UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center
8604 La Jolla Shores Drive
La Jolla, CA 92037

March 10, 2011

Final Cruise Instructions

Date Submitted: March 10, 2011

Platform: NOAA Ship *Shimada*

Cruise Number: 11-04-SH

Project Title: California Current Ecosystem Survey

Cruise Dates: 17 March – 27 April 2011

Prepared by: _____ Dated: March 10, 2011
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SWFSC (FRD)

Approved by: _____ Dated: March 10, 2011
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FRD Director
SWFSC (FRD)

Approved by: _____ Dated: March 10, 2011
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Approved by: _____ Dated: _____
Captain Michele G. Bullock, NOAA
Commanding Officer
Marine Operations Center - Pacific

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March 16, 2011

Cruise Instructions 11-04-SH (SH11-04)

I. Cruise Overview

I.A. Cruise Period
I.A.1. 17 March 2011 – 27 April 2011

I.B. Operating Area

I.B.1. Cape Flattery, WA to US/Mexican border with variable transect lengths (please refer to Appendix 1 for detailed plot).

I.C. Summary of Objectives

Survey the distributions and abundances of pelagic fish stocks, their prey, and their biotic and abiotic environments in the area of the California Current between Cape Flattery, Washington and San Diego, California.

The following are specific objectives for legs I & II (Daily Egg Production Method, DEPM) and leg III (Spring CalCOFI).

Legs I & II (DEPM):

I.C.1. Continuously sample pelagic fish eggs using the Continuous Underway Fish Egg Sampler (CUFES). The data of Pacific sardine eggs will be used to allocate additional Pairovet samples to estimate the daily egg production of Pacific sardine. The Pairovet samples will be also taken at predetermined stations. Both samples from CUFES and Pairovet will be used to estimate the distributions and abundances of spawning sardine, anchovy and mackerel and other species.

I.C.2. Continuously sample multi-frequency acoustic backscatter using the Simrad EK60. The data will be used to estimate the distributions and abundances of coastal pelagic fishes (e.g., sardine, anchovy, and mackerel) and krill species.

I.C.3. Sample selected aggregations of fish and zooplankton which have been observed acoustically. These data will be used to identify the sound scattering species and their sizes.

I.C.4 Sample fish near the surface at nighttime by conducting 2-5 surface trawls at stations (Appendix 2) or at random sites each night. The data will be used to estimate the reproductive parameters, distributions and demographics of sardine, anchovy and mackerel.

I.C.5. Continuously sample profiles of currents using the RDI/Teledyne Acoustic Doppler Current Profiler.

I.C.6. Continuously sample sea-surface temperature, salinity, and chlorophyll-a using a thermosalinograph and fluorometer. These data will be used to estimate the physical oceanographic habitats for target species.

I.C.7. Continuously sample air temperature, barometric pressure, and wind speed and direction using an integrated weather station.

I.C.8. Sample profiles of seawater temperature and salinity using a CTD with water-sampling rosette and other instruments at prescribed stations.

I.C.9. Sample plankton using a CalBOBL (CalCOFI Bongo) at prescribed stations. These data will be used to estimate the distributions and abundances of ichthyoplankton and zooplankton species.

I.C.10. Sample plankton using a Manta (neuston) net at prescribed stations. These data will be used to estimate the distributions and abundances of ichthyoplankton species.

I.C.11. Sample the vertically integrated abundance of fish eggs using a Pairovet net at prescribed stations. These data will be used to quantify the abundances and distributions of fish eggs.

Leg III (Spring CalCOFI):

I.C.12. Continuously sample pelagic fish eggs using the Continuous Underway Fish Egg Sampler (CUFES). The data will be used to estimate the distributions and abundances of spawning sardine, anchovy and mackerel.

I.C.13. Continuously sample multi-frequency acoustic backscatter using the Simrad EK60. The data will be used to estimate the distributions and abundances of coastal pelagic fishes (e.g., sardine, anchovy, and mackerel), and krill species.

I.C.14. Continuously sample sea-surface temperature, salinity, and chlorophyll-a using a thermosalinograph and fluorometer. These data will be used to estimate the physical oceanographic habitats for target species.

I.C.15. Continuously sample air temperature, barometric pressure, and wind speed and direction using an integrated weather station.

I.C.16. Sample profiles of seawater temperature, salinity, chlorophyll-a, nutrients, and phytoplankton using a CTD with water-sampling rosette and other instruments at prescribed stations. Measurements of extracted chlorophyll and phaeophytin will be obtained with a fluorometer. Primary production will be measured as C-14 uptake in a six hour in situ incubation. Nutrients will be measured with an auto-analyzer. These data will be used to estimate primary productivity and the biotic and abiotic habitats for target species.

I.C.17. Sample the light intensity in the photic zone once per day in conjunction with a daytime CTD station. These data will be used to interpret the measurements of primary production.

I.C.18. Sample plankton using a CalBOBL (CalCOFI Bongo) at 10 nm-spaced stations. These data will be used to estimate the distributions and abundances of ichthyoplankton and zooplankton species.

I.C.19. Sample plankton using a Manta (neuston) net at prescribed stations. These data will be used to estimate the distributions and abundances of ichthyoplankton species.

I.C.20. Sample the vertically integrated abundance of fish eggs using a Pairovet net at prescribed stations. These data will be used to quantify the abundances and distributions of fish eggs.

I.C.21. Sample plankton using a PRPOOS (Planktonic Rate Processes in Oligotrophic Ocean Systems net) at all prescribed CalCOFI stations on lines 90.0 and 80.0 as well as stations out to and including station 70.0 on lines 86.7 and 83.3. These data will be used in analyses by the LTER (Long Term Ecological Research) project.

I.C.22. Continuously sample profiles of currents using the RDI/Teledyne Acoustic Doppler Current Profiler.

I.C.23. Continuously observe, during daylight hours, seabirds and mammals. These data will be used to estimate the distributions and abundances of seabirds and marine mammals.

I.C.24. Addition to usual CalCOFI protocol: Sample fish near the surface at nighttime by conducting 1 trawl between 30 - 60 minutes after the start of each night (defined as 30 minutes after sunset).

Add one trawl prior to each of the next two CalCOFI nighttime stations, before deployment of the pairovet/ bongo/ manta net tows. Transit between nighttime stations at 14 knots.

The trawl data will be used to obtain species composition and size structure for partitioning acoustic backscatter attributed to fish.

No trawling at CalCOFI stations will be done during daylight. No changes to the location of the CalCOFI stations will be made.

