawater exposure in this laboratory (i.e. at times it is likely to be very wet in there).

Container Information:

- Approximate weight on ship: 13,500 lbs.
- Size: standard container: 8' W x 8.5' H x 20' L
- Power input: Square D Transformer, EE15T3H: 3 Phase, Primary - 480V, Secondary - 208Y/120; Frequency Rating - 60Hz
- We provide a 35' power cable that plugs into our transformer.
- The other end of the cable currently has a Russell Stohl connector: #JPS334H. This would plug into a JRS334H, JRSA334H, or similar receptacle. Most ships require a different plug that they provide and wire up after disconnecting our JPS334H.

Needs:

- Compressed air at a minimum of 70 psi (we have a 100' air line but wonder what fitting we should bring to connect to your supply). Our air line will connect on our end via a dead-light pass through in our vestibule.
- Fresh water (we use at most approximately 10 gallons per day) - we will supply our own garden hose (25 or 50') to connect with your supply. It connects on our end in our vestibule.
- Phone - if you have a special phone that needs a different connection than the standard US one, please advise. We have a connection in our vestibule.
- Ethernet - we can supply a 100' cat 5 cable. We have a connection in our vestibule.
- Sink drain - we have 20' or so of drain line. This would flow from a 1.5" drain pipe in our vestibule.
- We have our own Air Conditioner/Heater installed in the vestibule. It is powered via our transformer and power panel/breaker box. In case you wish to know, it is a Mitsubishi Mr. Slim model #MUZ-GA24NA.

It is the responsibility of the scientists to arrange for shipment of their equipment and van to NOAA Ship *Fairweather* at 7600 Sand Point Way NE Seattle, WA 98115. The project, in coordination with the Operations Officer, will arrange for the shore crane - most likely via Ness Crane during the staging period.

De-staging: On August 30, one laboratory van, the CTD frames, and any other large scientific equipment will be offloaded in San Diego with the use of a shore crane. The rest of the scientific equipment will be de-staged and offloaded manually August 29-30 (one or more hand trucks from the ship would be helpful).

It is the responsibility of the scientists to arrange for shipment of their equipment and vans from *Fairweather* in San Diego. The project, in coordination with the Operations Officer, will arrange for the shore crane in San Diego.

C. Operations to be conducted

The cruise will consist of continuous underway measurements and CTD/net tow stations from north to south along approximately 16 transit lines. Operations will be conducted on a 24-hours-per-day basis. The desired transit speed will be 10-12 knots between stations, depending on sea state and proximity to shore (12 kts between stations that are far apart, 10 kts as stations are closer together in nearshore areas). We request a slower transit speed between stations that are close together to allow the shift scientists sufficient time to sample the CTD/rosette after each cast before conducting the next cast.

The CTD rosette underwater package (primary and backup) will be provided by the PMEL science party. It will be comprised of a Sea-Bird Electronics (SBE) 9plus CTD with dual temperature, conductivity, and dissolved oxygen sensors; an SBE 32 carousel water sampler and 24 12-liter Niskin bottles; a Metrox load cell; a Kongsberg rechargable

altimeter; and a Sea-Point chlorophyll fluorometer. 24-Hz data will be acquired using an SBE 11plus deck unit and personal computer provided by PMEL in a lab space with clean power and cool temperature. CTD casts at each station will be conducted from the surface to 10 m above the bottom, with a maximum depth near 4500 m. Water samples will be collected from the Niskin bottles after each cast. Salinity samples collected will need to be stored for post-cruise analysis.

The ship will provide a working winch with 6000 m of 0.322" conducting cable and spare slip rings; as well as a method for monitoring winch speed, wire tension, and wire out and communicating with the winch operator. Ship's personnel will be required to run the winch, and two persons will be needed to assist with the deployment and recovery of the underwater package during 24-hour operations. Also required is one Survey Technician to stand a 12-hour watch as CTD console operator and salinity sampler. The ship's ET will be required to terminate the sea cable and troubleshoot if necessary.

Columbia River Stations:

Three Columbia River CTD sampling stations are included in the project plan to be completed on or about Aug. 6th or 7th. The station latitudes and longitudes are included below. These stations should take no longer than 30 minutes and consist of a single CTD cast at each station with eight Niskin bottle samples. The ability to sample at these stations will depend on conditions at the river entrance on the sampling day. Tides, currents, marine traffic, bar conditions, weather conditions and many other variables may have an impact on the possibility of these stations. The ship will make the final determination on conducting these stations as we approach, and they will only be done during daylight hours. These three stations can be completed in any order desired by the ship’s officers so as to ensure safe operations.

