U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Pacific Islands Fisheries Science Center
1845 Wasp Blvd. Bldg. 176 • Honolulu, Hawaii
96818

FINAL Project Instructions

Date Submitted: January 8, 2015

Platform: NOAA Ship *Hi'ialakai*

Project Number: HA-15-01 (OMAO)

Project Title: ASRAMP (American Samoa RAMP)

Project Dates: January 21, 2015 to May 3, 2015

Prepared by: _____ Dated: 1/8/15

Kelvin D. Gorospe, Ph.D.
For: Kelvin D. Gorospe, Ph.D., Chief Scientist Leg I
Bernardo Vargas-Ángel, Ph.D., Chief Scientist Legs II & III
Charles Young, Chief Scientist Leg IV
Coral Reef Ecosystem Division
Pacific Islands Fisheries Science Center

Approved by: _____ Dated: 1/8/15

Ned Cyr, Ph.D., Acting Director
Pacific Islands Fisheries Science Center

Approved by: _____ Dated: 22 Jan 2015

CAPT Douglas D. Baird, Jr, NOAA
Commanding Officer
Marine Operations Center, Pacific

I. Overview

A. Brief Summary and Project Period

NOAA Ship *Hi'ialakai* will be engaged as support for the 2015 American Samoa Reef Assessment and Monitoring Program (ASRAMP) from January 22 through May 3, for a total of 91 days at sea (DAS). The ship will conduct an additional DAS on January 21 in support of fueling operations, sea trials and instrument calibrations. These Project Instructions detail activities occurring on all Legs (I-IV) of ASRAMP 2015.

ASRAMP is a component of an integrated coral reef ecosystem assessment led by the Coral Reef Ecosystem Division (CRED) of the Pacific Islands Fisheries Science Center (PIFSC) in some 50 U.S.-affiliated Pacific Islands. This comprehensive, multi-agency research and education effort is sponsored by: (i) NOAA's Coral Reef Conservation Program (CRCP), a partnership between the National Marine Fisheries Service, National Ocean Service, and other NOAA agencies with the objective of improving understanding and management of coral reef ecosystems (74 DAS); (ii) NOAA's Ocean Acidification Program (13 DAS); and (iii) NOAA's National Marine Fisheries Service (4 DAS).

Small boats will be deployed from *Hi'ialakai* to reach dive survey areas around the American Samoa-administered areas of Swains Island, Tutuila, Ofu, Olesega, Ta'u, and Rose Atoll, as well as the Pacific Remote Island Areas of Howland, Baker, and Jarvis Islands, Palmyra and Johnston Atolls, and Kingman Reef. Teams of scuba divers will conduct rapid ecological assessment (REA) surveys of reef fishes, corals, other invertebrates, and algae. Towed-divers will conduct surveys of larger (>50cm) reef fish, benthic cover, and macroinvertebrates. In addition, autonomous reef monitoring structures (ARMS) will be retrieved in order to characterize coral reef cryptic biodiversity.

Scientists will collect data to monitor nearshore physical and ecological factors associated with ocean acidification and general water quality, including data on water temperature, salinity, and other physical and biological characteristics of the coral reef environment using an assortment of oceanographic sampling and monitoring instruments, including systems deployed from the ship, underwater moored instruments, and shipboard sensors.

Data collected during this mission are pivotal to long-term biological and oceanographic monitoring of coral reef ecosystems at American Samoa as well as the Pacific Remote Island Areas. The 2015 expedition will add to information collected during previous monitoring and mapping surveys conducted in 2002, 2004, 2006, 2008, 2010, and 2012. Data on the abundance and spatial distribution of reef fishes, invertebrates, corals, and algae will allow scientists to evaluate potential changes in the condition and integrity of coral reef ecosystems in these areas and enable federal and jurisdictional resource managers to more effectively

conserve these coral reef ecosystems and manage ecosystem services. Data collected during the project also support monitoring components of the CRCP Coral Reef Ecosystem Integrated Observing System (CREIOS) in the Pacific.

B. Service Level Agreements

Of the 91 DAS (+1 DAS) scheduled for this project, 91 DAS are funded by a Line Office Allocation. The additional +1 DAS is funded by OMAO Allocation for the preparation of the ship and calibration of equipment. This project is estimated to exhibit a High Operational Tempo.

C. Operating Area

The Operating Area for each leg of HA-15-01 follows:

Leg I: The operating area includes transit across the central Pacific Ocean, from Honolulu, Hawai'i to Pago Pago, American Samoa with dive operations occurring en route at Johnston Atoll, Howland and Baker Islands, and Swains Island. Dive operations are also anticipated to begin around Tutuila prior to pulling into port (*Appendix 1*).

Leg II: The operating area includes the nearshore waters of the island of Tutuila (*Appendix 2*).

Leg III: The operating area includes transit from Pago Pago, American Samoa to the Manu'a Islands (Ofu, Olosega, and Ta'u) and Rose Atoll, and returning to Pago Pago, with dive operations occurring around Tutuila, the Manu'a Islands, and Rose Atoll (*Appendix 2*).

Leg IV: The operating area includes return transit across the central Pacific Ocean, from Pago Pago, American Samoa to Pearl Harbor, Hawai'i, with dive operations occurring en route at Jarvis Island, Palmyra Atoll, and Kingman Reef (*Appendix 3*).

The Station/Waypoint List for instrument deployments and retrievals of the project is presented as an attached file (*Appendix 4*).