After the CalCOFI grid is complete, all extra days will be used to fill gaps in the daytime acoustic transects and do more nighttime trawling in areas of high Coastal Pelagic Species abundance, and to conduct some directed trawls during daytime.

I.D. Participating Institutions

I.D.1. Southwest Fisheries Science Center, Fisheries Resources Division.

I.D.2. Scripps Institution of Oceanography, Integrative Oceanography Division.

I.D.3. Monterey Bay Aquarium Research Institute.

I.E. Personnel (SciencePartY)(15 science berths)

Acoustic calibration staff 17 MAR Seattle, Washington

Position	Name, Gender	Affiliation	Citizenship
Acoustics	Steve Sessions, M	SWFSC	USA
Acoustics	Josiah Renfre, M	SWFSC	USA
Acoustics	Randy Cutter, M	SWFSC	USA

Shimada Leg I (DEPM):
17 MAR – Dep. Seattle 09:00h 30 MAR – Arr. San Francisco, 14 DAS

Position	Name, Gender	Affiliation	Citizenship
Cruise Leader	Dave Griffith, M	SWFSC	USA
Fishery Biologist	Bev Macewicz, F	SWFSC	USA
Fishery Biologist	Sherri Charter, F	SWFSC	USA
Fishery Biologist	Dimitry Abramenkoff, M	SWFSC	USA
Fishery Biologist	Elaine Acuna, F	SWFSC	USA
Acoustics	Josiah Renfree, M	SWFSC	USA
Bird Observer	Scott Mills, M	NWFSC	USA

space for additional (8)

Shimada Leg II (DEPM):
San Francisco to Avila Beach (waypoint only)
2 APR – Dep. San Francisco 7 APR – Arr. Avila Beach, 6 DAS

Position	Name, Gender	Affiliation	Citizenship
Cruise Leader	Dave Griffith, M	SWFSC	USA
Fishery Biologist	Sherri Charter, F	SWFSC	USA
Fishery Biologist	Dimitry Abramenkoff, M	SWFSC	USA
Fishery Biologist	Andrew Thompson, M	SWFSC	USA
Fishery Biologist	Russ Vetter, M	SWFSC	USA
Fishery Biologist	Christina Show, F	SWFSC	USA
Fishery Biologist	Ed Weber, M	SWFSC	USA
Oceanographer	Sam McClatchie, M	SWFSC	USA
Acoustics	Steve Sessions, M	SWFSC	USA

Oceanographer	Marguerite Blum, F	MBARI	USA
Volunteer	Debra Winter, F	Independent	USA
Bird Observer	Scott Mills, M	NWFSC	USA
Mammal observer	Jim Cotton, M	SWFSC	USA
Volunteer	Francisco Werner, M	SWFSC	USA
space for additional (1)			

Shimada Leg III (CalCOFI):
7 APR Dep. Avila Beach 27 APR– Arr. San Diego, 20 DAS

Position	**Name, Gender**	**Affiliation**	**Citizenship**
Cruise Leader	Dave Griffith, M	SWFSC	USA
Fishery Biologist	Sherri Charter, F	SWFSC	USA
Fishery Biologist	Dimitry Abramenkoff, M	SWFSC	USA
Oceanographer	David Wolgast, M	SIO	USA
Oceanographer	Jennifer R.-Wolgast, M	SIO	USA
Oceanographer	Jim Wilkinson, M	SIO	USA
Oceanographer	Megan Roadman, F	SIO	USA
Oceanographer	David Faber, M	SIO	USA
Oceanographer	Shonna Dovel, F	SIO	USA
Acoustics	Randy Cutter, M	SWFSC	USA
Chemist	Melissa Miller, F	SIO	USA
Bird Observer	Dawn Breese, F	FIAER	USA
Mammal observer	Anne Simonis	SIO	USA
Mammal observer	Katherine Whitaker	SIO	USA
Volunteer	Ian Will	SIO	USA

I.F. Administrative

I.F.1. Points of Contacts:

Chief Scientist/alternate: Sam McClatchie/David Griffith (858-546-7083/858-546-7155; 8604 La Jolla Shores Drive, La Jolla, CA, 92037; Sam.McClatchie@noaa.gov/Dave.Griffith@noaa.gov),
Ops Officer: LT Amanda Goeller (OPS.Bell.Shimada@noaa.gov)
Ship cell phone (206) 427-2374
Ship Iridium phone (808) 684-5457 code: 8816 5145 2194

Agent if needed: N/A

I.F.2. Diplomatic Clearances: N/A

I.F.3. Licenses and Permits: N/A

II. Operations

II.A. Itinerary

Acoustic calibration 17 MAR – Seattle, Washington
Leg 1: 17 MAR Dep. Seattle southwards
30 MAR Arr. San Francisco
Leg 2: 2 APR Dep. San Francisco, southwards
7 APR Arr. waypoint Avila Beach

Leg 3: 7 APR Dep. waypoint Avila Beach southwards
28 MAY Arr. San Diego. Offload.

Total 40 DAS

II.B. Staging and Destaging

Staging to be conducted in San Francisco. We will require a crane operator.

We request 2 laboratory vans to be craned onto the afterdeck and secured in San Francisco prior to CalCOFI leg III. The dimensions of the van are approximately 8x8x10 feet and it weighs 5800 lbs. Power requirement is 110V.

De-staging to be conducted in San Diego. Ship will tie up in San Diego the North Navy Pier.

II.C. Operations to be Conducted

II.C.1. Underway Operations

II.C.2.a. Thermosalinometer sampling - The ship will provide and maintain a thermosalinometer (TSG), which is calibrated and in working order, for continuous measurement of surface water temperature and salinity. A backup unit (calibrated and in working order) will also be provided by the vessel and remain aboard during the cruise. The Scientific Computing System (SCS) will serve as the main data collection system. All SCS data will be provided to SWFSC personnel at the completion of the cruise.
NOTE: The vessel has no constant temperature room. The salinometer room can't be considered temperature controlled.

II.C.2.b. Acoustics: Calibration of the Simrad EK60 echosounders will be performed at the beginning of the cruise (requiring 6-12 hours). The ship will sail at 0900 on 17 March, anchor at Elliot Bay (near Seattle), Washington, and calibrate. The keel will remain in the retracted position. Three motorized down-riggers, two on one side of the vessel and one on the other, will be used to swing a 38.1 mm diameter tungsten carbide sphere beneath the keel-mounted transducers.