Station 42: 46° 14.7’N | 124° 06.6’W
Station 43: 46° 15.0’N | 124° 00.2’W
Station 44: 46° 11.4’N | 123° 54.7’W

In addition to the CTD stations and underway sampling, there will be two types of net tows we will conduct. Vertical plankton tows (VPT) will be done at almost every CTD station in Canadian and US waters. The focus will be on the CTD stations with total depth around the 80-90 db range, but more will be included on a case-by-case basis with coordination and pre-approval of the ship. The same can be said for the Bongo tows, but those will only occur at mostly at nighttime. Both tows will go down to a maximum depth of 100 meters utilizing a wire speed of 30 meters per minute. We will need the ship to be stationary for the VPT and underway at ~2 kt for the Bongo tows.

D. Dive Plan

N/A

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

The following systems and their associated support services are essential to the cruise. Sufficient consumables, back-up units, and on-site spare parts and technical support must be in place to assure that operational interruptions are minimal. All measurement instruments are expected to have current calibrations, and all pertinent calibration information shall be included in the data package.

a. Navigational systems including high-resolution GPS.

b. Thermosalinograph calibrated to within 0.1°C and 0.01 ppt.

c. Dry compressed air (120 psi, 4 CFM), power, fresh water, phone, and Ethernet connections to van.

d. Continuously flowing uncontaminated seawater to the CO_2 equilibrator in the equipment cage identified during an earlier visit as an appropriate location for the pCO_2 system (6 L/min).

e. Refrigerator space (10 cubic feet) for seawater samples (no chemicals).

f. Freezer space (10 cubic feet) for seawater samples (no chemicals).

g. Real-time SCS feed of selected ship data (GPS, barometric pressure, salinity, and intake seawater temperature) for the PMEL underway CO_2 system.

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

a. Chemical reagents and compressed gases will be located in the research Van or another secure, appropriate storage location (e.g. ship's small hazmat locker). A complete listing of all chemicals to be brought onboard is included in the Hazardous Materials section. Material Data Safety Sheets (MSDS) will be provided to the ship before any chemicals are loaded.

b. CTD/Rosette Package plus spares.

c. Sampling nets and other equipment needed to sample and process phytoplankton and zooplankton samples (e.g. filters, filtration apparatuses, microscopes, etc.).

d. Other consumables, i.e., pens, pencils, paper, data storage media, etc.

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 the anticipated quantity brought aboard; MSDS and appropriate neutralizing agents, buffers, or absorbents in amounts adequate to address spills of a size equal to the amount of chemical brought aboard; and a chemical hygiene plan. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

Per FEC 07, the scientific party will include with their project instructions and provide to the CO of the respective ship 60 to 90 days before departure:

- A list of hazardous materials by name and anticipated quantity.
- Include a chemical spill plan that addresses all of the chemicals the program is bringing aboard. This shall include:
    - Procedures for how the spilled chemicals will be contained and cleaned up.
    - A complete inventory (including volumes/amounts) of the chemical spill supplies and equipment brought aboard by the program. This must be sufficient to clean and neutralize all of the chemicals brought aboard by the program.
    - A list of the trained personnel that will be accompanying the project and the training they've completed.

Full chemical hygiene plan in Appendix A.

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.

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. Radioactive Isotopes

No radioisotope work is proposed for this cruise.

The Chief Scientist is responsible for complying with OMAO 0701-10 Radioactive Material aboard NOAA Ships. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

At least three months in advance of a domestic project and eight months in advance of a foreign project start date the shall submit required documentation to MOC-CO, including:

1. NOAA Form 57-07-02, Request to Use Radioactive Material aboard a NOAA Ship
2. Draft Project Instructions
3. Nuclear Regulatory Commission (NRC) Materials License (NRC Form 374) or a state. The license for each state the ship will operate in with RAM on board the ship.
4. Report of Proposed Activities in Non-Agreement States, Areas of Exclusive Federal Jurisdiction, or Offshore Waters (NRC Form 241), if only state license(s) are submitted).
5. MSDS
6. Experiment or usage protocols, including spill cleanup procedures.

Scientific parties will follow responsibilities as outlined in the procedure, including requirements for storage and use, routine wipe tests, signage, and material disposal as outline in OMAO 0701-10.

