

FINAL CRUISE INSTRUCTIONS

FOCI

NOAA Ship *MILLER FREEMAN*, MF-03-03

February 24 – March 7, 2003

Chief Scientist: William J. Floering

1.0 FINAL CRUISE INSTRUCTIONS

(Version 2003.6, 1/31/2003)

1.1 **Cruise Title** – Fisheries-Oceanography Coordinated Investigations (FOCI).

1.2 **Cruise Numbers:**

1.2.1 **Cruise Number** – MF-03-03

1.2.2 **FOCI Number** – 2MF03

1.3 **Cruise Dates:**

1.3.1 **Depart** – Depart Kodiak, Alaska, on Monday, February 24, 2003.

1.3.2 **Arrive** – Arrive Dutch Harbor, Alaska, on Friday, March 7, 2003.

1.4 **Operating Area** – Gulf of Alaska, Bering Sea.

2.0 CRUISE OVERVIEW

2.1 **Cruise Objectives** – The primary objective of the cruise will be the recovery and deployment of moorings in the Gulf of Alaska, and Bering Sea. The following mooring operations will be conducted on this cruise:

| Operation | Site | Latitude | | | Longitude | | |
|---------------------------------|-------------------|----------|--------|---|-----------|--------|---|
| Recover | Iron Meter | 59° | 17.50' | N | 148° | 57.50' | W |
| Recover/Deploy/CTD (3 moorings) | Line 8 | 57° | 39.90' | N | 155° | 25.98' | W |
| Recover/Deploy | Pavlof Bay | 55° | 10.88' | N | 161° | 41.20' | W |
| Recover/Deploy | Kodiak Crab 1 | 56° | 25.04' | N | 160° | 12.97' | W |
| Recover/Deploy | Kodiak Crab 2 | 56° | 29.90' | N | 160° | 59.92' | W |
| Recover/Deploy (3 moorings) | Bering Sea Site 2 | 56° | 52.02' | N | 164° | 03.02' | W |

2.2 **Applicability** - These instructions, with **FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN**, dated April 8, 2002, present complete information for this cruise.

2.3 Participating Organizations

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

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

University of Alaska – Fairbanks (UAF)
Institute of Marine Science
200 O’Neill, Fairbanks, Alaska 99775-1080

2.4 Personnel

2.4.1 Chief Scientist

| Name | Gender | Affiliation | E-mail Address |
|---------------------------------------|--------|-------------|--|
| William J. Floering (206) 526-6480 | Male | PMEL | William.Floering@noaa.gov |

2.4.2 Other Participating Scientists

| Name | Gender | Affiliation | E-mail Address |
|-----------------|--------|-------------|--|
| Carol L. DeWitt | Female | PMEL | Carol.DeWitt@noaa.gov |
| Earl Roskie | Male | PMEL | Earl.Roskie@noaa.gov |
| Sarah Thornton | Female | UAF | sarahjt@imsuaf.edu |
| Susan Henrichs | Female | UAF | henrichs@ims.uaf.edu |

2.5 Administration

2.5.1 Ship Operations

Marine Operations Center, Pacific
1801 Fairview Avenue East, Seattle, Washington 98102-3767
Telephone: (206) 553-4548, Fax: (206) 553-1109

LCDR Michele Bullock, NOAA
Chief, Operations Division (MOP1)
Telephone: (206) 553-8705, Cellular: (206) 390-7527
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Larry Mordock
Deputy Chief, Operations Division (MOP1x1)
Telephone - Work: (206) 553-4764, Home: (206) 365-3567
Cellular: (206) 465-9316, E-mail: Larry.Mordock@noaa.gov

2.5.2 Scientific Operations

Dr. Phyllis J. Stabeno, PMEL
Telephone: (206) 526-6453
E-mail: Phyllis.Stabeno@noaa.gov

Dr. Jeffrey M. Napp, AFSC
Telephone: (206) 526-4148
E-mail: Jeff.Napp@noaa.gov

3.0 OPERATIONS

3.1 Data To Be Collected

3.1.1 Scientific Computer System (SCS) – The ship's SCS shall operate throughout the cruise, acquiring and logging data from navigation, meteorological, oceanographic, and fisheries sensors. See *FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN* (SOI 5.2) for specific requirements.

3.2 Staging Plan – All equipment will be loaded on board prior to the ship's departure from Seattle, Washington.

3.3 De-staging Plan – Most equipment will be off-loaded in Dutch Harbor, Alaska, on Friday, March 7, 2003.

3.4 Cruise Plan – The ship will depart Kodiak, Alaska, on Monday, February 24, 2003, and steam directly for the FATE mooring site.

- a) FATE – If the weather cooperates, and the Fisheries and the Environment (FATE) mooring is still on site, we will install a new Advanced Research and Global Observation Satellite (ARGOS) transmitter on the surface mooring.
- b) Following the work at the FATE site, four ARGOS satellite-tracked drifter buoys will be deployed during the transit to the Iron Meter site (equally spaced along the transit).
- c) Iron Meter – The Iron Meter mooring will be recovered. Following the recovery we will install a new ARGOS transmitter at the nearby Global Ocean Ecosystem Dynamics (GLOBEC) surface mooring.
- d) Line 8 – Three moorings will be recovered along Line 8 in Shelikof Strait along with conducting Conductivity, Temperature, and Depth (CTD) profiler transects. The order of these operations may change depending on daylight.
- e) Pavlof Bay – One mooring will be recovered and redeployed in Pavlof Bay.
- f) Kodiak Crab Moorings – Following Pavlof Bay, the ship will proceed to Kodiak Crab Site 1A in the Bering Sea, deploying a drifter in the Bering Sea during the transit, just beyond Unimak Pass. One recovery and redeployment will occur at each of the two Kodiak Crab sites.

- g) **FOCI Bering Sea Site 2** – Following the crab moorings, the ship will transit to FOCI Bering Sea Site 2. Three subsurface mooring deployments will be completed at Site 2 along with five CTD (with nutrient and chlorophyll samples) and Marine Assessment Monitoring and Prediction (MARMAP) Bongo tows surrounding and in the middle of Site 2, and possibly some California Cooperative Oceanic Fisheries Investigation (CalCOFI) Vertical Egg Tow (CalVET) net tows.
- h) **70-m Isobath CTDs** – After completion of the work at Site 2, a CTD transect along the 70-m isobath, northwest to the ice edge or Site 4 whichever comes first, will be done.