The EK60 echosounder will be operated at 18, 38, 120 and 200 kHz and interfaced to a data acquisition system to estimate small pelagic fish and krill biomasses between 10 and 750 m (no 70 kHz on vessel). The vessel's Simrad ES60 depth sounder may be used minimally at the discretion of the Commanding Officer, but will normally remain off while underway. The ship shall inform the Cruise Leader of any use of the vessel's sounders, as it interferes with the signals received on the EK60s that will be used continuously.

Daytime (between 30 minutes before sunrise to 30 minutes after sunset): collect acoustic data while transiting at a speed of 9 knots.

Nighttime: collect acoustic data while transiting at 14 knots.

II.C.2.c. ADCP: The ship’s ADCP should run continuously and be logged to a data acquisition system. Complete system settings will be provided by the oceanographer, but will include 5-minute averaging of currents, AGC and 4 beam

returns in 60 8-meter bins. The ADCP transmissions will be triggered by, and thereby synchronized with, the EK60s to avoid cross talk.

II.C.2.d. CUFES: The egg pump will be mounted inside the ship's hull drawing water from a depth of three meters. During the legs I, II and III, the pump will run continuously between stations to sample any pelagic fish eggs. Approximately 640 liters/minute is sent through a concentrator which filters all material larger than 505µm. The sieved material is then collected and identified. All fish eggs are identified to lowest taxa, counted and entered into the data acquisition software. Each sample entry is coupled with sea surface temperature, geographical position, wind speed and direction, date and time, and surface salinity. Sampling intervals will vary in length, depending on the number of fish eggs seen, from five to 30 minutes. At any time during legs I and II when the CUFES detects sardine egg concentrations of one egg per minute or higher in two consecutive samples, the ship will begin conducting pairovet tows at four mile intervals until the egg concentration falls below a density of one egg per minute in two consecutive samples. This information will be relayed to the bridge by scientists monitoring the CUFES system.

II.C.2.e. Surface trawling: During legs I, II and III, a Nordic 264 surface trawl will be deployed between the hours of approximately 1800 and 0600 PST between Port Angeles and south to San Diego at positions indicated in Appendix 2. The positions may be changed at the discretion of the Chief Scientist or Cruise Leader depending on information gained and occurrence of sardines. The trawl has been modified with a marine mammal excluder device (MMED) to reduce possibility of catching marine mammals. Note that trawling during CalCOFI leg III is an addition to the usual protocol.

A marine mammal watch will be initiated 30 minutes before trawling. Trawling will be the first activity on arrival at a trawling station, or will be located away from a previously occupied station to avoid any mammals that may have been attracted to the vessel. The trawl is fitted with a marine mammal excluding device (MMED) to avoid any take of cetaceans or pinnipeds. If any mammals are detected, the trawl position will be moved to a new area and the mammal watch reinitiated. Any mammal capture will trigger telephone contact to the Division Director of FRD (Russ Vetter), SWFSC who will take immediate action.

Any adult salmon caught in the trawl will be immediately returned to the sea and assumed to have survived. Any juvenile salmon caught incidentally will be frozen and turned over to Bob Emmett at NWFSC for further study.

Each trawl will be fished for 30 minutes in duration at a towing speed of approximately 3.5 knots. The catch of each tow will be processed in the following manner: The fish will be sorted to species, if possible, and the catch weighed. Sardines collected in each trawl will be randomly subsampled. Standard length and body weight will be measured, fish sexed and maturity graded, otoliths will be collected, ovaries preserved in buffered formalin and tails preserved in ethanol vials for genetics. Standard length and body weight will also be measured for Northern anchovy, Jack and Pacific mackerels, hake and other species as time permits.

Additional trawls may be set on acoustic targets as time and opportunity permit.

II.C.2.f. Bird Observations: For all 3 legs, during daylight hours a bird observer will be posted on the flying bridge to identify and count birds while the ship is underway during cruise transects.

II.C.g. Acoustic hydrophone: During transit between most daylight stations on leg III (Spring CalCOFI), an acoustic hydrophone array will be towed from the stern with a deck loaded winch to record sounds from marine mammals. Upon approaching a station, a sonobuoy will be deployed one nautical mile prior to stopping for station work.

II.C.h. Shimada position at sunrise and sunset of each day to be recorded by bridge watch and logged as events in the SCS.

II.C.2. Station Operations - Each standard station will include the following:

II.C.2.a. CTD/Rosette consisting of 12 10-liter hydrographic bottles will be lowered to 500 meters (depth permitting) at each station to measure physical parameters and collect water at discrete depths for analysis of: salinity, nutrients and chlorophyll. Casts conducted on line 66.7 will be to a depth of 1000 meters. NOTE: SIO will provide their own CTD sensor and 24 bottle (10 liter) rosette unit for use on leg III.

II.C.2.b. CalBOBL (CalCOFI Bongo): standard oblique plankton tow with 300 meters of wire out, depth permitting, using paired 505 μm mesh nets with 71 cm diameter openings. The technical requirements for this tow are: Descent wire rate of 50 meters per minute and an ascent wire rate of 20 meters per minute. All tows with ascending wire angles lower than 38° or higher than 51° in the final 100 meters of wire will be repeated. Additionally, a 45° wire angle should be closely maintained during the ascent and descent of the net frame. A self contained LOPC (Laser Optical Particle Counter) will be mounted in the port side opening during each tow only during leg 3 (CalCOFI stations). The port side sample will be preserved in buffered ethanol at every station.

II.C.2.c. Manta net (neuston) tow: using a 505 μm mesh net on a frame with a mouth area of 0.1333 m². Tows are 15 minutes in duration at towing speed of approximately 1.5 - 2.0 knots. Wire angles should be kept between 15° and 25°.

II.C.2.d. Pairovet net: will be fished from 70 meters to the surface (depth permitting) using paired 25 cm diameter 150 μm mesh nets at all stations. If sardine eggs are present beyond station 80 we will continue Pairovet sampling at each station on the CalCOFI leg as long as more than one egg per sample is counted (or to the end of the line). The technical requirements for Pairovet tows are: Descent rate of 70 meters per minute, a terminal depth time of 10 seconds and an ascent rate of 70 meters per minute. All tows with wire angles exceeding 15° during the ascent will be repeated.
NOTE: The available winch may not provide 70 m/min on Pairovet but can get to 60 m/min for sure.

II.C.2.e. PRPOOS (Planktonic Rate Processes in Oligotrophic Ocean Systems net will be taken at all Leg III (CalCOFI) stations on line 90.0 and 80.0 as well as stations out to and including station 70.0 on lines 86.7 and 83.3. These stations are occupied as part of the LTER (Long Term Ecological Research) project. The mesh of the PRPOOS net is 202 μm and the tow is a vertical cast up from 210 meters.