All radioisotope work will be conducted by NRC- or State-licensed investigators only, and copies of these licenses shall be provided per OMAO 0701-10 at least three months prior to the start date of domestic projects and eight months in advance of foreign project start dates.

C. Inventory (itemized) of Radioactive Materials

Not applicable. No radioactive materials will be used on this cruise.

V. Additional Projects

A. Supplementary ("Piggyback") Projects
B. NOAA Fleet Ancillary Projects

VI. Disposition of Data and Reports

A. Data Responsibilities

At the end of the cruise, 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. Pre- and Post-Project Meeting

Prior to departure, the Chief Scientist will conduct a meeting of the scientific party to train them in sample collection and inform them of project objectives. Some vessel protocols, e.g., meals, watches, etiquette, etc. will be presented by the ship's Operations Officer.

Post-Project Meeting: Upon completion of the project, a meeting will normally be held at 0830 (unless prior alternate arrangements are made) and attended by the ship's officers, the Chief Scientist and members of the scientific party to review the project. Concerns regarding safety, efficiency, and suggestions for improvements for future projects will be discussed. Minutes of the post-project meeting will be distributed to all participants by email, and to the Commanding Officer and Chief of Operations, Marine Operations Center.

C. Ship Operation Evaluation Report

Within seven days of the completion of the project, a Ship Operation Evaluation form is to be completed by the Chief Scientist. The preferred method of transmittal of this form is via email to omao.customer.satisfaction@noaa.gov. If email is not an option, a hard copy may be forwarded to:

Director, NOAA Marine and Aviation Operations
NOAA Office of Marine and Aviation Operations
8403 Colesville Road, Suite 500
Silver Spring, MD 20910

VII. 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 survey.

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 7, 1999, 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, Revised: 02 JAN 2012) 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 participant can mail, fax, or scan the form into an email using the contact information below. The NHSQ 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 that health services might require before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of the NHSQ. Be sure to include proof of tuberculosis (TB) testing, sign and date the 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.

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

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. Steel-toed shoes are required to participate in any work dealing with suspended loads, including CTD

deployments and recovery. The ship does not provide steel-toed boots. Hard hats are also 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.

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 vessels staff and the science team at no charge. Increased bandwidth in 30 day increments is available on the VSAT systems at increased cost to the scientific party. If increased bandwidth is being considered, program accounting is required, and it must be arranged at least 30 days in advance.

E. IT Security

Any computer that will be hooked into 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 three 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 (FRNS) 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.

Foreign National access must be sought not only for access to the ship involved in the project, it must also be sought and approved for the dates of any DOC facilities (marine

centers or port offices) that foreign nationals might have to traverse to access to and from the ship.

The following are basic requirements. Full compliance with NAO 207-12 is required. Responsibilities of the Chief Scientist:

- Provide the Commanding Officer with the e-mail generated by the FRNS granting approval for the foreign national guest's visit. 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.
- 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.
- 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 Officer.
- 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 FRNS 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 - Eight 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 Regional 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.

Appendix A: Full Chemical Hygiene Plan

Hazardous Materials Inventory: Current inventory can be downloaded from the cruise web page at http://www.pmel.noaa.gov/co2/dg/Fairweather_2013/Haz_Mat_inventory.xlsx

Common Name of Material	Qty	Notes	Who	Spill control
Acetone	4 x 1L	DIC Van	Greeley/Sutton	S
CO2	4 lecture bottles	DIC Van	Greeley/Sutton	NA
Compressed Gas, nos: 500ppm CO2 in Nitrogen	1 tank	DIC Van	Greeley/Sutton	NA
Magnesium Perchlorate	2 x 1 Kg	DIC Van	Greeley/Sutton	G
Mercuric Chloride	2 x 10g	DIC Van	Greeley/Sutton	M
Nitrogen	1 tank	DIC Van	Greeley/Sutton	NA
Phosphoric Acid	2 x 500ml	DIC Van	Greeley/Sutton	A
Soda Lime	2 x 1 Kg	DIC Van	Greeley/Sutton	C
manganous chloride solution	1.5 L	O Lab	Gradoville	G
sodium iodate solution	2 L	O Lab	Gradoville	G
sodium thiosulfate solution	4 L	O Lab	Gradoville	G
sulfuric acid, 30 %	1.5 L	O Lab	Gradoville	A
Winkler's reagent: sodium hydroxide / sodium iodide	1.5 L	O Lab	Gradoville	C
Ascarite II, Fine (20-30 Mesh)	2 x 500g	DIVE Lab	Peacock	G,X
Drierite, Indicating (10-20 mesh)	1x5lb	DIVE Lab	Peacock	G,X
Hydrochloric Acid, 0.1N	20x500ml	DIVE Lab	Peacock	A
Formaldehyde solution, 37%	5 L	Fish Tote on Deck	Fisher	F
10% Formaldehyde solution	6 x 1 L	O Lab	Bednarsek	F
70% Ethanol	6 x 1 L	O Lab	Bednarsek	S
Calcein	1 x 25 g	O Lab	Bednarsek	G,X
Lead Perchlorate	50ml x 2	pH, CO3	Liu	G
Metacresol Purple	50ml x 2	pH, CO3	Liu	G
20% Formalin	1 x 500ml	Elizabeth	Wright	F