Depending on time and the location of the ice edge the following work will also occur (listed by priority):

1. Collect nutrient samples from beneath the ice edge (Jeff Napp). If possible, sampling should be conducted at seven stations along a transect starting 2 nautical miles in the ice-free zone, extending to 10 nautical miles into the ice. Stations should be every 2 nautical miles (-2, 0, 2, 4, 6, 8, 10 nautical mile). At each station one MARMAP Bongo and one CalVET tow should be done. The bongo tows would use the 20-cm frame with 0.150-mm mesh and the 60-cm frame with 0.333-mm mesh.

In addition, if it is possible for the ship's divers to enter the water, then two samples of the algae attached to the underside of the ice should be collected at the 10 nautical mile and 2 nautical mile stations, and pictures of the underside of the ice (still or video) taken. The divers should take the 32-oz glass bottles with them and fill them with green 'goo' from under the ice, two per station. The samples should be pickled with 5% Formalin soon after the divers return to the deck.

A CTD should be done at the 2 nautical mile and 10 nautical mile stations regardless of whether a dive is completed or not. Trip two Niskin bottles each at 5 and 10 meters. Fill a 32-oz glass jar from each of the bottles, label them with the microzooplankton labels and fix it with 5% Formalin just like the ice scrapings.

2. Complete 5-station box at Site 4 (CTD/Bongos/CalVETs).
3. Complete 5-station box at Site 3 (CTD/Bongos/CalVETs).
4. 'Dog-leg' CTD transect occupied in the past. See Sections [9.3.2 'Dog-leg' CTD Transects](#) and [9.4.2 'Dog-leg' CTD Transects Figure](#).

The ship shall then transit to Dutch Harbor, Alaska, arriving on Friday, March 7, 2003.

3.5 Time/Weather Dependant Operations – The following operations will be conducted on this cruise, time and weather dependant:

| Operation | Site | Latitude | Longitude |
|---|-------------|--------------|---------------|
| Service surface mooring | FATE | 58° 15.60' N | 147° 41.20' W |
| Deploy 4 ARGOS drifters (along transit) | Seward Line | | |
| Recover | Iron Meter | 59° 17.50' N | 148° 57.50' W |
| Service surface mooring | GLOBEC | 59° 18.00' N | 148° 58.20' W |
| Recover/Deploy/CTD (3 moorings) | Line 8 | 57° 39.90' N | 155° 25.98' W |

| Operation | Site | Latitude | | | Longitude | |
|-----------------------------|------------------------|----------|--------|---|-----------|----------|
| Recover/Deploy | Pavlof Bay | 55° | 10.88' | N | 161° | 41.20' W |
| Deploy ARGOS drifter | Bering Sea/Unimak Pass | 54° | 24.00' | N | 165° | 27.00' W |
| Recover/Deploy | Kodiak Crab 1 | 56° | 25.04' | N | 160° | 12.97' W |
| Recover/Deploy | Kodiak Crab 2 | 56° | 29.90' | N | 160° | 59.92' W |
| Recover/Deploy (3 moorings) | Bering Sea Site 2 | 56° | 52.02' | N | 164° | 03.02' W |
| Box at Site 2 | Bering Sea Site 2 | 56° | 52.00' | N | 164° | 03.00' W |
| 70-m Isobath CTD Transect | 70-m Isobath | | | | | |
| Sampling under ice edge | | | | | | |
| Box at Site 4 | Bering Sea Site 4 | 57° | 51.10' | N | 168° | 52.20' W |
| Box at Site 3 | Bering Sea Site 3 | 56° | 03.00' | N | 166° | 20.30' W |
| Deep CTD Transect | | | | | | |
| CTD 'Dog-leg' Transect | | | | | | |

3.6 Station Locations – See Sections [9.3 Station Locations](#) and [9.4 Figures](#).

3.7 Station Operations – The following are operations to be conducted on this cruise. The procedures for these operations are listed in the ***FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN*** (SOI). Operations not addressed in the SOI and changes to standard procedures are addressed below.

- CTD/Water Sample Operations (SOI 3.2.1),
- MARMAP Bongo Tows (SOI 3.2.2),
- CalVET Net Tows (SOI 3.2.6),
- Chlorophyll Sampling Operations (SOI 3.2.10), and
- ARGOS Satellite Tracked Drifter Buoy Deployments (SOI 3.2.11).

3.8 Underway Operations – The following are underway operations to be conducted on this cruise. The procedures for these operations are listed in the ***FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN*** (SOI). Operations not addressed in the SOI and changes to standard procedures are addressed below.

- Acoustic Doppler Current Profiler (ADCP) Operations (SOI 3.2.13),
- Radiometer Operations (SOI 3.2.14),
- Scientific Computer System (SCS) data acquisition (SOI 5.2), and
- Thermosalinograph monitoring (SOI 5.3).

3.9 Small Boat Operations – Weather permitting, the small boat may be needed for mooring operations and supporting dive operations.

4.0 FACILITIES

4.1 Equipment and Capabilities Provided by Ship

- Oceanographic winch with slip rings and 3-conductor cable terminated for CTD,
- Manual wire-angle indicator,
- Oceanographic winch with slip rings and 3-conductor cable terminated for the SBE SEACAT for net tow operations,

- Sea-Bird Electronics' SBE 911*plus* CTD system with stand, each CTD system should include underwater CTD, weights, and pinger. There should be one deck unit and tape recorder for the two systems,
- 10 liter Niskin sampling bottles for use with rosette (10 plus 4 spares),
- AUTOSAL salinometer for CTD field corrections,
- Sea-Bird Electronics' SBE-19 SEACAT system,
- Wire speed indicators and readout for quarterdeck, Rowe, and Marco winches,
- 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 ,
- RD Instruments' ADCP written to Iomega Zip drive,
- Use of Pentium PC in DataPlot for data analysis,
- Scientific Computer System (SCS),
- Electrical connection between Rowe winch and DataPlot,
- Removable stern platform in place,
- Laboratory space with exhaust hood, sink, lab tables, and storage space,
- Sea-water hoses and nozzles to wash nets (quarterdeck and aft deck),
- Adequate deck lighting for night-time operations,
- Navigational equipment including GPS and radar,
- Safety harnesses for working on quarterdeck and fantail, and
- Ship's crane(s) used for loading and/or deploying.