II.C.2.f. Primary productivity: at about 1100 hours on each day **of leg III** a primary productivity CTD cast consisting of six 10-liter hydrographic bottles will be carried out. The cast arrangement will be determined by a Secchi disc observation. The purpose of the cast is to collect water from six discrete depths for daily *in situ* productivity experiments. Measurements of extracted chlorophyll and phaeophytin will be obtained with a fluorometer. Primary production will be measured as C^{14} uptake in a six hour *in situ* incubation. Nutrients will be measured with an auto-analyzer. All radioisotope work areas will be given a wipe test before the departure of the SIO and MBARI technical staff.

II.C.2.g. A light meter will be used to measure the light intensity in the euphotic zone once a day with the primary productivity cast.

II.C.2.h. Weather observations.

II.D. Dive Plan: N/A

II.E. Applicable Restrictions: N/A

III. Equipment

III.A. Equipment and Capabilities Provided by the Ship:

We request the following systems and their associated support services, sufficient consumables, back-up units, and on-site spares. All measurement instruments are assumed to have current calibrations and we request that all pertinent calibration information be included in the data package.

1. Starboard hydro winch with ¼" cable for standard Bongo, Pairovet and Manta tows
NOTE: Starboard hydro winch has .375 electro-mechanical wire rather than ¼" dead cable. This wire is heavier and less flexible which caused backlash on the winch while deploying the bongo using SWFSC standard bongo procedure in 2008. Adaptation of the operation that addresses the gear difference but still replicates past sampling will be necessary.
Port winch with 0.375" conductive cable
Port and starboard trawl winch with 1 1/8" trawl cable
Port and starboard gantries with trawl blocks for 1 1/8" trawl cable
J-frame w/block to accommodate 0.375" cable
Constant temperature room set at 22°C ± 1°C (71.5°F ± 2°F)
NOTE: The vessel has no constant temperature room. The salinometer room can't be considered temperature controlled.

Winch monitoring system
Seabird thermosalinometer
Knudsen 12 kHz depth recorder
Acoustic Doppler Current Profiler
Multifrequency EK60 transducers (ES18-11, ES38B, ES120-7C, ES200-7C). (no 70 kHz on vessel).
12-bottle rosette frame capable of carrying 10-liter niskin bottles, fitted with SBE911+ CTD unit. SIO to provide complete CTD for leg III.
Pump unit for CUFES water sampling.
Fish splitting bin and sorting table.
GPS feed to flying bridge for use by bird observers.
-80^{o}C Freezer

III.B. Equipment and Capabilities Provided by the Scientists

37% Formalin (SWFSC)
Ethanol (SWFSC)
Tris buffer (SWFSC)
Sodium borate (SWFSC)
30 cc and 50 cc syringes (SWFSC)
Canulas (SWFSC)
Pint, quart and gallon jars (SWFSC)
Jars for ovaries (SWFSC)
Inside and outside labels (SWFSC)
CalCOFI net tow data sheets (SWFSC)
71 cm CalCOFI Bongo frames (SWFSC)
71 cm CalCOFI 505 μm mesh nets (SWFSC)
CalCOFI 150 μm Pairovet nets and codends (SWFSC)
CalCOFI Pairovet frames (SWFSC)
333 μm mesh codends (SWFSC)
Inclinometer for bongo tows (SWFSC)
Digital flowmeters (SWFSC)
PRPOOS frames (SIO)
170 lb PRPOOS weight (SIO)
202 μm mesh PRPOOS nets and codends (SIO)
75 lb Bongo weight (SWFSC)
100 lb hydro weights (SWFSC)
CalCOFI Manta net frames (SWFSC)
60 cm CalCOFI 505 μm mesh Manta nets (SWFSC)
Standard CalCOFI tool boxes (SWFSC)
Bucket thermometers and holders (SWFSC)
Hand held inclinometer for Pairovet tows(SWFSC)
Oxygen auto-titration rig with reagents (SIO)
Oxygen flasks (SIO)
Guildline Portasal (SWFSC, SIO)
Salinity bottles (SIO)
Standard sea water (SIO)
Data sheets for scheduled hydrographic work (SIO)
Weather observation sheets (SIO)
Primary productivity incubation rack (SIO)
C^{14} and other chemicals for primary productivity work (SIO, MBARI)
24 niskin bottles (10 liter) for rosette (SIO)
SBE911+ CTD unit with necessary sensors (SIO)
Turner fluorometer (SIO)
90% acetone and all supplies for chlorophyll extraction (SIO)
Nutrient vials (SIO)
Simrad EK60 GPTs and ER60 software (SWFSC)
EK60 calibration apparatus
LOPC (SIO)
Isotope van (SIO)

Dissecting microscopes (SWFSC)
Nordic 264 rope trawl (SWFSC) fitted with Marine Mammal Excluder Device

Trawl rigging (SWFSC)
3.0 m² XL-Lite foam core trawl doors (SWFSC)
Motion compensated balances (SWFSC)
Fish measuring boards (SWFSC)
Dissection equipment (SWFSC)
Sonobuoy (SIO)

IV. Hazardous Materials

HAZMAT list and amounts will be provided to Chief Survey Tech upon arrival and departure.

A. Policy and Compliance

The Chief Scientist is responsible for complying with MOCDOC 15, Fleet Environmental Compliance #07, Hazardous Material and Hazardous Waste Management Requirements for Visiting Scientists, released July 2002. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

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, and/or absorbents in amounts adequate to address spills of a size equal to the amount of chemical brought aboard. The amount of hazardous material arriving and leaving the vessel shall be accounted for by the Chief Scientist.

B. Radioactive Isotopes

Each scientist working with these materials will be required to wear a lab coat and disposable booties to reduce the likelihood of tracking the substance out of the specified working area.

It will be the responsibility of the investigator to conduct pre-cruise (for background) and post-cruise wipe tests (regardless of whether a spill occurred or not). Wipe tests should also be conducted in the event of a spill, as well as periodically while underway.

A detailed procedural methodology describing the use of these materials should be provided to the Environmental Compliance Officer (ECO) for review at least one month prior to bringing them aboard. A spill contingency plan should also be provided at the same time. Please note that ship's personnel are not first responders in the event of a spill.

A log detailing the type and amount of materials brought aboard and removed from of the ship shall be maintained, along with a record of any spills that occurred.

All radioisotope work will be conducted by NRC or State licensed investigators only, and copies of these licenses shall be provided to the ECO at least one month prior to bringing any materials on board.