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.

C: Caustics:

Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric.

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. Use Polyform-F at ratio of 1:1 or 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.

G: General Spill

Wear appropriate personal protective equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. If dry, sweep up, if wet, soak up with absorbent material. Either one, containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. Following product recovery, wipe or flush area with water.

M: Mercury

Spills: Pick up and place in a suitable container for reclamation or disposal in a method that does not generate dust. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Use PMEL Mercury Spill Kit if need be.

P: Phenol

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Collect in a non-combustible container for prompt disposal.
Never return spills in original containers for re-use. Clean up in accordance with all applicable regulations.
Neutralize spill area and washings with soda ash or lime. Collect in a non-combustible container for prompt disposal.

S: Solvents

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Use only non-sparking tools. All equipment used when handling the product must be grounded.
Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Dike far ahead of spill for later disposal.
Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Collect in a non-combustible container for

prompt disposal. Never return spills in original containers for re-use. Clean surface thoroughly to remove residual contamination.
1-5 gallon bucket of Spill X-S adsorbent is recommended and will handle up to 3.2 gallons of Acetone.

X: Virtually Harmless
Small Quantities of less than 5 gallons/pounds should be collected in a ziplock or bucket and marked as "used".

Spill Kit Contents to be brought on-board:

1: 30 gal. drum. - blue, poly with the following inside:
1: 5 lb bucket of Spill X-S: Adsorbs many organic solvents and fuels (other than organic peroxides or hydrazine compounds). Carbon-based adsorbent reduces vapors and can raise the flash point to above 140° when applied properly. Quantity Adsorbed per Container (in gallons)
Acetone : 3.2 Gallons
Ethanol : 1.9 Gallons
Toluene : 1.9 Gallons
Xylene: 2.4 Gallons

1: Spill X-A Acid Spill Kit. Contains six 2.5 lb containers of neutralizer. Each container treats up to a one-gallon spill. Treats much more if the acid is not full strength. More info here:
http://www.ansul.com/AnsulGetDoc.asp?FileID=23574

3: 1 gal pails - white, plastic + covers
1: Portable Mercury Kit
1: Anti static Scoop - 1 quart
Many: Quart size zip-loc bags
Many: Gallon size zip-loc bags

Personal Protective Equipment:
2: R95 respirator (dust masks) for nuisance level acid gas relief
1: XL Tyvek Body coverall
1: Medium Tyvek body coverall
10: Large Silvershield Gloves
3: Stealth Teal Frame Uvex Goggles

Tracy Shaw add on:
Spill kit, which contains formaldehyde solidifier plus spill pillows, gloves, respirators, etc.