D. Summary of Objectives

The ship will support assessment and monitoring operations in the waters surrounding Johnston Atoll, the Phoenix Islands, the Territory of American Samoa and the Line Islands. The scientific objectives of this project are to:

1. Conduct ecosystem monitoring of the species composition, abundance, percent cover, size distribution, recruitment and general health of the fishes, corals, other invertebrates, and algae of the shallow water (< 35 m) coral reef ecosystems of Johnston Atoll, the Phoenix Islands, the Territory of American Samoa and the Line Islands.

2. Deploy, retrieve and/or service an array of Subsurface Temperature Recorders (STRs), Sea Surface Temperature (SST) Buoys, Autonomous Reef Monitoring Structures (ARMS), Calcification Accretion Units (CAUs), Bioerosion Monitoring Units (BMUs), Ecological Acoustic Recorders (EARs), moored Acoustic Doppler Current Profilers (ADCPs) as well as anchored arrays consisting of a portable underwater collector (PUC), ADCP, a Conductivity Temperature Pressure (CTP) recorder and a thermistor string to allow remote long-term monitoring of oceanographic and environmental conditions affecting the coral reef ecosystems of Johnston Atoll, the Phoenix Islands, the Territory of American Samoa and the Line Islands. This effort is in support of the Coral Reef Ecosystem Integrated Observing Systems (CREIOS).

3. Monitor nearshore physical and ecological factors associated with ocean acidification and general water quality, including analysis of seawater for nutrients, chlorophyll concentration, salinity, temperature, dissolved oxygen, transmissivity, total alkalinity and dissolved inorganic carbon. These parameters will be measured via the collection of water in Niskin bottles and conductivity-temperature-depth (CTD) casts. Shallow-water CTDs from small boats to a depth of ~30 m.

4. Collect shallow water coral cores to examine calcification/growth rates in recent decades and assess potential early impacts of ocean acidification. Coring operations will be conducted opportunistically (as a scientific dive).

5. Conduct shipboard Acoustic Doppler Current Profiler (ADCP) surveys around reef ecosystems to examine physical and biological linkages supporting and maintaining the island ecosystems.

6. Collect oceanographic data utilizing ship-based measurement systems (ADCP, ThermoSalinoGraph - TSG, and the Scientific Computer System - SCS) during all transits for the duration of the project.

7. Conduct investigations of marine microbial communities, including the collection of specimens via water sampling and benthic grab samples.

8. Determine the existence of threats to the health of these coral reef resources from anthropogenic sources, including marine debris.

E. Participating Institutions

- Joint Institute for Marine and Atmospheric Research (JIMAR)
- NOAA Pacific Islands Fisheries Science Center (PIFSC):
  - Coral Reef Ecosystem Division (CRED)
  - Fisheries Research and Monitoring Division (FRMD)
  - PIFSC Scientific Operations (SCI-OPS)
- NOAA Diving Program (NDP)
- San Diego State University (SDSU)
- U.S. Fish and Wildlife Services (USFWS)
- American Samoa Department of Marine and Wildlife Resources (DMWR)
- NOAA Office of National Marine Sanctuaries (ONMS)
- Bigelow Laboratory for Ocean Sciences (BLOS)
- National Institute of Standards and Technology (NIST)

F. Personnel / Science Party

Name (Last, First)	Title	Participating Leg(s)	Gender	Affiliation	Nationality
Annandale, Senifa	Fish REA Diver	2	Male	CRED/JIMAR	USA
Akridge, Michael	Data Manager	4	Male	CRED/JIMAR	USA
Asher, Jacob	Fish REA Diver	Patch Test, 1	Male	CRED/JIMAR	USA
Ayotte, Paula	Fish REA Diver	Patch Test,1,2,4	Female	CRED/JIMAR	USA
Bailey, Hatsue	Benthic REA Diver	Patch Test,1,4	Female	CRED/JIMAR	JPN (USA Perm. Resident)
Bostick, James	Chamber Operator / Dive Master	Patch Test, 1,2,3,4	Male	NDP	USA
Clark, Jeanette	Instrumentation Diver	Patch Test 1,2,3,4	Female	CRED/JIMAR	USA
Coccagna, Edmund	Fish REA Diver	4	Male	CRED/JIMAR	USA
Cover, Wendy	Benthic REA Diver	3	Female	ONMS	USA
Day, Russell	Instrumentation Diver	3	Male	NIST	USA
Donham, Emily	Fish REA Diver	3	Female	BLOS	USA
Ferguson, Marie	Tow Diver	Patch Test,1	Female	CRED/JIMAR	USA
Garriques, Joao	Benthic REA/Tow Diver	Patch Test, 1,3,4	Male	CRED/JIMAR	USA
Giuseffi, Louise	Fish REA Diver	Patch Test,1	Female	SCI-OPS	USA
Godwin, Scott	Instrumentation Diver	4	Male	ONMS	USA
Gorospe, Kelvin	Chief Scientist / Fish REA Diver	Patch Test, 1,2,3,4	Male	CRED/JIMAR	USA
Gray, Andrew	Tow Diver	Patch Test, 1,2,3,4	Male	CRED/JIMAR	USA
Hevroni, Gur	Microbial Diver	4	Male	SDSU	USA
Heenan, Adel	Fish REA Diver	Patch Test,1	Female	CRED/JIMAR	ENG