4.2 Equipment and Capabilities Provided by Scientists

- Sea-Bird Electronics' SBE 911*plus* CTD system to be used with PMEL stand,
- Sea-Bird Electronics' SBE-19 SEACAT system,
- PMEL PC with SEASOFT software for CTD data collection and processing,
- Fluorometer and light meter to be mounted on CTD,
- CTD stand modified for attachment of fluorometer,
- Conductivity and temperature sensor package to provide dual sensors on the primary CTD,
- CTD rosette sampler,
- IAPSO standard water,
- 60-cm bongo sampling arrays,
- 20-cm bongo arrays,
- Spare wire angle indicator,
- Subsurface moorings,
- ARGOS tracked drifter buoys, and
- Miscellaneous scientific sampling and processing equipment.

5.0 DISPOSITION OF DATA AND REPORTS

5.1 The following data products will be included in the cruise data package:

- **NOAA Form 77-13d – Deck Log – Weather Observation Sheets,**
- Electronic Marine Operations Abstracts (E-MOA),
- SCS backup – recordable compact diskette (CD-RW),

- Calibration Sheets for all ship's instruments used,
- PMEL CTD Weather Observation Logs,
- CTD Cast Information/Rosette Log,
- Autosalinometer Logs,
- ADCP Log Sheets,
- ADCP Iomega Zip and/or recordable compact diskette (CD-RW), and
- Electronic Navigation suite's export files on diskette,

5.2 **Pre- and Post-cruise Meetings** – Cruise meetings may be held in accordance with **FOCI Standard Operating Instructions for NOAA Ship MILLER FREEMAN** (SOI 5.5).

6.0 ADDITIONAL PROJECTS

6.1 **Definition** – Ancillary and piggyback projects are secondary to the objectives of the cruise and should be treated as additional investigations. The difference between the two types of secondary projects is that an ancillary project does not have representation aboard and is accomplished by the ship's force.

6.2 **Ancillary Projects** – Any ancillary work done during this project will be accomplished with the concurrence of the Chief Scientist and on a not-to-interfere basis with the programs described in these instructions and in accordance with the **NOAA Fleet Standing Ancillary Instructions**.

6.3 **Piggyback Projects** – None at this time.

7.0 HAZARDOUS MATERIALS

7.1 **Inventory** – See Section [9.2 HAZMAT Inventory](#).

7.2 **Material Safety Data Sheets (MSDS)** – All MSDSs, except for Fluorinert, can be found on the **OERD HAZMAT Emergency Guidelines – MSDS**, dated January 15, 2003. Click on the Fluorinert Adobe Portable Document Format (PDF) hyperlink to view the MSDS ([Fluorinert, FC-77.pdf](#))

8.0 MISCELLANEOUS

8.1 **Communications** - Specific information on how to contact the NOAA Ship ***MILLER FREEMAN*** and all other fleet vessels can be found at:

<http://www.pmc.noaa.gov/phone.htm>

8.2 **Important Telephone and Facsimile Numbers and E-mail Addresses**

8.2.1 **Pacific Marine Environmental Laboratory (PMEL)**

FOCI – Ocean Environmental Research Division (OERD):

- (206) 526-4700 (voice)
- (206) 526-6485 (fax)

Administration:

- (206) 526-6810 (voice)
- (206) 526-6815 (fax)

8.2.2 Alaska Fisheries Science Center (AFSC)

FOCI – Resource Assessment and Conservation Engineering (RACE):

- (206) 526-4171 (voice)
- (206) 526-6723 (fax)

8.2.3 NOAA Ship MILLER FREEMAN – Telephone methods listed in order of increasing expense:

Homeport – Seattle, Washington:

- (206) 553-4589
- (206) 553-4581
- (206) 553-8344

United States Coast Guard – Kodiak, Alaska:

- (907) 487-9752
- (907) 487-9753
- (907) 487-4397
- (907) 487-4398

Cellular:

- (206) 660-7167

INMARSAT Mini-M:

- 011-872-761-267-346 (voice/PBX)
- 011-872-761-267-347 (voice)

INMARSAT B:

- 011-872-330-394-120 (voice)
- 011-872-330-394-121 (fax)

E-Mail: NOAA.Ship.Miller.Freeman@noaa.gov (mention the person's name in SUBJECT field)

8.2.4 Marine Operations Center, Pacific (MOP)

Operations Division (MOP1):

- (206) 553-4548 (voice)
- (206) 553-1109 (fax)

E-Mail to Radio Room: Radio.Room@noaa.gov

9.0 APPENDICES

9.1 Equipment Inventory

| Item | Quantity | Weight | Total Weight |
|----------------------------|----------------------|----------|-------------------|
| Anchors: | | | |
| | 2 | 660 lbs | 1320 lbs |
| | 1 | 2150 lbs | 2150 lbs |
| | 1 | 1700 lbs | 1700 lbs |
| | 5 | 1600 lbs | 8000 lbs |
| | Subtotal: | | 13,170 lbs |
| Floats: | | | |
| Steel 28" floats | 6 | 200 lbs | 1200 lbs |
| Steel 30" floats | 5 | 200 lbs | 1000 lbs |
| Steel 41" floats | 2 | 400 lbs | 800 lbs |
| 37" syntactic foam float | 2 | 600 lbs | 1200 lbs |
| Miscellaneous Gear: | | | |
| Box misc. hardware | 1 | 400 lbs | 400 lbs |
| Footlocker | 1 | 200 lbs | 200 lbs |
| Moorings on spools | 3 | 100 lbs | 300 lbs |
| Tool box | 1 | 50 lbs | 50 lbs |
| Misc Instr. and Cages | 1 | 300 lbs | 300 lbs |
| Nitrate meter frames | 3 | 50 lbs | 150 lbs |
| 75 kHz ADCP | 2 | 250 lbs | 500 lbs |
| Current Meters | 2 | 50 lbs | 100 lbs |
| Acoustic Releases | 9 | 125 lbs | 1125 lbs |
| Acoustic Release- UAF | 1 | 125 lbs | 125 lbs |
| Drifters (2/box) | 3 | 150 lbs | 450 lbs |
| | Total Weight: | | 21,070 lbs |