Elizabeth Write add on:
1: 32 oz Polyform-F to

Training

Greeley, Dana

- Laboratory Safety & Health, Feb 19-21, 1992, 24hr, ACS, San Francisco, CA
- Laboratory Health & Safety, Mar 3-7, 1993, 40hr, NOAA, Seattle.
- Hazardous Waste Operations, April 19-23, 1993, 40hr, WRA Inc, Seattle.
- Hazardous Materials Spill Response, April 26-30, 1993, 40hr, NOAA, Seattle.
- DOT Shipping Requirements for Hazardous Materials, Sep 20, 1993, 4hr, NOAA, Seattle.
- Hazardous Materials & Waste Management, Dec 5, 1995, 8hr, NOAA, Seattle.
- Transportation & Handling of Chemicals, Dec 6, 1995, 8hr, NOAA, Seattle.
- Hazardous Waste Operations, April 15-18, 1996, 32hr, WRA Inc, Seattle.
- Washington State Environmental Compliance, April 19, 1996, 8hr, Morson Consulting, Seattle.
- Hazardous Waste Operations Refresher, April 22-23, 1996, 16hr, WRA Inc, Seattle.
- EPA Region VI Hazardous Materials First Responders Course, Sept. 23-24, 1996, 16hr, Prezant-now RGA, Seattle.
- Respirator Fit Testing September 24, 1996 - Prezant- now RGA, Seattle.
- Environmental Management Training, March 19, 1997, 8hr, Lynette Ansell, Seattle.
- DOT Hazardous Materials Transportation Training HM-181/HM-126F, April 2, 1997, 8hr, Prezant- now RGA, Seattle.
- Hazardous Waste and WA State Dangerous Waste Refresher, April 3, 1997, 8hr, Morson Consulting, Seattle.
- Environmental Awareness and Decision Making for NOAA Managers, July 22, 1997, 4hr, Waste Resource Associates, Seattle.
- Emergency Spill Response Refresher, July 20, 1998, 8 hr, Prezant- now RGA, Seattle.
- Respirator Fit Testing, October 28, 1998 - Judy Masura
- Implementation of the CEMP at NOAA Facilities Course, January 19-20, 1999, 16 hours, Waste Resource Associates, Seattle.
- Emergency Spill Response Refresher, Aug 25, 1999, 4 hr, Prezant- now RGA, Seattle.
- Fire Extinguisher Types, Operation, & Use, 1999, 2 hr, Prezant- now RGA, Seattle.
- Emergency Response to Hazardous Materials Incidents (165.15), Dec 6-10, 1999, 40 hr, EPA, Bothell.
- DOT Hazardous Materials Transportation Training HM-181/HM-126F, Jan 28, 2000, 8hr, Prezant- now RGA, Seattle.
- Satellite Waste Designation, Sep. 26, 2000, NOAA, Seattle.
- Chemical Hygiene, Nov 16, 2000, 4hr, Prezant- now RGA, Seattle.
- Basic Life Support Instructor, July 21-22, 2002, American Heart Association, NOAA, Seattle
- STARS: Stop Taking Avoidable Risks: Safety for Supervisors, March 18, 2003
- DOT Hazardous Materials Transportation Training HM-181/HM-126F, Feb 28, 2006, 8hr, Prezant- now RGA, Seattle.
- Spill Prevention Control and Countermeasures, Jan 23, 2009, NOAA Commerce Learning Center on-line course.
- 2009 NOAA Safety and Environmental Awareness Course, Feb 18, 2009, NOAA Commerce Learning Center on-line course.
- Spill Prevention Control and Countermeasures, Jan 23, 2009, NOAA Commerce Learning Center on-line course.
- DOT Hazardous Materials Transportation Training HM-181/HM-126F, Sep 16, 2009, Eduwhere.com
- 2010 NOAA Safety and Environmental Awareness Course, Dec 21, 2009, NOAA Commerce Learning Center on-line course.
- Environmental Compliance and Hazardous Waste Training, Sep 23, 2010, Western Regional Center, Minh Trinh

- DOT Hazardous Materials Transportation Training HM-181/HM-126F, Dec 19, 2012, Transportation Compliance Associates
- IATA Training, Jan 8, 2013, Transportation Compliance Associates
- IMDG, Jan 9, 2013, Transportation Compliance Associates

Appendix B: Station list

Latest information should be obtained from this url: http://www.pmel.noaa.gov/co2/dg/Fairweather_2013/index.html