Knowles, Ben	Microbial Diver	2,3	Male	SDSU	AUS (USA Perm. Resident)
Kropidlowski, Stefan	Terrestrial Biologist	Patch Test,1	Male	USFWS	USA
Lichowski, Frances	Mapping Specialist, Tow Diver	Patch Test, 2	Female	CRED/JIMAR	GER (USA Perm. Resident)
Lino, Kevin	Fish REA/Tow Diver	2,3,4	Male	CRED/JIMAR	USA
McCoy, Kaylyn	Tow Diver	4	Female	CRED/JIMAR	USA
Morioka, James	Instrumentation / Fish REA Diver	Patch Test, 1,2,3,4	Male	CRED/JIMAR	USA
Nadon, Marc	Fish REA Diver	3	Male	FRMD	CAN
O'Brien, Kevin	Operations Lead / Fish REA Diver	Patch Test,1,2	Male	CRED/JIMAR	USA
Pomeroy, Noah	Instrumentation Diver	Patch Test,1	Male	CRED/JIMAR	USA
Reardon, Kerry	Instrumentation Diver	2,3,4	Female	CRED/JIMAR	USA
Reardon, Russell	Operations Lead / Instrumentation Diver	2,3,4	Male	CRED/JIMAR	USA
Richards, Benjamin	Fish REA Diver	3	Male	FRMD	USA
Ronco, Hope	Terrestrial Biologist	Patch Test,1,3	Female	USFWS	USA
Schumacher, Brett	Benthic REA Diver	2,3	Male	CRED/JIMAR	USA
Silveira, Cynthia	Microbial Diver	Patch Test,1	Female	SDSU	BRA
Stamoulis, Kosta	Fish REA Diver	3	Male	CRED/JIMAR	USA
Suan, Aviv	Instrumentation / Benthic REA Diver	Patch Test,1,2,3,4	Male	CRED/JIMAR	USA
Sudek, Mareike	Benthic REA Diver	2,3	Female	DMWR	GER
Suka, Rhonda	Mapping Specialist	Patch Test	Female	CRED/JIMAR	USA
Swanson, Dione	Benthic REA Diver	Patch Test,1,4	Female	CRED/JIMAR	USA
Taylor, Jeremy	Mapping Specialist	Patch Test	Male	SCI-OPS	USA
Timmers, Molly	Instrumentation Diver	2	Female	CRED/JIMAR	USA
Tootell, Jesse	Benthic REA Diver	Patch Test,1,4	Male	CRED/JIMAR	USA
Trick, Kevin	Data Manager	Patch Test,1,2,3	Male	CRED/JIMAR	USA
Vargas-Ángel, Bernardo	Chief Scientist / Benthic REA Diver	2,3	Male	CRED/JIMAR	USA
Wegman, Alexander	Terrestrial Biologist	4	Male	USFWS	USA
Young, Charles	Chief Scientist / Instrumentation Diver	2,3,4	Male	CRED/JIMAR	USA
Zamzow, Jill	Fish REA/Tow Diver	Patch Test,1,2	Female	CRED/JIMAR	USA

G. Administrative

1. Points of Contact

Chief Scientists*:

Dr. Kelvin D. Gorospe (Leg I)
Kelvin.Gorospe@noaa.gov
NOAA IRC
Attn: NMFS / PIFSC / CRED
1845 Wasp Blvd, Building 176, Honolulu, HI 96818
808-725-5488

Dr. Bernardo Vargas-Ángel, (Legs II, III)
Bernardo.VargasAngel@noaa.gov
NOAA IRC
Attn: NMFS / PIFSC / CRED
1845 Wasp Blvd, Building 176, Honolulu, HI 96818
808-725-5423

Charles Young, (Leg IV)
Charles.Young@noaa.gov
NOAA IRC
Attn: NMFS / PIFSC / CRED
1845 Wasp Blvd, Building 176, Honolulu, HI 96818
808-725-5408

Project Operations Leads*:

Kevin O'Brien (Leg I)
Kevin.OBrien@noaa.gov
NOAA IRC
Attn: NMFS / PIFSC / CRED
1845 Wasp Blvd, Building 176, Honolulu, HI 96818
808-725-5446

Russell Reardon (Legs II, III)
Russell.Reardon@noaa.gov
NOAA IRC
Attn: NMFS / PIFSC / CRED
1845 Wasp Blvd, Building 176, Honolulu, HI 96818
808-725-5404

João Garriques (Leg IV)
Joao.Garriques@noaa.gov

NOAA IRC
Attn: NMFS / PIFSC / CRED
1845 Wasp Blvd, Building 176, Honolulu, HI 96818
808-725-5407

Ship Operations Officer:
LT Faith O. Knighton
OPS.Hiialakai@noaa.gov
Faith.Knighton@noaa.gov
NOAA Ship *Hi'ialakai*
1897 Ranger Loop, Building 184, Honolulu, HI 96818
808-725-5780

* The Leg I Chief Scientist and Project Operations Lead are the designated program points of contact for all project planning and pre-departure correspondence with the ship.

2. Diplomatic Clearances

None Required.

3. Licenses and Permits

The Chief Scientist will ensure the appropriate authorizations are secured for all planned scientific operations prior to the start of the project. These authorizations include:

NEPA: Environmental Assessment for Research Activities Conducted by CRED, FONSI dated May 7, 2010 (PIFSC-20100901)

ESA: Section 7 consultation for the collection of eight ESA-listed coral species, PIRO PRD Biological Opinion (pending)

Navigable Waters: Nationwide Permit No. 5 for the installation and maintenance of scientific measurement devices and structures authorized under U.S. Army Corps of Engineers verification letter dated 18 March 2014 (approved: POH-2009-00083).