Hazardous Communication training will be conducted for all personnel aboard regarding the hazards of radioactive material. This training will take place prior to the commencment of leg III.

C. Inventory

V. Additional Projects

A. No additional projects
B. No NOAA Fleet Ancillary Projects

VI. Disposition of Data and Reports

A. Data Responsibilities

The Chief Scientist will receive all original data related to the project. The Chief Scientist will in turn furnish the Commanding Officer with a complete inventory listing of all data gathered by the scientific party, detailing types of operations and quantities of data prior to departing the ship. All data gathered by the vessel's personnel that are desired by the Chief Scientist will be released to him, including supplementary data specimens and photos gathered by the scientific crew.

B. Pre and Post Cruise Meeting

Pre-Cruise 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 cruise objectives. Some vessel protocols, e.g., meals, watches, etiquette, etc. will be presented by the ship's Operations Officer.

Post-Cruise Meeting: Upon completion of the cruise, 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, the Vessel Coordinator and the Port Captain to review the cruise. Concerns regarding safety, efficiency, and suggestions for improvements for future cruises should be discussed. Minutes of the post-cruise 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 cruise, 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.Satisfation@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

VII. Miscellaneous

A. Meals and Berthing

Meals and berthing are required for 11 scientists. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the cruise, and ending two hours after the termination of the cruise. Galley will be closed for dinner during inports.

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. We request night lunches for science crew on legs I and II.

Special dietary requirements for scientific participants will be made available to the ship's command at least seven days prior to the survey (e.g., Chief Scientist is allergic to fin fish).

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Chief Scientist. The Chief Scientist and Commanding Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current make-up of the ship's complement. The Chief Scientist is responsible for ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen return; and for the return of any room keys which were issued. The Chief Scientist is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the cruise 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: 08/08) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Chief Scientist or the NOAA website at NOAA HEALTH SERVICES QUESTIONNAIRE 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 cruise 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 – Atlantic 439 W. York Street Norfolk, VA 23510 Telephone 757.441.6320 Fax 757.441.3760 E-mail: MOA.Health.Services@noaa.gov	Regional Director of Health Services Marine Operations Center - Pacific 1801 Fairview Avenue East Seattle, WA 98102 Telephone 206.553.8704 Fax 206.553.1112 Email: MOP.Health-Services@noaa.gov

Prior to departure, the Chief Scientist must provide a listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: 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 modes of communication, the ship is able to maintain contact with the Marine Operations Center on an as needed basis. These methods will be made available to the Chief Scientist upon request, in order to conduct official business. Due to a new directive from Marine Operations Center, the ship must charge the science party for all calls made on the cell or sky-cell telephone. INMARSAT, Sky Cell and cellular communication costs shall be reimbursed to the ship for telephone calls made by all scientific personnel. Currently, Sky Cell and cellular telephone services are about $0.89 per minute and INMARSAT Mini M is

around $1.68 per minute for voice. These charges will be assessed against the program after the ship receives the bill. There is generally a three month delay receiving the bill for review. The Chief Scientist will be required to keep a log of all calls made by the science party.

E. IT Security

Any computer that will be hooked into the ship's network must comply with the NMAO Fleet IT Security Policy 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 preferable.

Non-NOAA personnel using the ship's computers or connecting their own computers to the ship's network must complete NOAA's IT Security Awareness Course within 3 days of embarking.

F. Foreign National Guests Access to OMAO Facilities and Platforms

All foreign national access to the vessel shall be in accordance with NAO 207-12 and RADM De Bow's March 16, 2006 memo. 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.

The following are basic requirements. Full compliance with NAO 207-12 is required.

Responsibilities of the Chief Scientist:

1. 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.
2. Escorts – The Chief Scientist is responsible to provide escorts to comply with NAO 207-12 Section 5.10, or as required by the vessel's DOC/OSY Regional Security Officer.
3. Ensure all non-foreign national members of the scientific party receive the briefing on Espionage Indicators (NAO 207-12 Appendix A) at least annually or as required by the servicing Regional Security Officer.
4. Export Control - The NEFSC currently neither possesses nor utilizes 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 - 8 weeks in advance of the cruise, 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.

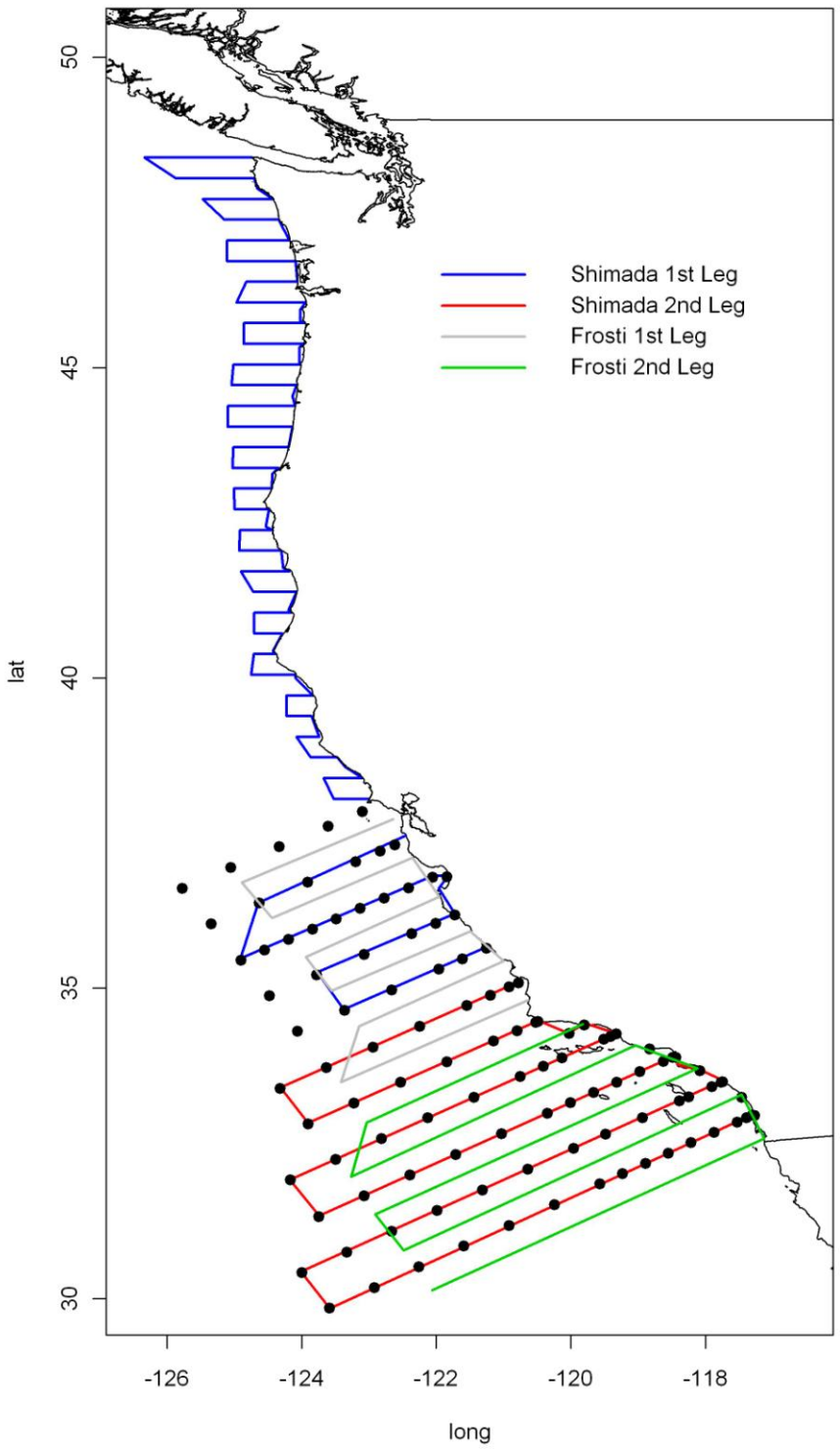
Responsibilities of the Foreign National Sponsor:

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 Guest) as required by NAO 207-12 Section 5.03.h.

Appendix I. Cruise track and proposed station position for SH11-04 legs I, II, and III. Stations listed in Appendix II.



Appendix II. Station positions for SH11-04.

Leg I & II

Schedule_Order	Line	Station	Dlatitude	Dlongitude	Arrive	dist
1	10.3746447	-5.21594115	48.38333	124.732595	3/18/11 8:00 AM	0
2	7.60066404	9.19808497	48.38333	126.337895	3/18/11 2:50 PM	64.327857
3	9.90249911	7.23729906	48.05	125.868695	3/18/11 6:20 PM	27.5297268
4	11.9330885	-3.31395289	48.05	124.700796	3/18/11 11:36 PM	47.1045507
5	12.7608781	-2.61527371	47.8833333	124.656662	3/19/11 1:31 AM	10.1826145
6	13.922388	-3.65065647	47.7166667	124.422127	3/19/11 2:46 AM	13.8146686
7	12.0935853	5.85208127	47.7166667	125.467079	3/19/11 7:37 AM	42.4162163
8	14.1434981	5.20042213	47.3833333	125.148959	3/19/11 10:47 AM	23.8695328
9	15.5715635	-2.22002348	47.3833333	124.33766	3/19/11 2:47 PM	33.140837
10	17.3513857	-1.46825093	47.05	124.178856	3/19/11 5:41 PM	21.0768041
11	15.7073141	7.07459551	47.05	125.108084	3/19/11 10:09 PM	38.1959172
12	17.199937	9.31869933	46.7166667	125.106306	3/20/11 12:58 AM	20.0456655
13	19.0080055	-0.07630033	46.7166667	124.089274	3/20/11 5:47 AM	42.0639943
14	20.5454848	1.93472356	46.3833333	124.065627	3/20/11 8:36 AM	20.0679549
15	19.1968891	8.94223203	46.3833333	124.820176	3/20/11 12:27 PM	31.3989425
16	20.419508	12.589318	46.05	124.967684	3/20/11 3:21 PM	20.9667257
17	22.258311	3.03461728	46.05	123.943356	3/20/11 8:14 PM	42.8829429
18	22.6185906	4.46254966	45.94	124.016662	3/20/11 9:53 PM	7.29228674
19	23.217032	5.46503175	45.8029308	124.024703	3/20/11 10:37 PM	8.24782846
20	23.5015991	5.76780791	45.7435498	124.014096	3/20/11 10:56 PM	3.59782264
21	23.7360943	5.35582997	45.7166667	123.95083	3/20/11 11:12 PM	3.11579882
22	22.1008849	13.8526271	45.7166667	124.857498	3/21/11 3:40 AM	38.1841291
23	23.5793339	16.1703811	45.3833333	124.859275	3/21/11 6:29 AM	20.0393852
24	25.1721466	7.89388349	45.3833333	123.979878	3/21/11 10:52 AM	37.254447
25	25.294957	8.68177687	45.3357988	124.029025	3/21/11 12:11 PM	3.53610422
26	26.5622656	10.6706129	45.05	124.032561	3/21/11 1:44 PM	17.1807904
27	24.7815807	19.9233234	45.05	125.011986	3/21/11 6:31 PM	41.7342779
28	26.2057789	22.5229723	44.7166667	125.040308	3/21/11 9:20 PM	20.0726217
29	27.9705944	13.3527219	44.7166667	124.073567	3/22/11 2:05 AM	41.4315595
30	28.6269535	15.1738199	44.5422787	124.138238	3/22/11 4:04 AM	10.8428523
31	29.4045152	15.901851	44.3833333	124.099044	3/22/11 4:56 AM	9.70080601
32	27.5847346	25.3577086	44.3833333	125.091895	3/22/11 9:49 AM	42.7932386
33	29.0460891	27.7642879	44.05	125.096952	3/22/11 12:38 PM	20.0341474
34	30.8095257	18.6012021	44.05	124.138742	3/22/11 5:24 PM	41.533012
35	32.1793455	21.4834096	43.7166667	124.195908	3/22/11 8:14 PM	20.1849008
36	30.6711486	29.3202307	43.7166667	125.011986	3/23/11 12:28 AM	35.569512
37	32.1155485	31.814909	43.3833333	125.024124	3/23/11 3:17 AM	20.0368387
38	33.3831585	25.243959	43.3828085	124.341999	3/23/11 7:00 AM	29.8949694
39	33.6121046	26.7356303	43.2934315	124.430912	3/23/11 8:36 AM	6.63682662
40	34.6520808	28.6347003	43.05	124.448449	3/23/11 9:55 AM	14.6466814
41	33.6159326	34.0186842	43.05	125.004905	3/23/11 1:08 PM	24.5200159