9.2 HAZMAT Inventory –

| Chemical | CAS Number | Respondee | Organization | Quantity | H | F | R | C | Storage Color Code | Hazard Class | Packing Group Number | UN | Reportable Quantity | Response Indices |
|------------------------------------|------------|------------|--------------|----------|---|---|---|---|--------------------|---------------|----------------------|------|---------------------|------------------|
| Battery, Lithium Bromine Chloride | mix | DeWitt | PMEL | 27 Cells | 1 | 1 | 2 | | General | 9 | II | 3091 | None | None |
| Battery, Lithium Sulfuryl Chloride | mix | DeWitt | PMEL | 33 Cells | 1 | 1 | 2 | | General | 9 | II | 3090 | None | None |
| Fluorinert | 86508-42-1 | Henrichs | PMEL | | 3 | 0 | 0 | | General | Not regulated | | | None | None |
| Hydrochloric Acid | 7647-01-0 | Thornton | UAF | 500-ml | 3 | 0 | 0 | | Corrosive | 8 | II | 1789 | 5000 Lb | 1 |
| Iodine Lugols, Concentrate | mix | Wisegarver | PMEL | 250-ml | | | | | | Not regulated | | | | None |
| Mercuric Chloride | 7487-94-7 | Henrichs | PMEL | | 4 | 0 | 1 | | Corrosive | 6.1 | II | 1624 | 12 Kg | 2 |
| Sulfamic Acid | 5329-14-6 | Henrichs | PMEL | | 2 | 0 | 2 | | Corrosive | 8 | III | 2967 | None | 3 |
| Tributyltin Oxide | 56-35-9 | DeWitt | PMEL | < 4-oz | | | | | Poison | 6.1 | II | 3020 | None | 4 |

Spill Response 1: Ventilate area of leak or spill. Wear appropriate personal protective equipment. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then 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. **Do not flush to sewer!** U.S. Regulations (CERCLA) requires reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802.

Spill Response 2: Evacuate area. Wear Self-Contained Breathing Apparatus (SCBA), rubber boots, and heavy rubber gloves. Wear disposable coveralls and discard them after use. Sweep up, place in bag and hold for waste disposal. Ventilate area and wash spill site after material pickup is complete. Avoid raising dust.

Spill Response 3: Ventilate area of leak or spill. Wear appropriate personal protective equipment. Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. Place material in closed container.

Spill Response 21: Stop the leak, if possible. Ventilate the space involved. Absorb, sweep up, and place in container for disposal. Shut off or remove all ignition sources. Prevent waterway contamination. Construct a dike to prevent spreading. Collect run-off (water) and transfer to drums or tanks for later disposal.

9.3 Station Locations

9.3.1 Primary Cruise Objectives –

| Activity | Latitude | | | Longitude | | | Dist. (NM) | Spd (Kts) | Transit Time (Hrs) | Approx Bottom Depth (m) | On Stn (Hrs) | Arrive (Local) Date | Arrive (Local) Time | Depart (Local) Date | Depart (Local) Time |
|----------------------------|----------|---------|---|-----------|---------|---|------------|-----------|--------------------|-------------------------|--------------|---------------------|---------------------|---------------------|---------------------|
| Depart Kodiak, Alaska | 57° | 43.746' | N | 152° | 31.273' | W | | | | | | | | 24-Feb-03 | 10:00 |
| Service WXPAK | 58° | 15.600' | N | 147° | 41.200' | W | 145.5 | 10.5 | 13.9 | | 4.0 | 25-Feb-03 | 1:39 | 25-Feb-03 | 5:39 |