National Park: Scientific Research and Collecting Permit in the National Park of American Samoa, NPS permit (pending)

Sanctuary: Research Permit in the American Samoa National Marine Sanctuary, ONMS permit (approved: FBNMS-2014-003)

Refuges: Special Use Permit for research in Rose Atoll, Palmyra Atoll, Kingman Reef, Howland Island, Baker Island, and Jarvis Island National Wildlife Refuges, USFWS permit (pending)

American Samoa: Department of Marine and Wildlife Resources (DMWR), Scientific Study and Collection Permit (approved: scientific permit series no. 2014/010)

Monuments: Scientific exploration and research conducted in the Pacific Remote Islands and Rose Atoll Marine National Monuments by DOC/NOAA/NMFS is exempt from permitting per Presidential Proclamations 8336 and 8337, respectively.

A copy of these research permits will be provided to the Command prior to commencing scientific operations.

II. Operations

The Chief Scientist is responsible for ensuring the scientific staff are trained in planned operations and are knowledgeable of project objectives and priorities. The Commanding Officer is responsible for ensuring all operations conform to the ship's accepted practices and procedures.

A. Project Itinerary

Weather, equipment failures, and scheduling problems are unpredictable. As such, the following intended itinerary should be considered as only a guide for survey progression. In particular, the order in which survey areas are worked within a single island area or among islands within close proximity may be altered as appropriate based on weather, sea conditions, or the progress of the survey. Transit estimates have been calculated based on a ship's speed of 9.7 knots westbound, 9.2 knots north and southbound, and 8.7 knots eastbound.

In addition, the dates below reflect the schedule for our maximum project of 103 DAS.

Pre-Project

Jan 12-16	Loading of 10' ARMS Lab container, boat cradle and chest freezer with Navy crane. Small boat fuel (gasoline) and ethanol loading. Conduct small boat and davit familiarization for scientific personnel. Conduct station walk-throughs and dive neurological examinations for scientific personnel joining on later legs in Pago Pago.

Leg I:

Jan 21	**Depart Pearl Harbor**: Embark full scientific complement (18 ASRAMP personnel and 3 CRED mapping specialists) at Ford Island no later than (NLT) 0700. Transit to Navy fuel pier to take on fuel. Embark additional (3) ASRAMP divers for the Welcome Aboard Brief. (These 3 divers will then disembark once brief is completed.) Depart the fuel pier to conduct a patch test throughout the night in order to calibrate *Hi'ialakai's* multibeam (see ancillary project below).
Jan 22-24	**Begin ASRAMP Transit**: From a nearshore, logistically advantageous location to be determined (e.g., Koolina, Pearl Harbor, Kewalo Basin), transfer the (3) mapping specialists (Lichowski, Suka, Taylor) to shore by small boat and swap for final (3) ASRAMP personnel. Recover the small boat and begin transit ~0830 en route to Johnston Atoll (~710 nmi, 3d 2h).
Jan 25-30	**Johnston Atoll**: Begin Johnston Atoll operations upon arrival (ETA ~1030). Transfer USFWS terrestrial team to shore via small boat to conduct terrestrial surveys. After this initial effort, additional trips to deliver camp re-supply equipment may be conducted opportunistically while on station. Johnston Atoll operations include: fish and benthic Rapid Ecological Assessment (REA) surveys, towed-diver surveys, moored instrument deployments and retrievals (deploy: 16 STRs and 25 CAUs, as well as a temporary deployment [up to 48 hours] of an anchored array consisting of a PUC, ADCP, CTP, and thermistor string; retrieve: nine STRs, 25 CAUs, and the temporarily deployed anchored array), collection of up to six 20-40 cm coral cores as well as collection of carbonate chemistry water samples and small boat CTD casts at all CAU and coral coring sites, and microbial collections at one to two sites per day. Night operations include shipboard ADCP transects each night around Johnston Atoll. Prior to departure, retrieve USFWS terrestrial team. Depart Johnston Atoll (~1700) on January 30 and transit to Howland Island; the Chief Scientist may request an earlier departure from Johnston Atoll due to work tempo and/or operational conditions (~1,050 nmi, 4d 19h).
Jan 31-Feb 3	Continue transit to Howland Island.
Feb 4-7	**Howland Island**: Arrive at Howland Island (~1200) on February 4 and begin operations as time allows. Upon arrival,

transfer USFWS terrestrial team to shore via Avon inflatable boat to conduct terrestrial surveys. Howland Island operations include: fish and benthic Rapid Ecological Assessment (REA) surveys, towed-diver surveys, moored instrument deployments and retrievals (deploy: seven STRs, 25 CAUs, as well as a temporary deployment [up to 48 hours] of an anchored array consisting of a PUC, ADCP, CTP, and thermistor string; retrieve: six STRs, 25 CAUs, and the temporarily deployed anchored array), collection of up to six 20-40 cm coral cores as well as collection of carbonate chemistry water samples and small boat CTD casts at all CAU and coral coring sites, and microbial collections at one to two sites per day. Night operations include shipboard ADCP transects each night around Howland Island. Prior to departure, retrieve USFWS terrestrial team. Depart Howland Island (~1800) Feb 7 en route to Baker Island (~40 nmi, 4.5h).