42	35.1012898	36.3005416	42.7166667	124.992767	3/23/11 3:57 PM	20.0338567
43	36.0506806	31.3673625	42.7166667	124.484913	3/23/11 6:59 PM	22.4987262
44	37.1833831	33.8222726	42.4386465	124.532268	3/23/11 9:30 PM	16.8340781
45	37.6226269	33.1992901	42.3833333	124.427748	3/23/11 10:01 PM	5.71765354
46	36.7099303	37.9418009	42.3833333	124.91387	3/24/11 12:59 AM	21.6504526
47	38.1368347	40.5273879	42.05	124.931066	3/24/11 3:48 AM	20.0382648
48	39.3253145	34.3518658	42.05	124.300712	3/24/11 7:21 AM	28.2215207
49	40.5891284	36.100351	41.7728182	124.275305	3/24/11 9:52 AM	16.688281
50	41.0099252	35.5983714	41.7166667	124.183205	3/24/11 10:21 AM	5.34226781
51	39.6513337	42.6578199	41.7166667	124.90072	3/24/11 2:17 PM	32.2906086
52	41.4504305	43.3094391	41.3833333	124.719661	3/24/11 5:14 PM	21.6229859
53	42.6732092	36.9556948	41.3833333	124.076813	3/24/11 8:52 PM	29.0787435
54	43.7230176	40.2330298	41.0922567	124.194416	3/24/11 11:31 PM	18.2760894
55	43.9831214	40.149191	41.05	124.15502	3/24/11 11:47 PM	3.10578563
56	42.9322136	45.6098684	41.05	124.7055	3/25/11 3:03 AM	25.0268291
57	44.3948728	48.0096678	40.7166667	124.700442	3/25/11 5:52 AM	20.0186405
58	45.1910506	43.8726064	40.7166667	124.284833	3/25/11 8:35 AM	18.9897859
59	46.1309941	47.3626671	40.4375283	124.429341	3/25/11 11:13 AM	18.0202368
60	46.4547642	47.3061585	40.3833333	124.383778	3/25/11 11:34 AM	3.86822061
61	45.8324137	50.5399865	40.3833333	124.707523	3/25/11 1:55 PM	14.8656304
62	47.2017151	53.4248875	40.05	124.748994	3/25/11 4:44 PM	20.1050436
63	48.4810802	46.7771114	40.05	124.086341	3/25/11 8:30 PM	30.576355
64	48.681923	47.1533066	40.0026732	124.089132	3/25/11 9:45 PM	2.84442091
65	50.4324968	46.6372535	39.7166667	123.829095	3/25/11 11:39 PM	20.966985
66	49.6638127	50.6314532	39.7166667	124.225035	3/26/11 2:19 AM	18.3579362
67	51.1227049	53.0508271	39.3833333	124.219977	3/26/11 5:08 AM	20.012506
68	51.8440632	49.3025396	39.3833333	123.849738	3/26/11 7:42 AM	17.2483172
69	53.5146639	50.6218432	39.05	123.736994	3/26/11 10:34 AM	20.6906146
70	52.8526949	54.0615354	39.05	124.075332	3/26/11 1:00 PM	15.836525
71	54.7086504	54.4177073	38.7166667	123.866769	3/26/11 4:01 PM	22.2725602
72	55.4956051	50.3285708	38.7166667	123.466425	3/26/11 6:43 PM	18.8262311
73	56.3340678	50.2876056	38.5728062	123.358428	3/26/11 8:37 PM	10.0199954
74	57.6828883	48.963114	38.3833333	123.092861	3/26/11 10:09 PM	16.920703
75	56.5406611	54.898301	38.3833333	123.671138	3/27/11 1:38 AM	27.3188612
76	58.2790836	55.8651924	38.05	123.523426	3/27/11 4:33 AM	21.1923826
77	59.3199499	50.4566923	38.05	122.998577	3/27/11 7:48 AM	24.907732
78	63.3	50	37.3758582	122.473211	3/27/11 1:07 PM	47.57927
79	63.3	55	37.2091915	122.834518	3/27/11 3:56 PM	20.0005765
80	63.3	60	37.0425248	123.195021	3/27/11 6:45 PM	19.9998193
81	63.3	70	36.7091915	123.913642	3/27/11 11:23 PM	39.9973018
82	63.3	80	36.3758582	124.629124	3/28/11 4:01 AM	39.9942903
83	66.7	90	35.4536276	124.902778	3/28/11 10:11 AM	56.9076238
84	66.7	85	35.6202942	124.549617	3/28/11 1:00 PM	19.9926683
85	66.7	80	35.7869609	124.195712	3/28/11 4:49 PM	19.9934123
86	66.7	75	35.9536276	123.841058	3/28/11 7:38 PM	19.9941578

87	66.7	70	36.1202942	123.485649	3/28/11 11:27 PM	19.9949047
88	66.7	65	36.2869609	123.129477	3/29/11 2:16 AM	19.9956531
89	66.7	60	36.4536276	122.772537	3/29/11 6:05 AM	19.9964029
90	66.7	55	36.6202942	122.414823	3/29/11 8:54 AM	19.9971541
91	66.7	50	36.7869609	122.056327	3/29/11 11:43 AM	19.9979067
92	70	51	36.1820508	121.725864	3/29/11 4:19 PM	39.6638012
93	70	55	36.0487175	122.010478	3/29/11 6:46 PM	15.9962085
94	70	60	35.8820508	122.365563	3/29/11 9:35 PM	19.9945838
95	70	70	35.5487175	123.073478	3/30/11 2:13 AM	39.9868656
96	70	80	35.2153841	123.778431	3/30/11 6:51 AM	39.9838939
97	73.3	80	34.6438074	123.364388	3/30/11 11:28 AM	39.9145015
98	73.3	70	34.9771407	122.664405	3/30/11 4:06 PM	39.9788271
99	73.3	60	35.310474	121.961541	3/30/11 8:44 PM	39.9817775
100	73.3	55	35.4771407	121.609013	3/30/11 11:33 PM	19.9920305
101	73.3	50	35.6438074	121.255748	3/31/11 2:22 AM	19.9927732