| Deploy Drifter | 58° | 27.960' | N | 147° | 56.302' | W | 14.7 | 10.5 | 1.4 | | | 25-Feb-03 | 7:03 | 25-Feb-03 | 7:03 |
| Deploy Drifter | 58° | 40.320' | N | 148° | 11.490' | W | 14.7 | 10.5 | 1.4 | | | 25-Feb-03 | 8:27 | 25-Feb-03 | 8:27 |
| Deploy Drifter | 58° | 52.680' | N | 148° | 26.769' | W | 14.7 | 10.5 | 1.4 | | | 25-Feb-03 | 9:51 | 25-Feb-03 | 9:51 |
| Deploy Drifter | 59° | 05.040' | N | 148° | 42.138' | W | 14.7 | 10.5 | 1.4 | | | 25-Feb-03 | 11:15 | 25-Feb-03 | 11:15 |
| Recover 02GB-3B & CTD | 59° | 17.500' | N | 148° | 57.500' | W | 14.7 | 10.5 | 1.4 | 188 | 3.0 | 25-Feb-03 | 12:39 | 25-Feb-03 | 15:39 |
| Service WXPAK | 59° | 18.000' | N | 148° | 58.200' | W | 0.6 | 10.0 | 0.1 | | 4.0 | 25-Feb-03 | 15:43 | 25-Feb-03 | 19:43 |
| CTD Line 8, Station 61 | 57° | 43.200' | N | 155° | 15.600' | W | 43.7 | 10.0 | 4.4 | | 1.0 | 26-Feb-03 | 18:25 | 26-Feb-03 | 19:25 |
| CTD Line 8, Station 60 | 57° | 41.000' | N | 155° | 10.000' | W | 3.7 | 10.0 | 0.4 | | 1.0 | 26-Feb-03 | 19:48 | 26-Feb-03 | 20:48 |
| CTD Line 8, Station 59 | 57° | 38.500' | N | 155° | 04.200' | W | 4.0 | 10.0 | 0.4 | | 1.0 | 26-Feb-03 | 21:12 | 26-Feb-03 | 22:12 |
| CTD Line 8, Station 58 | 57° | 36.300' | N | 155° | 00.500' | W | 3.0 | 10.0 | 0.3 | | 1.0 | 26-Feb-03 | 22:29 | 26-Feb-03 | 23:29 |
| CTD Line 8, Station 57 | 57° | 33.100' | N | 154° | 52.500' | W | 5.4 | 10.0 | 0.5 | | 1.0 | 27-Feb-03 | 0:01 | 27-Feb-03 | 1:01 |
| CTD Line 8, Station 56 | 57° | 30.900' | N | 154° | 47.000' | W | 3.7 | 10.0 | 0.4 | | 1.0 | 27-Feb-03 | 1:23 | 27-Feb-03 | 2:23 |
| CTD Line 8, Station 55 | 57° | 28.500' | N | 154° | 42.000' | W | 3.6 | 10.0 | 0.4 | | 1.0 | 27-Feb-03 | 2:45 | 27-Feb-03 | 3:45 |
| R/D SSP-3 | 57° | 29.016' | N | 154° | 48.440' | W | 3.5 | 10.0 | 0.4 | | 2.0 | 27-Feb-03 | 4:06 | 27-Feb-03 | 6:06 |
| R/D SSP-2 | 57° | 37.134' | N | 155° | 04.472' | W | 11.8 | 10.0 | 1.2 | 250 | 2.0 | 27-Feb-03 | 7:17 | 27-Feb-03 | 9:17 |
| R/D SSP-1 | 57° | 39.580' | N | 155° | 14.460' | W | 5.9 | 10.0 | 0.6 | | 2.0 | 27-Feb-03 | 9:52 | 27-Feb-03 | 11:52 |
| R/D Pavlof Bay/CTD | 55° | 10.880' | N | 161° | 41.200' | W | 1.1 | 2.0 | 0.5 | 100 | 4.0 | 28-Feb-03 | 18:35 | 28-Feb-03 | 22:35 |
| Deploy Drifter | 54° | 24.000' | N | 165° | 27.000' | W | 113.5 | 10.0 | 11.4 | 100 | | 01-Mar-03 | 21:53 | 01-Mar-03 | 21:53 |
| R/D 03KC-1A & CTD | 56° | 25.040' | N | 160° | 12.970' | W | 65.8 | 10.0 | 6.6 | 25 | 2.0 | 02-Mar-03 | 20:19 | 02-Mar-03 | 22:19 |
| R/D 03KC-2A & CTD | 56° | 29.900' | N | 160° | 59.920' | W | 26.4 | 10.0 | 2.6 | 60 | 2.0 | 03-Mar-03 | 0:57 | 03-Mar-03 | 2:57 |
| R/D 03BS-2A & CTD | 56° | 52.020' | N | 164° | 03.020' | W | 103.0 | 10.0 | 10.3 | 72 | 4.0 | 03-Mar-03 | 13:15 | 03-Mar-03 | 17:15 |
| Deploy 03BSP-2A & CTD | 56° | 52.020' | N | 164° | 03.020' | W | 0.0 | 10.0 | 0.0 | 72 | 2.0 | 03-Mar-03 | 17:15 | 03-Mar-03 | 19:15 |
| R/D 03BSST-2A & CTD | 56° | 52.000' | N | 164° | 03.000' | W | 0.0 | 10.0 | 0.0 | 72 | 2.0 | 03-Mar-03 | 19:15 | 03-Mar-03 | 21:15 |
| CTD & Bongo - Site 2/south | 56° | 40.000' | N | 163° | 52.000' | W | 13.4 | 10.0 | 1.3 | 75 | 1.2 | 03-Mar-03 | 22:36 | 03-Mar-03 | 23:48 |
| CTD & Bongo - Site 2/east | 56° | 56.500' | N | 163° | 50.010' | W | 16.5 | 10.0 | 1.7 | 69 | 1.2 | 04-Mar-03 | 1:27 | 04-Mar-03 | 2:39 |