Feb 8-11 **Baker Island**: Arrive at Baker Island (NLT 0600) for a full day of operations. Upon arrival, transfer USFWS terrestrial team to shore via Avon inflatable boat to conduct terrestrial surveys. Baker Island operations include: fish and benthic Rapid Ecological Assessment (REA) surveys, towed-diver surveys, moored instrument deployments and retrievals (deploy: 16 STRs and 25 CAUs, as well as a temporary deployment [up to 48 hours] of an anchored array consisting of a PUC, ADCP, CTP, and thermistor string; retrieve: nine STRs, 25 CAUs, and the temporarily deployed anchored array), collection of up to six 20-40 cm coral cores as well as collection of carbonate chemistry water samples and small boat CTD casts at all CAU and coral coring sites, and microbial collections at one to two sites per day. Night operations include shipboard ADCP transects each night around Baker Island. Prior to departure, retrieve USFWS terrestrial team. Depart Baker Island (~1700) Feb 11 en route to Swains Island (~770 nmi, 3d 12h).

Feb 12-14 Continue transit to Swains Island.

Feb 15-18 **Swains Island**: Arrive at Swains Island (~0500) for full day of operations. Swains Island operations include: fish and benthic Rapid Ecological Assessment (REA) surveys, towed-diver surveys, moored instrument deployments and retrievals (deploy: 16 STRs and 25 CAUs, as well as a temporary deployment [up to 48 hours] of an anchored array consisting of a PUC, ADCP, CTP, and thermistor string; retrieve: seven STRs, one anchor, 25 CAUs, and the temporarily deployed

	anchored array), collection of up to six 20-40 cm coral cores as well as collection of carbonate chemistry water samples and small boat CTD casts at all CAU and coral coring sites, and microbial collections at one to two sites per day. Divers may also be tasked with collecting tissue samples of reef fish (details provided in the Supplementary Projects section). Night operations include shipboard ADCP transects each night around Swains Island. Depart Swains Island (~1800) Feb 18 en route to Tutuila, American Samoa (~205 nmi, 22.5h).
Feb 19	Continue transit to Tutuila, American Samoa.
Feb 20-21	**Tutuila**: Arrive at Tutuila (exact work location TBD) NLT 0600 on February 20 to conduct a full day of Tutuila operations (detailed in Leg II). On February 21, conduct at least ½ day of Tutuila operations (detailed in Leg II) in the general vicinity of Pago Pago Harbor prior to pulling into port. (Small boats may meet the ship alongside the pier.) End of Leg I.
Feb 22-25	**In-Port, Pago Pago, American Samoa**: Neurological exams and station walk-through for new divers. Resupply small boat fuel. Many staff will remain onboard for HA-15-01, Leg II.
Leg II:	
Feb 26-Mar 6	**Tutuila, American Samoa**: All scientific personnel should embark by 0600 in Pago Pago. Depart Pago Pago at ~0830. As feasible, small boats should be launched prior to ship getting underway. Tutuila operations include: fish and benthic Rapid Ecological Assessment (REA) surveys, towed-diver surveys, moored instrument deployments and retrievals (deploy: 16 STRs, 65 CAUs, 20 BMUs, and 12 ARMS, as well as temporary deployments of up to eight ADCPs [for one month] and an anchored array [up to 48 hours] consisting of a PUC, ADCP, CTP, and thermistor string; retrieve: two SST buoys, eight anchors, 12 STRs, 65 CAUs, nine ARMS, and the temporarily deployed anchored array and up to eight ADCPs), collection of up to six 20-40 cm coral cores as well as collection of carbonate chemistry water samples and small boat CTD casts at all CAU and coral coring sites, and microbial collections at one to two sites per day. Night operations include shipboard ADCP transects each night around the island of Tutuila.
Mar 7	Conduct at least ½ day of Tutuila operations (detailed above) in the general vicinity of Pago Pago Harbor prior to pulling

into port. (Small boats may meet the ship alongside the pier). End of Leg II.

Mar 8-11 **In-Port, Pago Pago, American Samoa**: Neurological exams and station walk-through for new divers. Resupply small boat fuel. Opportunistic fueling of *Hi'ialakai* if moored at the fuel pier during the in-port period. Many staff will remain onboard for HA-15-01, Leg III. Shipboard education and outreach event for American Samoa partners (1 day).

Leg III:

Mar 12 **Tutuila, American Samoa**: All scientific personnel should embark vessel by 0600 in Pago Pago. Depart Pago Pago at ~0830. (Fueling operations for *Hi'ialakai* may need to occur prior to departure if not accomplished opportunistically during the in-port period.) As feasible, small boats should be launched prior to the ship getting underway. Teams will complete work remaining from the initial effort (detailed above in Leg II). Depart Tutuila NLT (~1800) Mar 12 en route to the Manu'a Islands (65 nmi, 8h).

Mar 13-16 **Manu'a Islands**: Arrive at Ofu/Olosega or Ta'u (NLT 0600) on March 13 for full day of operations. Ofu/Olosega and Ta'u operations include: fish and benthic Rapid Ecological Assessment (REA) surveys, towed-diver surveys, moored instrument deployments and retrievals (deploy: 16 STRs, 70 CAUs, 20 BMUs, 12 ARMS; retrieve: 14 STRs, one anchor, 70 CAUs, and nine ARMS), collection of up to six 20-40 cm coral cores as well as collection of carbonate chemistry water samples and small boat CTD casts at all CAU and coral coring sites, and microbial collections at one to two sites per day. Night operations include shipboard ADCP transects each night around Ofu/Olosega and Ta'u. Depart Ofu/Olosega or Ta'u (~1800) March 16 en route to Rose Atoll (~85 nmi, ~10h).