Leg III

Schedule_Order	Line	Station	Dlatitude	Dlongitude	Arrive	dist
102	76.7	49	35.0882434	120.777403	4/5/11 1:21 PM	40.7743752
103	76.7	51	35.0215768	120.917821	4/5/11 4:14 PM	7.99621347
104	76.7	55	34.8882434	121.19831	4/5/11 8:00 PM	15.9920687
105	76.7	60	34.7215768	121.548277	4/6/11 12:13 AM	19.9894189
106	76.7	70	34.3882434	122.246083	4/6/11 6:39 AM	39.9765739
107	76.7	80	34.0549101	122.941091	4/6/11 1:05 PM	39.9736468
108	76.7	90	33.7215768	123.633345	4/6/11 7:31 PM	39.9707334
109	76.7	100	33.3882434	124.322891	4/7/11 1:57 AM	39.9678341
110	80	100	32.8166667	123.905992	4/7/11 8:25 AM	40.2057025
111	80	90	33.15	123.220987	4/7/11 1:51 PM	39.9628964
112	80	80	33.4833333	122.533349	4/7/11 7:17 PM	39.9657707
113	80	70	33.8166667	121.843035	4/8/11 12:43 AM	39.9686597
114	80	60	34.15	121.15	4/8/11 6:09 AM	39.9715631
115	80	55	34.3166667	120.802448	4/8/11 9:22 AM	19.9869035
116	80	51	34.45	120.523905	4/8/11 12:08 PM	15.9900521
117	80	50.5	34.4666667	120.489055	4/8/11 1:21 PM	1.99879009
118	81.8	46.9	34.2748975	120.025237	4/8/11 6:12 PM	25.7699138
119	81.7	43.5	34.4055514	119.80037	4/8/11 8:43 PM	13.6557612
120	83.3	39.4	34.2650899	119.327811	4/9/11 1:29 AM	24.9698529
121	83.3	40.6	34.2250899	119.411235	4/9/11 4:00 AM	4.79687137
122	83.3	42	34.1784232	119.508513	4/9/11 5:37 AM	5.59629669
123	83.3	51	33.8784232	120.132579	4/9/11 10:36 AM	35.974774
124	83.3	55	33.7450899	120.40923	4/9/11 1:22 PM	15.9880515
125	83.3	60	33.5784232	120.754434	4/9/11 4:35 PM	19.9844083
126	83.3	70	33.2450899	121.442831	4/9/11 10:01 PM	39.9665933
127	83.3	80	32.9117566	122.128582	4/10/11 3:27 AM	39.9637148
128	83.3	90	32.5784232	122.811732	4/10/11 9:53 AM	39.9608513
129	83.3	100	32.2450899	123.492322	4/10/11 4:19 PM	39.9580033
130	83.3	110	31.9117566	124.170395	4/10/11 10:45 PM	39.955171
131	86.7	110	31.3228593	123.743126	4/11/11 5:21 AM	41.5403357
132	86.7	100	31.6561926	123.069401	4/11/11 11:47 AM	39.9502071
133	86.7	90	31.989526	122.39323	4/11/11 6:13 PM	39.9530105
134	86.7	80	32.3228593	121.714573	4/12/11 12:39 AM	39.9558304
135	86.7	70	32.6561926	121.03339	4/12/11 7:05 AM	39.9586664
136	86.7	60	32.989526	120.349637	4/12/11 12:31 PM	39.9615181
137	86.7	55	33.1561926	120.006783	4/12/11 3:44 PM	19.9818596
138	86.7	50	33.3228593	119.663272	4/12/11 6:57 PM	19.9825786
139	86.7	45	33.489526	119.319096	4/12/11 10:10 PM	19.9832994
140	86.7	40	33.6561926	118.974252	4/13/11 1:23 AM	19.9840221
141	85.4	35.8	34.0213592	118.834131	4/13/11 4:56 AM	22.9890997
142	86.7	35	33.8228593	118.628732	4/13/11 8:40 AM	15.7179208
143	86.7	33	33.889526	118.490334	4/13/11 10:33 AM	7.99410502

144	86.8	32.5	33.8888721	118.444235	4/13/11 11:48 AM	2.30546443
145	88.5	30.1	33.6744235	118.083693	4/13/11 4:15 PM	22.1618229
146	90	27.7	33.4946159	117.747408	4/13/11 8:28 PM	20.0241301
147	90	28	33.4846159	117.768079	4/13/11 10:35 PM	1.19902019
148	90	30	33.4179492	117.905821	4/14/11 12:28 AM	7.99340092
149	90	35	33.2512825	118.249711	4/14/11 3:41 AM	19.9829896
150	90	37	33.1846159	118.387081	4/14/11 5:34 AM	7.99299712
151	90	45	32.9179492	118.935511	4/14/11 10:07 AM	31.9708049
152	90	53	32.6512825	119.482276	4/14/11 2:40 PM	31.9689717
153	90	60	32.4179492	119.959345	4/14/11 6:46 PM	27.9713597
154	90	70	32.0846159	120.638718	4/15/11 12:12 AM	39.9566378
155	90	80	31.7512825	121.315594	4/15/11 5:38 AM	39.9538133
156	90	90	31.4179492	121.990013	4/15/11 11:04 AM	39.9510051
157	90	100	31.0846159	122.662016	4/15/11 4:30 PM	39.9482137
158	90	110	30.7512825	123.331643	4/15/11 9:56 PM	39.9454393
159	90	120	30.4179492	123.998933	4/16/11 3:22 AM	39.9426825
160	93.3	120	29.8463724	123.586614	4/16/11 8:51 AM	40.4180344
161	93.3	110	30.1797058	122.923242	4/16/11 3:17 PM	39.937997
162	93.3	100	30.5130391	122.257599	4/16/11 9:43 PM	39.940723
163	93.3	90	30.8463724	121.589647	4/17/11 4:09 AM	39.9434671
164	93.3	80	31.1797058	120.919346	4/17/11 10:35 AM	39.946229
165	93.3	70	31.5130391	120.246658	4/17/11 5:01 PM	39.9490082
166	93.3	60	31.8463724	119.571542	4/17/11 11:27 PM	39.9518045
167	93.3	55	32.0130391	119.233061	4/18/11 3:40 AM	19.9769802
168	93.3	50	32.1797058	118.893958	4/18/11 7:53 AM	19.9776858
169	93.3	45	32.3463724	118.554228	4/18/11 12:06 PM	19.9783934
170	93.3	40	32.5130391	118.213865	4/18/11 4:19 PM	19.979103
171	93.3	35	32.6797058	117.872864	4/18/11 8:32 PM	19.9798146
172	93.3	30	32.8463724	117.531221	4/19/11 12:45 AM	19.9805281
173	93.3	28	32.9130391	117.394382	4/19/11 3:38 AM	7.99241437
174	91.7	26.4	33.2435006	117.465417	4/19/11 7:52 AM	20.1317972
175	93.4	26.4	32.9490519	117.273565	4/19/11 12:06 PM	20.1316092
176	93.3	26.7	32.9563724	117.305381	4/19/11 2:17 PM	1.66678879