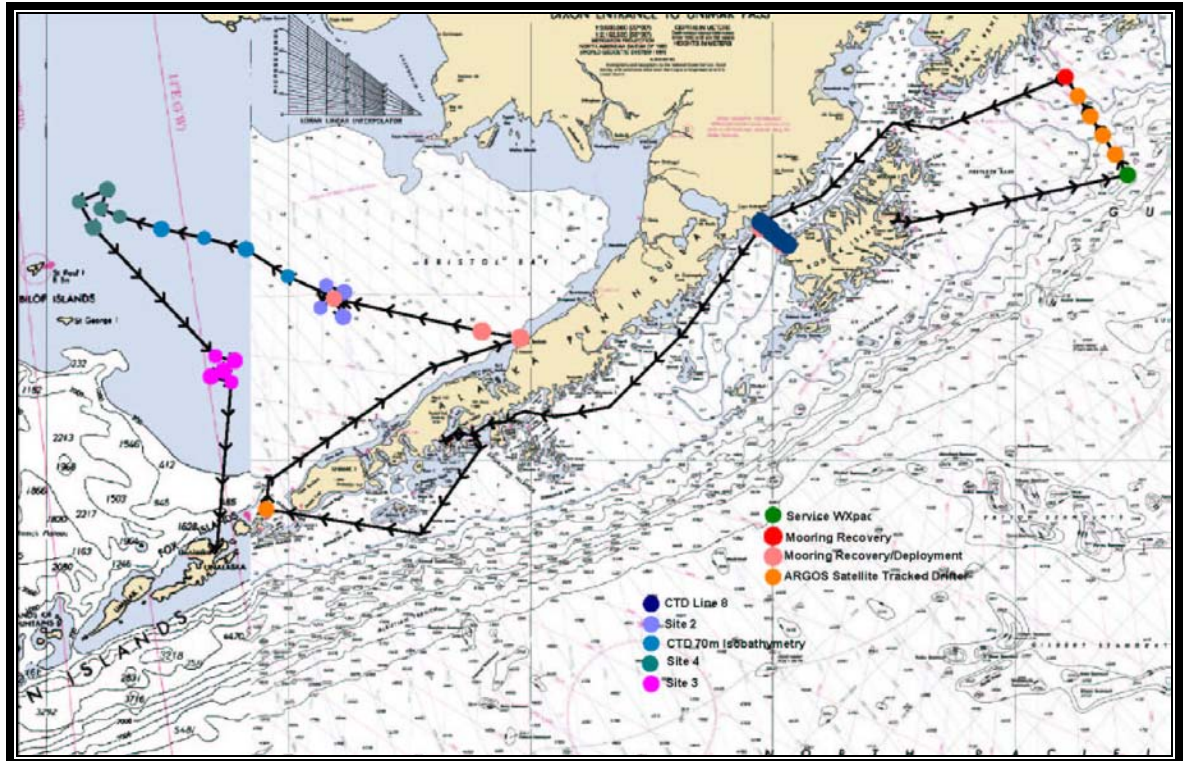
| Activity | Latitude | | | Longitude | | | Dist. (NM) | Spd (Kts) | Transit Time (Hrs) | Approx Bottom Depth (m) | On Stn (Hrs) | Arrive (Local) Date | Arrive (Local) Time | Depart (Local) Date | Depart (Local) Time |
|------------------------------------|----------|---------|---|-----------|---------|---|------------|-----------|--------------------|-------------------------|--------------|---------------------|---------------------|---------------------|---------------------|
| CTD & Bongo - Site 2/north | 57° | 01.000' | N | 164° | 13.000' | W | 13.3 | 10.0 | 1.3 | 69 | 1.2 | 04-Mar-03 | 3:59 | 04-Mar-03 | 5:11 |
| CTD & Bongo - Site 2/west | 56° | 46.000' | N | 164° | 20.000' | W | 15.5 | 10.0 | 1.5 | 75 | 1.2 | 04-Mar-03 | 6:44 | 04-Mar-03 | 7:56 |
| CTD & Bongo & CalVET - Site 2 (M2) | 56° | 52.540' | N | 164° | 03.330' | W | 11.2 | 10.0 | 1.1 | 69 | 1.2 | 04-Mar-03 | 9:03 | 04-Mar-03 | 10:15 |
| CTD - 70 m isobath | 57° | 07.000' | N | 165° | 00.000' | W | 34.1 | 10.0 | 3.4 | 70 | 0.5 | 04-Mar-03 | 13:39 | 04-Mar-03 | 14:09 |
| CTD - 70 m isobath | 57° | 25.030' | N | 165° | 52.000' | W | 33.4 | 10.0 | 3.3 | 69 | 0.5 | 04-Mar-03 | 17:30 | 04-Mar-03 | 18:00 |
| CTD - 70 m isobath | 57° | 32.000' | N | 166° | 44.000' | W | 28.8 | 10.0 | 2.9 | 69 | 0.5 | 04-Mar-03 | 20:53 | 04-Mar-03 | 21:23 |
| CTD - 70 m isobath | 57° | 38.020' | N | 167° | 37.000' | W | 29.0 | 10.0 | 2.9 | 71 | 0.5 | 05-Mar-03 | 0:17 | 05-Mar-03 | 0:47 |
| CTD & Bongo - Site 4/east | 57° | 46.000' | N | 168° | 28.000' | W | 28.4 | 10.0 | 2.8 | 71 | 1.0 | 05-Mar-03 | 3:37 | 05-Mar-03 | 4:37 |
| CTD & Bongo & CalVET - Site 4 | 57° | 51.110' | N | 168° | 52.200' | W | 13.9 | 10.0 | 1.4 | 71 | 2.0 | 05-Mar-03 | 6:01 | 05-Mar-03 | 8:01 |
| CTD & Bongo - Site 4/north | 58° | 04.000' | N | 168° | 43.800' | W | 13.6 | 10.0 | 1.4 | 71 | 1.0 | 05-Mar-03 | 9:22 | 05-Mar-03 | 10:22 |
| CTD & Bongo - Site 4/west | 57° | 55.600' | N | 169° | 19.300' | W | 20.6 | 10.0 | 2.1 | 71 | 1.0 | 05-Mar-03 | 12:26 | 05-Mar-03 | 13:26 |
| CTD & Bongo - Site 4/south | 57° | 39.200' | N | 169° | 01.200' | W | 19.0 | 10.0 | 1.9 | 71 | 1.0 | 05-Mar-03 | 15:20 | 05-Mar-03 | 16:20 |
| CTD & Bongo - Site 3/north | 56° | 12.500' | N | 166° | 30.000' | W | 119.7 | 10.0 | 12.0 | 120 | 1.0 | 06-Mar-03 | 4:18 | 06-Mar-03 | 5:18 |
| CTD & Bongo - Site 3/east | 56° | 10.000' | N | 166° | 06.000' | W | 13.6 | 10.0 | 1.4 | 120 | 1.0 | 06-Mar-03 | 6:40 | 06-Mar-03 | 7:40 |
| CTD & Bongo & CalVET - Site 3 | 56° | 02.940' | N | 166° | 20.300' | W | 10.7 | 10.0 | 1.1 | 120 | 2.0 | 06-Mar-03 | 8:44 | 06-Mar-03 | 10:44 |
| CTD & Bongo - Site 3/west | 55° | 59.000' | N | 166° | 35.000' | W | 9.1 | 10.0 | 0.9 | 120 | 1.0 | 06-Mar-03 | 11:38 | 06-Mar-03 | 12:38 |
| CTD & Bongo - Site 3/south | 55° | 55.000' | N | 166° | 10.000' | W | 14.6 | 10.0 | 1.5 | 120 | 1.0 | 06-Mar-03 | 14:06 | 06-Mar-03 | 15:06 |
| Arrive Dutch Harbor, AK | 53° | 53.697' | N | 166° | 31.518' | W | 0.4 | 10.0 | 0.0 | | | 07-Mar-03 | 3:23 | | |