Mar 17-21 **Rose Atoll**: Arrive at Rose Atoll (NLT 0600) for full day of operations. Within the first few days of arrival (exact day will be determined based on the progress of diving operations), transfer USFWS terrestrial team to shore to conduct terrestrial surveys. Rose Atoll operations include: fish and benthic Rapid Ecological Assessment (REA) surveys, towed-diver surveys, moored instrument deployments and retrievals (deploy: 16 STRs and 60 CAUs, as well as a temporary deployment [up to 48 hours] of an anchored array consisting of a PUC, ADCP, CTP, and thermistor string; retrieve: one SST buoy, three

anchors, two EARs, 12 STRs, 60 CAUs, nine ARMS, and the temporarily deployed anchored array), collection of up to six 20-40 cm coral cores as well as collection of carbonate chemistry water samples and small boat CTD casts at all CAU and coral coring sites, and microbial collections at one to two sites per day. Divers may also be tasked with collecting tissue samples of reef fish (details provided in the Supplementary Projects section). Night operations include shipboard ADCP transects each night around Rose Atoll. Prior to departure, retrieve USFWS terrestrial team. Depart Rose (~1800) March 21 en route to the Manu'a Islands (~85 nmi, 10h).

Mar 22 — **Rest Day:** The actual date of the rest day is flexible, but must occur on any day between March 20-22, such that divers do not exceed 10 days of consecutive diving during Leg III. No scientific dive operations are scheduled for the rest day, however possible night operations would include shipboard ADCP transects in the vicinity.

Mar 23-27 — **Manu'a Islands**: Arrive at Ofu/Olosega or Ta'u (NLT 0600) for full day of operations on March 23. Teams will complete work remaining from the initial effort (detailed above in Leg II). Depart Ofu/Olosega or Ta'u (~1800) March 27 en route to Pago Pago (~65 nmi, 8h).

Mar 28-30 — **Tutuila, American Samoa**: Arrive at Tutuila (NLT 0600) for full day of Tutuila operations. Teams will complete work remaining from the initial effort earlier in this Leg. Conduct at least ½ day of Tutuila operations March 30 in the general vicinity of Pago Pago Harbor prior to pulling into port. (Small boats may meet the ship alongside the pier.) End of Leg III.

Mar 31-Apr 2 — **In-Port, Pago Pago, American Samoa**: Resupply small boat fuel. Many staff will remain onboard for HA-15-01, Leg IV.

Leg IV:

Apr 3 — **Depart Pago Pago**: All scientific personnel should embark vessel by 0600. Depart Pago Pago (~0800) en route to Jarvis Island (~1,050 nmi, 4d 21.5h).

Apr 4-7 — Continue transit to Jarvis Island. Conduct neurological exams and station walk through for new divers.

Apr 8-13 — **Jarvis Island**: Arrive at Jarvis Island (~0600) April 8 for a full day of operations. Within the first few days of arrival (exact day will be determined based on the progress of diving

operations), transfer USFWS terrestrial team to shore via Avon inflatable boat to conduct terrestrial surveys. Jarvis Island operations include: fish and benthic Rapid Ecological Assessment (REA) surveys, towed-diver surveys, moored instrument deployments and retrievals (deploy: 16 STRs, 30 CAUs, 20 BMUs, and nine ARMS, as well as a temporary deployment [up to 48 hours] of an anchored array consisting of a PUC, ADCP, CTP, and thermistor string; retrieve: one SST, two anchors, one EAR, seven STRs, 30 CAUs, nine ARMS, and the temporarily deployed anchored array), collection of up to six 20-40 cm coral cores as well as collection of carbonate chemistry water samples and small boat CTD casts at all CAU and coral coring sites, and microbial collections at one to two sites per day. Night operations include shipboard ADCP transects each night around Jarvis Island. Prior to departure, retrieve USFWS terrestrial team. Depart Jarvis Island (~1700) April 13 en route to Palmyra Atoll (~395 nmi, 1d 19h).

Apr 14 — Continue transit to Palmyra Atoll.

Apr 15-22 — **Palmyra Atoll**: Arrive at Palmyra Atoll (~1200) on April 22 and begin operations as time allows. Palmyra Atoll operations include: fish and benthic Rapid Ecological Assessment (REA) surveys, towed-diver surveys, moored instrument deployments and retrievals (deploy: 16 STRs, 60 CAUs, 20 BMUs, 9 ARMS, as well as a temporary deployment [up to 48 hours] of an anchored array consisting of a PUC, ADCP, CTP, and thermistor string; retrieve: one SST buoy, four anchors, one EAR, 17 STRs, 60 CAUs, nine ARMS, and the temporarily deployed anchored array), collection of up to six 20-40 cm coral cores as well as collection of carbonate chemistry water samples and small boat CTD casts at all CAU and coral coring sites, and microbial collections at one to two sites per day. Night operations include shipboard ADCP transects each night around Palmyra Atoll. Depart Palmyra Atoll (~1800) April 22 en route to Kingman Reef (~40 nmi, 4.5h) (Or remain in the lee of Palmyra Atoll if choosing to observe the Rest Day there.)