Line goes in or out	Station	Long	Lat	arrive at station	lv station
	Seattle	-122.3331	47.6097	07/30 10:00	07/30 10:00
	Cape Flattery	-124.7198	48.4948	07/30 21:31	07/30 21:31
IN	1	-128.5000	49.6700	07/31 11:14	07/31 13:03
IN	2	-128.2882	49.8134	07/31 14:33	07/31 16:17
IN	3	-128.1897	49.8800	07/31 17:47	07/31 19:37
IN	4	-128.0969	49.9412	07/31 21:07	07/31 22:14
IN	5	-128.0068	50.0025	07/31 23:44	08/01 01:07
IN	6	-127.9707	50.0246	08/01 02:37	08/01 04:51
IN	7	-127.9288	50.0540	08/01 06:21	08/01 07:51
IN	8	-127.9022	50.0723	08/01 09:21	08/01 11:07
IN	9	-127.8839	50.0846	08/01 12:37	08/01 14:20
IN	10	-127.1000	47.9000	08/02 02:35	08/02 04:56
IN	11	-126.6041	48.1866	08/02 07:19	08/02 09:23
IN	12	-126.4146	48.2959	08/02 10:53	08/02 12:10
IN	13	-126.3081	48.3568	08/02 13:40	08/02 14:47
IN	14	-126.2047	48.4156	08/02 16:17	08/02 16:59
IN	15	-126.1074	48.4712	08/02 18:29	08/02 19:00
IN	16	-125.9983	48.5348	08/02 20:30	08/02 21:16
IN	17	-125.8857	48.5995	08/02 22:46	08/02 23:46
IN	18	-125.7838	48.6579	08/03 01:16	08/03 02:15
IN	19	-125.6759	48.7200	08/03 03:45	08/03 05:29
IN	20	-125.5710	48.7800	08/03 06:59	08/03 08:30
IN	21	-125.5160	48.8100	08/03 10:00	08/03 11:29
IN	22	-125.4644	48.8400	08/03 12:59	08/03 14:45
OUT	23	-124.9512	48.3700	08/03 17:54	08/03 19:24
OUT	24	-124.9499	47.9700	08/03 21:35	08/03 22:30
OUT	25	-125.1746	48.1300	08/04 00:00	08/04 01:47
OUT	26	-125.3292	47.9600	08/04 03:17	08/04 05:18
OUT	27	-125.5799	47.6800	08/04 07:05	08/04 09:06
OUT	28	-126.0850	47.1200	08/04 12:41	08/04 14:45
IN	29	-125.1957	47.1167	08/04 18:03	08/04 19:27
IN	30	-125.0553	47.1167	08/04 20:57	08/04 22:11
IN	31	-124.9829	47.1167	08/04 23:41	08/05 01:40
IN	32	-124.8195	47.1167	08/05 03:10	08/05 04:56
IN	33	-124.7300	47.3500	08/05 06:26	08/05 07:06
IN	34	-124.6442	47.1167	08/05 08:36	08/05 10:22
IN	35	-124.3863	47.1167	08/05 11:52	08/05 13:34
IN	36	-125.1883	46.1300	08/05 19:44	08/05 21:12
IN	37	-124.9114	46.1300	08/05 22:42	08/06 00:09
IN	38	-124.6702	46.1300	08/06 01:39	08/06 02:28
IN	39	-124.5269	46.1300	08/06 03:58	08/06 04:45
IN	40	-124.2678	46.1300	08/06 06:15	08/06 08:00
IN	41	-124.0917	46.1300	08/06 09:30	08/06 11:11
IN	42	-124.1100	46.2450	08/06 11:53	08/06 12:14
IN	WP1 CR	-124.0428	46.2607	08/06 12:34	08/06 13:10
IN	43	-124.0033	46.2500	08/06 13:21	08/06 13:42
IN	44	-123.9117	46.1900	08/06 14:17	08/06 14:38
IN	WP2 CR	-124.0020	46.2537	08/06 15:14	08/06 15:50
IN	WP1 CR	-124.0428	46.2607	08/06 16:02	08/06 16:38
IN	WP3 CR	-124.1333	46.2500	08/06 17:03	08/06 17:39