9.3.2 'Dog-Leg' CTD Transect –

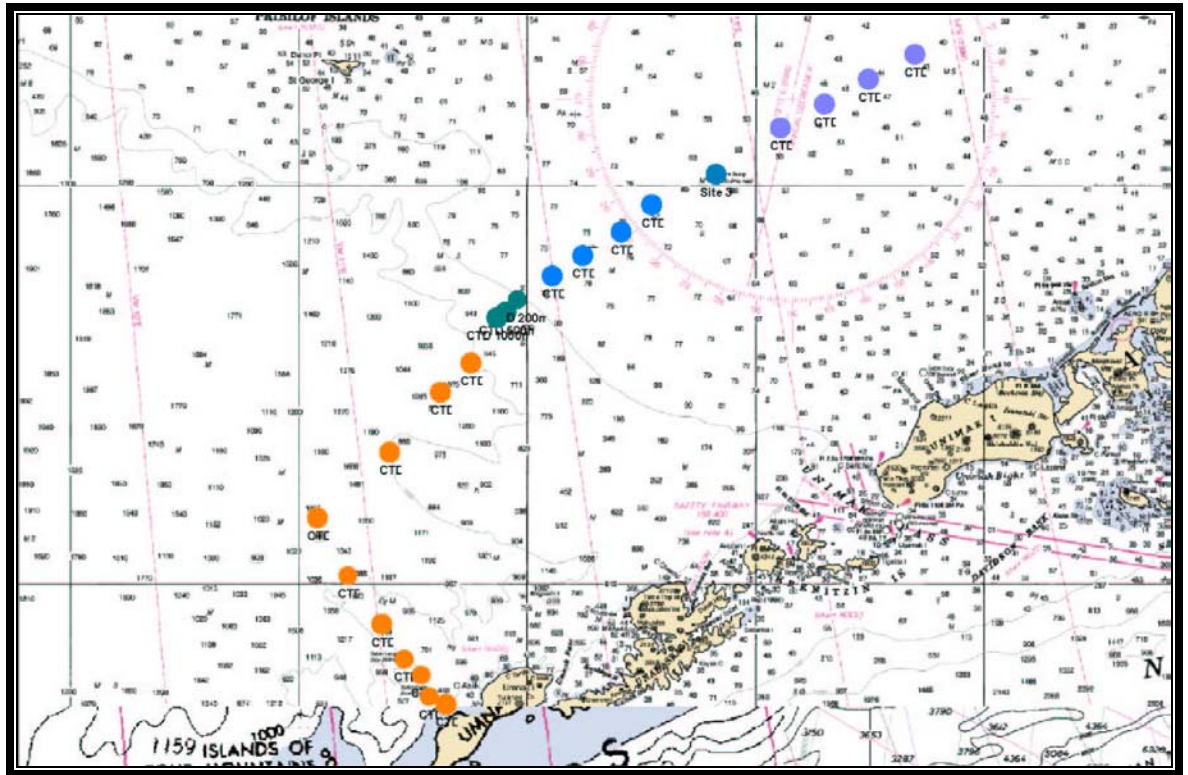
| Activity | Latitude | Longitude | Dist. (NM) | Spd (Kts) | Transit Time (Hrs) | Approx Bottom Depth (m) | On Stn (Hrs) | Cumulative Time (Hrs) |
|--|--------------|---------------|------------|-----------|--------------------|-------------------------|--------------|-----------------------|
| CTD - Cross-shelf | 56° 37.82' N | 164° 36.00' W | | 10.5 | | 79 | 0.5 | 0.5 |
| CTD - Cross-shelf | 56° 30.63' N | 165° 00.00' W | 15.1 | 10.0 | 1.5 | 81 | 0.5 | 2.5 |
| CTD - Cross-shelf | 56° 23.54' N | 165° 23.17' W | 14.6 | 10.0 | 1.5 | 89 | 0.5 | 4.5 |
| CTD - Cross-shelf | 56° 16.48' N | 165° 46.32' W | 14.6 | 10.0 | 1.5 | 96 | 0.5 | 6.4 |
| CTD - Site 3/middle | 56° 02.94' N | 166° 20.30' W | 23.3 | 10.0 | 2.3 | 127 | 0.8 | 9.5 |
| CTD - Outer Shelf Domain | 55° 54.00' N | 166° 54.00' W | 20.9 | 10.0 | 2.1 | 120 | 0.8 | 12.3 |
| CTD - Outer Shelf Domain | 55° 46.00' N | 167° 10.00' W | 12.0 | 10.0 | 1.2 | 120 | 0.8 | 14.3 |
| CTD - Outer Shelf Domain | 55° 39.00' N | 167° 30.02' W | 13.3 | 10.0 | 1.3 | 120 | 0.8 | 16.4 |
| CTD - Outer Shelf Domain | 55° 33.00' N | 167° 46.00' W | 10.8 | 10.0 | 1.1 | 120 | 0.8 | 18.2 |
| CTD - Shelf Break (200-m) DEPTH DEPENDENT | 55° 25.70' N | 168° 04.40' W | 12.7 | 10.0 | 1.3 | 200 | 0.8 | 20.2 |
| CTD - Shelf Break (500-m) DEPTH DEPENDENT | 55° 22.30' N | 168° 10.50' W | 4.9 | 10.0 | 0.5 | 500 | 0.8 | 21.5 |
| CTD - Shelf Break (1000-m) DEPTH DEPENDENT | 55° 20.50' N | 168° 15.20' W | 3.2 | 10.0 | 0.3 | 1000 | 1.0 | 22.8 |
| CTD | 55° 07.00' N | 168° 29.00' W | 15.6 | 10.0 | 1.6 | 1735 | 2.0 | 26.4 |
| CTD | 54° 58.00' N | 168° 45.00' W | 12.8 | 10.0 | 1.3 | 2067 | 2.0 | 29.7 |
| CTD | 54° 40.00' N | 169° 12.00' W | 23.8 | 10.0 | 2.4 | 1730 | 2.0 | 34.1 |
| CTD | 54° 20.00' N | 169° 50.00' W | 29.8 | 10.0 | 3.0 | 1900 | 2.0 | 39.0 |
| CTD | 54° 02.00' N | 169° 34.00' W | 20.3 | 10.0 | 2.0 | 1840 | 2.0 | 43.1 |
| CTD | 53° 47.00' N | 169° 16.00' W | 18.4 | 10.0 | 1.8 | 1575 | 2.0 | 46.9 |
| CTD | 53° 36.00' N | 169° 04.00' W | 13.1 | 10.0 | 1.3 | 1870 | 2.0 | 50.2 |
| CTD | 53° 31.00' N | 168° 55.00' W | 7.3 | 10.0 | 0.7 | 1825 | 2.0 | 53.0 |
| CTD | 53° 24.36' N | 168° 51.23' W | 7.0 | 10.0 | 0.7 | 1020 | 2.0 | 55.7 |
| CTD | 53° 22.00' N | 168° 42.00' W | 6.0 | 10.0 | 0.6 | 700 | 2.0 | 58.3 |