Apr 23 — **Rest Day**: The actual date of the rest day is flexible, but must occur on any day between Apr 18-25, such that divers do not exceed 10 days of consecutive diving during Leg IV. If the rest day is taken on a day other than Apr 23, then the exact operation dates for Palmyra Atoll (detailed above) and Kingman Reef (detailed below) would be adjusted accordingly. No scientific dive operations are scheduled for the rest day,

	however possible night operations would include shipboard ADCP transects in the vicinity.
Apr 24-28	**Kingman Reef**: Arrive at Kingman Reef (NLT 0600) on April 24. Kingman Reef operations include: fish and benthic Rapid Ecological Assessment (REA) surveys, towed-diver surveys, moored instrument deployments and retrievals (deploy: 16 STRs and 40 CAUs, as well as a temporary deployment [up to 48 hours] of an anchored array consisting of a PUC, ADCP, CTP, and thermistor string; retrieve: three anchors, one EAR, 13 STRs, 40 CAUs, nine ARMS, and the temporarily deployed anchored array), collection of up to six 20-40 cm coral cores as well as collection of carbonate chemistry water samples and small boat CTD casts at all CAU and coral coring sites, and microbial collections at one to two sites per day. Night operations include shipboard ADCP transects each night around Kingman Reef. Depart Kingman Reef (~1800) April 28 en route to Pearl Harbor (~930 nmi, 4d 5h).
Apr 29-May 2	Continue transit to Pearl Harbor. Arrive offshore of Pearl Harbor (~2300) on May 2.
May 3	Enter Pearl Harbor (~0800) and proceed to Navy Kilo Pier as desired by the Command (if chamber offload is necessary) or NOAA Pier F9/10. Disembark scientific personnel. End of project.

B. Staging and Destaging

Staging: Staging of large scientific gear and equipment will begin the week of January 12, or as otherwise coordinated with the Command. Assistance from the ship's personnel for craning aboard large gear and for loading small boat fuel will be necessary. Ethyl alcohol will be delivered in drums to be transferred to the ship's stainless steel tank. Hand carried items will be loaded in lab areas throughout the week prior to departure. All scientists anticipate embarking the vessel at Ford Island, Pearl Harbor, by 0700, on January 21, 2015, and will be aboard for the fueling and patch test. The ship itself will not return to the pier prior to beginning transit to Johnston Atoll on January 22; however, a limited personnel exchange is anticipated to occur via small boat.)

Mid-project Refueling: Replenishment of unleaded gasoline will be required in Pago Pago during all scheduled in-ports. Support from ship's personnel will be necessary to facilitate the logistics of purchase, transport, and transfer of unleaded gasoline in Pago Pago. Such logistics are typically facilitated through the ship's Port Agent, and payment for gasoline is made through use of program accounting codes. *Hi'ialakai* will be responsible for providing diesel fuel for HI-1 (Metal

Shark) and HI-2. Re-fueling of *Hi'ialakai* is scheduled for the day of departure on Leg III, unless it occurs opportunistically during the preceding in-port period.

Destaging: Full off-load of all program-provided gear and small boats will begin in coordination with the Command upon return to Pearl Harbor, May 3. It is anticipated that the recompression chamber will be offloaded at the Navy Kilo Pier prior to arrival at *Hi'ialakai's* home pier.

C. Operations to be Conducted

The Chief Scientist has the authority to revise or alter the technical portion of the instructions as work progresses, provided that, after consultation with the Commanding Officer, it is ascertained that the proposed changes will not (1) jeopardize the safety of personnel or the ship, (2) exceed the overall time allotted for the project, (3) result in undue additional expenses, and (4) alter the general intent of the project instructions. In addition, the Chief Scientist must notify the Office of the Science Director of the Pacific Islands Fisheries Science Center at the earliest opportunity prior to making (1) deviations from the general project track or area of operations noted in the project instructions, (2) changes or additions of research operations to those specified in the project instructions, or (3) port calls not specifically identified in the project instructions.

Scientific Operations

The ship will support assessment and monitoring operations within the project Operations Area. Specifically, the ship will support Rapid Ecological Assessments and the continuation of long-term monitoring operations of reef fish, corals, other invertebrates, and algae, and oceanographic monitoring of the coral reef ecosystems of the region.

Research and monitoring efforts will require extensive diving operations (both scuba and snorkeling) to be supported by *Hi'ialakai*. Up to five small boats will be operating simultaneously during daylight hours to maximize productivity. *Hi'ialakai*'s 29-ft Metal Shark (HI-1), 26-ft Ambar (HI-2), and 17-ft Northwind (HI-3), as well as two program-provided 19-ft SAFE Boats will be required to support the REA, towed diver, instrumentation, and microbial survey teams on a daily basis. The program's 17-ft Avon will be loaded aboard the ship inflated and ready to deploy/retrieve USFWS terrestrial survey teams to/from islands on Leg I. (The Avon will be deflated and stowed after Baker Island and then re-inflated during the in-port prior to Leg IV for use at Jarvis Island.) The ship's 17-ft Zodiac inflatable (HI-7) is anticipated to be carried deflated and palletized, serving as a back-up platform.

The REA and towed-diver surveys will include monitoring of species composition, abundance, size distribution, and spatial distribution of reef fishes,

corals, other invertebrates, and algae of the region and will further ground-truth shallow-water benthic habitat maps. Benthic community structure and demography parameters, including percent cover, taxonomic richness, density, size-class distribution, and health condition, will be assessed along line and belt transects to provide spatial-temporal appraisals of coral reef dynamics in the region. Scientists may also obtain limited specimens of algae, corals, and other invertebrates. All deployments, retrievals, and specimen collections will be conducted as stipulated through pertinent Agency-approved Special Activity Permit guidelines.