OUT	**45**	**-124.1300**	**44.6517**	**08/07 02:23**	**08/07 04:20**
OUT	**46**	**-124.2950**	**44.6517**	**08/07 05:50**	**08/07 07:52**
OUT	**47**	**-124.6500**	**44.6517**	**08/07 09:22**	**08/07 10:57**
OUT	**48**	**-124.7750**	**44.6517**	**08/07 12:27**	**08/07 14:10**
OUT	**49**	**-125.0000**	**44.6517**	**08/07 15:40**	**08/07 16:40**
OUT	**50**	**-125.1167**	**44.6517**	**08/07 18:10**	**08/07 18:57**
OUT	**51**	**-125.3667**	**44.6517**	**08/07 20:27**	**08/07 23:02**
OUT	**52**	**-125.6000**	**44.6517**	**08/08 00:32**	**08/08 03:06**
IN	**53**	**-124.9810**	**44.2000**	**08/08 06:33**	**08/08 07:11**
IN	**54**	**-124.5770**	**44.2000**	**08/08 08:46**	**08/08 09:14**
IN	**55**	**-124.4223**	**44.2000**	**08/08 10:44**	**08/08 11:29**
IN	**56**	**-124.2613**	**44.2000**	**08/08 12:59**	**08/08 14:45**
IN	**57**	**-124.1671**	**44.2000**	**08/08 16:15**	**08/08 17:57**
OUT	**WPCapeBlanco**	**-124.7833**	**42.7833**	**08/09 02:04**	**08/09 02:40**
OUT	**58**	**-124.3290**	**41.9935**	**08/09 07:21**	**08/09 09:02**
OUT	**59**	**-124.4167**	**41.9750**	**08/09 10:32**	**08/09 12:19**
OUT	**60**	**-124.4859**	**41.9616**	**08/09 13:49**	**08/09 14:18**
OUT	**61**	**-124.5846**	**41.9443**	**08/09 15:48**	**08/09 16:24**
OUT	**62**	**-124.7950**	**41.8985**	**08/09 17:54**	**08/09 18:43**
OUT	**63**	**-125.0474**	**41.8441**	**08/09 20:13**	**08/09 21:34**
OUT	**64**	**-125.6570**	**41.7200**	**08/10 00:08**	**08/10 02:40**
OUT	**65**	**-126.6797**	**41.5095**	**08/10 06:59**	**08/10 09:20**
IN	**66**	**-125.2062**	**39.8850**	**08/10 20:06**	**08/10 22:25**
IN	**67**	**-124.9368**	**40.0033**	**08/10 23:55**	**08/11 01:29**
IN	**68**	**-124.7111**	**40.1027**	**08/11 02:59**	**08/11 04:12**
IN	**69**	**-124.4841**	**40.2028**	**08/11 05:42**	**08/11 07:31**
IN	**70**	**-124.4451**	**40.2200**	**08/11 09:01**	**08/11 10:31**
IN	**71**	**-124.4117**	**40.2338**	**08/11 12:01**	**08/11 13:47**
IN	**72**	**-124.3840**	**40.2460**	**08/11 15:17**	**08/11 17:00**
IN	**73**	**-125.6446**	**36.6670**	**08/12 13:16**	**08/12 16:47**
IN	**74**	**-124.3077**	**37.2865**	**08/12 23:31**	**08/13 02:56**
IN	**75**	**-123.4814**	**37.6662**	**08/13 07:04**	**08/13 09:25**
IN	**76**	**-123.3170**	**37.7502**	**08/13 10:55**	**08/13 11:52**
IN	**77**	**-123.2757**	**37.7617**	**08/13 13:22**	**08/13 14:00**
IN	**78**	**-123.0713**	**37.8632**	**08/13 15:30**	**08/13 16:15**
IN	**79**	**-122.9817**	**37.9030**	**08/13 17:45**	**08/13 19:30**
IN	**80**	**-122.8805**	**37.9434**	**08/13 21:00**	**08/13 22:57**
	SF Pilot Buoy	**-122.4585**	**37.8186**	**08/14 00:54**	**08/14 00:54**
	San Francisco	**-122.4172**	**37.8105**	**08/14 02:24**	**08/14 02:24**
Import					
	San Francisco	**-122.4172**	**37.8105**	**08/16 10:00**	**08/16 10:00**
	SF Pilot Buoy	**-122.4585**	**37.8186**	**08/16 11:30**	**08/16 11:30**
IN	**81**	**-122.4345**	**36.5240**	**08/16 18:34**	**08/16 20:39**
IN	**82**	**-122.0624**	**36.6962**	**08/16 22:32**	**08/17 00:07**
IN	**83**	**-122.0204**	**36.7124**	**08/17 01:37**	**08/17 02:32**
IN	**84**	**-121.9692**	**36.7356**	**08/17 04:02**	**08/17 04:47**
IN	**85**	**-121.9272**	**36.7568**	**08/17 06:17**	**08/17 07:18**
IN	**86**	**-121.8722**	**36.7837**	**08/17 08:48**	**08/17 09:21**
IN	**87**	**-121.8484**	**36.7952**	**08/17 10:51**	**08/17 11:26**
IN	**WPCarmelCanyon**	**-122.1352**	**36.5883**	**08/17 13:07**	**08/17 13:43**
IN	**88**	**-122.4953**	**33.5248**	**08/18 06:31**	**08/18 09:39**
IN	**89**	**-121.1593**	**34.1405**	**08/18 17:16**	**08/18 19:09**
IN	**90**	**-121.0227**	**34.2055**	**08/18 20:39**	**08/18 21:56**
IN	**91**	**-120.7890**	**34.3144**	**08/18 23:26**	**08/19 00:31**
IN	**92**	**-120.6536**	**34.3774**	**08/19 02:01**	**08/19 02:58**
IN	**93**	**-120.5799**	**34.4109**	**08/19 04:28**	**08/19 05:14**
IN	**94**	**-120.5133**	**34.4405**	**08/19 06:44**	**08/19 07:30**
IN	**95**	**-120.4872**	**34.4543**	**08/19 09:00**	**08/19 09:42**
IN	**96**	**-120.9000**	**31.9507**	**08/19 23:30**	**08/20 03:10**
IN	**97**	**-120.0966**	**32.3450**	**08/20 07:27**	**08/20 09:14**
IN	**98**	**-120.0018**	**32.3891**	**08/20 10:44**	**08/20 11:48**
IN	**99**	**-118.4230**	**33.1597**	**08/20 20:11**	**08/20 21:33**
IN	**100**	**-118.0356**	**33.3494**	**08/20 23:36**	**08/21 00:40**
IN	**101**	**-117.7712**	**33.4821**	**08/21 02:13**	**08/21 03:14**
IN	**102**	**-117.7538**	**33.4880**	**08/21 04:44**	**08/21 05:41**
OUT	**WPCoronado**	**-117.3333**	**32.3833**	**08/21 12:01**	**08/21 12:37**