9.4 Figures

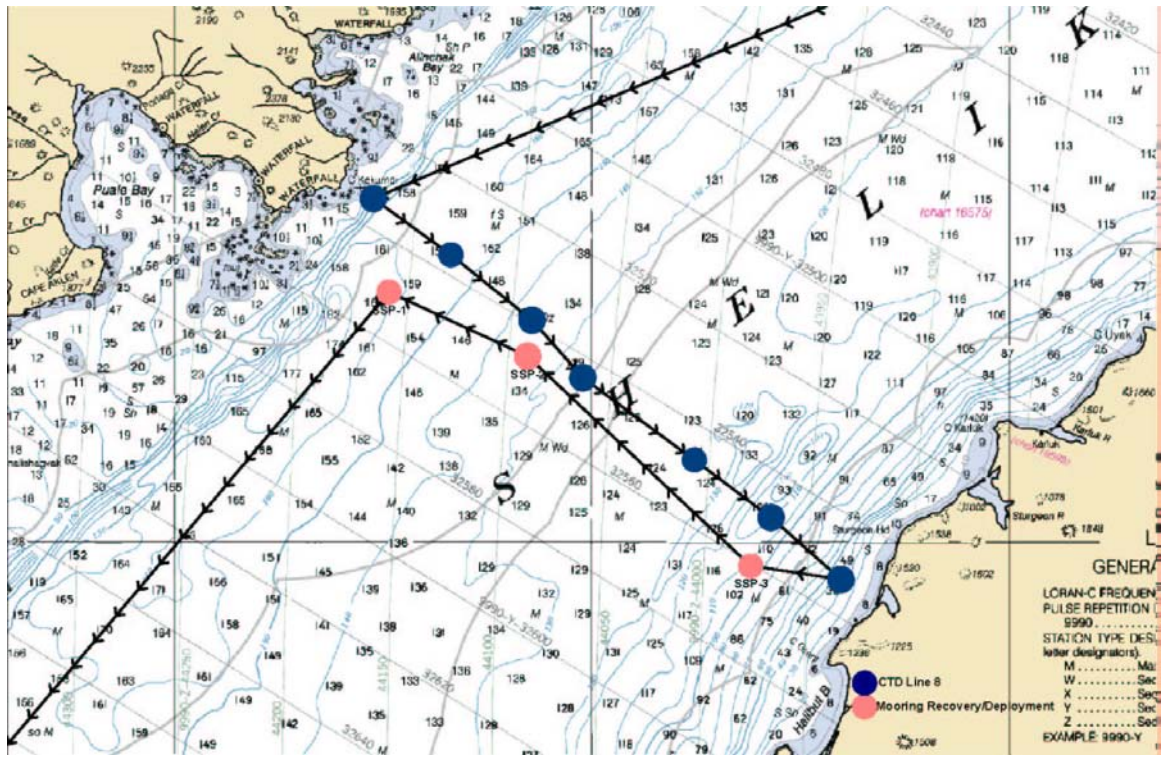
9.4.1 Cruise Overview Figure – [Hyperlink to Adobe PDF document MF-03-03 Station Locations \(NC 50 & 500\).pdf](#)



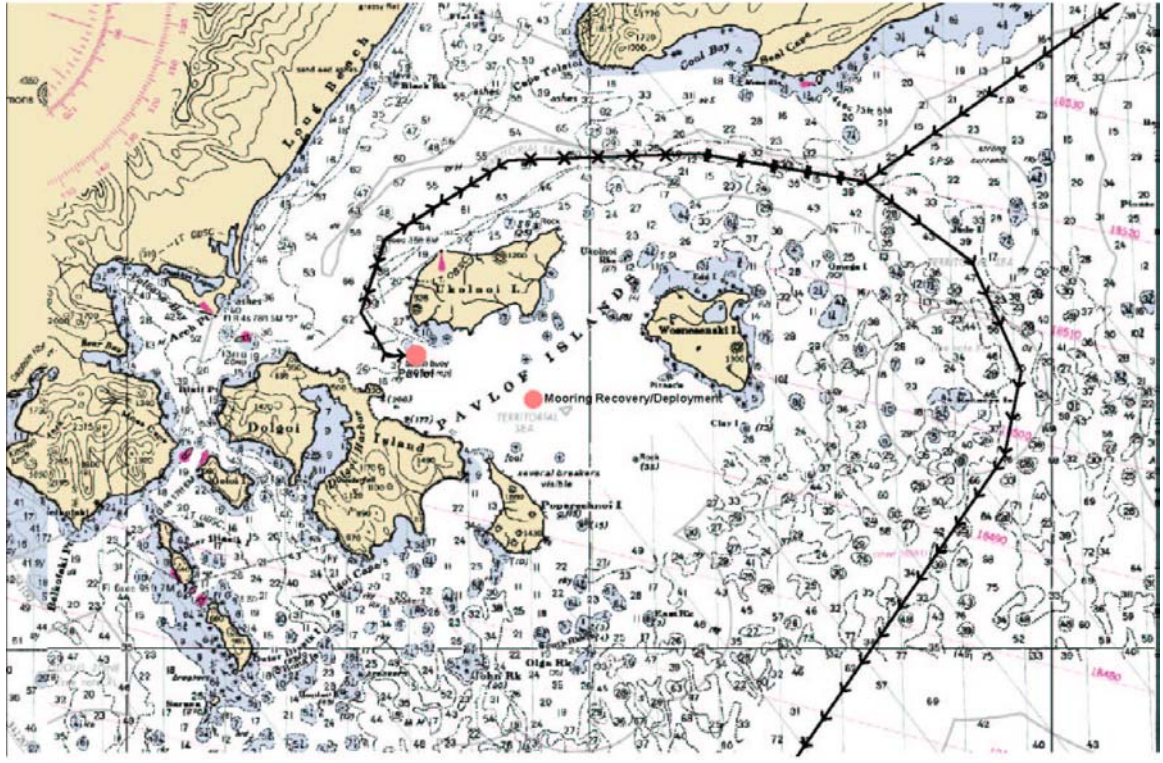
9.4.2 **'Dog-leg' CTD Transect Figure** – Hyperlink to Adobe PDF document [MF-03-03 Optional CTD Stations \(NC 16006\).pdf](#).



9.4.3 **Line 8 Detail** – Hyperlink to Adobe PDF document [MF-03-03 CTD Line 8 \(NC 16580\).pdf](#).



9.4.4 **Pavlof Bay Detail** – Hyperlink to Adobe PDF document [MF-03-03 Pavlof Bay \(NC 16540\).pdf](#).



9.4.5 **Unimak Pass Drifter Deployment Detail** – Hyperlink to Adobe PDF document [MF-03-03 Unimak Drifter \(NC 16520\).pdf](#).