OUT	**103**	**-116.7730**	**31.6852**	**08/21 17:13**	**08/21 17:54**
OUT	**104**	**-116.9063**	**31.6180**	**08/21 19:24**	**08/21 20:27**
OUT	**105**	**-117.1080**	**31.5192**	**08/21 21:57**	**08/21 23:04**
OUT	**106**	**-117.4512**	**31.3518**	**08/22 00:55**	**08/22 02:31**
OUT	**107**	**-117.7863**	**31.1855**	**08/22 04:20**	**08/22 05:49**
OUT	**108**	**-118.1200**	**31.0188**	**08/22 07:37**	**08/22 09:07**
OUT	**109**	**-118.4540**	**30.8523**	**08/22 10:56**	**08/22 12:53**
OUT	**110**	**-118.7883**	**30.6855**	**08/22 14:42**	**08/22 16:50**
OUT	**111**	**-119.4545**	**30.3517**	**08/22 20:27**	**08/22 23:31**
OUT	**112**	**-114.2342**	**28.3867**	**08/24 02:33**	**08/24 03:16**
OUT	**113**	**-114.5705**	**28.2197**	**08/24 05:19**	**08/24 06:05**
OUT	**114**	**-114.8920**	**28.0528**	**08/24 07:52**	**08/24 08:39**
OUT	**WPIslaNatividad**	**-115.2500**	**27.9667**		
OUT	**115**	**-115.2853**	**27.8525**	**08/24 10:51**	**08/24 11:19**
OUT	**116**	**-115.4098**	**27.7862**	**08/24 12:49**	**08/24 13:24**
OUT	**117**	**-115.5413**	**27.7195**	**08/24 14:54**	**08/24 16:48**
OUT	**118**	**-115.8688**	**27.5527**	**08/24 18:38**	**08/24 21:38**
OUT	**119**	**-116.1890**	**27.3860**	**08/24 23:25**	**08/25 02:20**
OUT	**120**	**-116.5167**	**27.2200**	**08/25 04:10**	**08/25 07:08**
OUT	**121**	**-112.8175**	**26.0850**	**08/26 02:13**	**08/26 03:00**
OUT	**122**	**-113.1368**	**25.9180**	**08/26 04:49**	**08/26 05:20**
OUT	**123**	**-113.4572**	**25.7508**	**08/26 07:09**	**08/26 08:05**
OUT	**124**	**-113.7750**	**25.5850**	**08/26 09:53**	**08/26 12:19**
OUT	**125**	**-114.0937**	**25.4183**	**08/26 14:07**	**08/26 16:46**
OUT	**126**	**-114.4098**	**25.2518**	**08/26 18:34**	**08/26 21:22**
OUT	**127**	**-114.7280**	**25.0852**	**08/26 23:22**	**08/27 02:19**
OUT	**128**	**-115.0465**	**24.9192**	**08/27 04:19**	**08/27 07:25**
	Pt Loma	**-117.6224**	**32.6224**	**08/28 23:35**	**08/28 23:35**
	Scripps Pier	**-117.2351**	**32.7030**	**08/29 01:16**	**08/29 01:16**

Appendix C: Station map

Latest information should be obtained from this url:
http://www.pmel.noaa.gov/co2/dg/Fairweather_2013/index.html