A number of Autonomous Reef Monitoring Structures (ARMS) will be recovered and replaced or newly installed at select locations by the Instrumentation Team. These small units are designed to mimic the complexity of the coral reef structure and to attract small invertebrates to recruit within them. ARMS samples will be processed onboard in a program-provided lab space, preserved in ethanol, and stored in the scientific freezer until the ship returns to Honolulu.

Calcification Accretion Units (CAUs) will be recovered and replaced or newly installed at select locations. The CAUs serve as a mechanism to quantify accretion rates of calcifying coralline algae and scleractinian corals; this information will allow for comparisons to determine possible consequences of increased ocean acidity and lowered aragonite saturation states. Additionally, a Bioerosion Monitoring Unit (BMU) will be installed on CAUs at select locations. Each BMU is made of a 1cm x 2cm x 5cm block of calcium carbonate rock mounted on a similarly sized piece of polyvinylchloride plate. The BMUs rest flush on the seafloor and serve as a mechanism to quantify bioerosion rates across coral reefs experiencing different physical oceanography and local human impacts. BMUs will be retrieved on a subsequent mission and measured for changes in weight and scanned for changes in density using microcomputed tomography.

Approximately 151 STRs, 425 CAUs, 42 ARMS, and 80 BMUs will be deployed and 106 STRs, 425 CAUs, 54 ARMS, 22 anchors, five SST buoys, and five EARs will be retrieved. In addition, the following instruments will be deployed and retrieved during the same project: eight moored ADCPs deployed and retrieved within one month and nine anchored arrays consisting of a PUC, ADCP, CTP, and thermistor string deployed and retrieved within 48 hours. Retrieved anchors will be secured on stackable aluminum pallets for transport back to Pearl Harbor.

As part of CRED's effort to investigate ocean acidification and carbonate chemistry, the Instrumentation Team may also obtain coral cores at several locations, if time and operational conditions allow. Up to three cores may be collected with a diver-held pneumatic drill at each given site. Each core would measure 30-90 cm in length and 3.8 cm in diameter. Locations for coring will not be planned in advance. Coring operations will be conducted opportunistically as appropriate, and as a scientific dive. In addition, underway shipboard

oceanographic measurements (ADCP, TSG, and SCS) will be recorded throughout the duration of the project and water samples may be collected from small boats for nutrient, chlorophyll, salinity and carbonate chemistry analyses.

As part of the ongoing effort to understand the microbial community, two types of water samples will be collected at select REA sites using diver-deployable Niskin bottles (four bottles; two liters per bottle). Two of the Niskin bottles will be filled with water collected from approximately one meter above the benthos, and two will be filled with water from within the reef (pore-water). The pore-water samples will be collected using Niskin bottles with a flexible stainless-steel hose attachment. These water samples will be returned to the ship and processed for dissolved organic carbon (DOC), particulate organic matter (POM), nutrients, microbial (Bacteria and Archaea) and viral abundance (fluorescent microscopy), FACS (heterotrophs vs. autotrophs), and microbial and viral community composition (coarse analysis: 16s rRNA). At two REA sites per island, approximately 60-80 L of reef water will be collected from reef crevices and surfaces for metagenomic analysis of the microbial and viral community associated with the reef benthos.

In addition to understanding water-column microbial dynamics, investigating shifts in the microbial community associated with benthic composition is important as it can serve as an indicator of reef-ecosystem health. If time permits, six fist-sized samples of rubble (three of these will also contain a handful of the first 5-10 cm of sediment from different sand pockets), and six pieces of the most dominant algae-type will be collected in zip-top bags. Both the algae and the rubble/sediment samples will be frozen at -20°C. These samples will remain on the ship until it returns to Honolulu. The 16s bacterial rRNA genes associated with these samples will be sequenced to characterize the microbial communities associated with the benthos (rubble and algae).

Snorkeling Operations

All snorkeling shall be conducted in accordance with the NOAA Scientific Diving Manual (Section 4.13).

Small Boat Operations

Per OMAO Supplement to the NOAA Small Boat Standards and Procedures Manual, March 2010, Section 4.03a2, a program certified Operator in Charge (OIC) must "earn the full confidence of both the Commanding Officer (CO) and Designated Examiner (DE) and has successfully completed the shipboard training requirements." As part of any OIC evaluation, it is understood that a small boat OIC will be designated to accompany and evaluate an OIC-in-training. This may limit the number of small boats the ship can deploy during this evaluation period,

but every effort will be made to limit any impact to operations. An OIC-in-training is not guaranteed to be qualified by the CO and DE during a project.

Small boat deployment and recovery operations from a ship at sea are inherently dangerous. Experience levels of all personnel involved and environmental conditions are limiting factors regarding the decision to proceed with said operations. Proficiency levels of deck officers, deck department, or small boat crews may impact operations. All small boat crewmembers must have the full confidence of the CO and DE. At any time, the CO may call for a halt to boat deployment and recovery operations. If indicated, a Safety Stand Down, extra training or practice may be required to begin operations again. This is especially true when the ship has been in port or when program personnel have not been aboard for an extended period of time, as well as when boat operations are called for within 48 hours of departure.

While minimizing impact to science operations, ship's diver/coxswain training and proficiency regulations may require the use of a ship's small boat during an extended project. The CO will work with the Chief Scientist to plan and minimize impacts to fulfill such requirements.

CTD Operations

No shipboard CTD operations are required under ASRAMP 2015. However, should multibeam mapping be undertaken as an Ancillary Project by *Hi'ialakai*, CTD casts for the purposes of calculating sound velocity profiles may need to be conducted.. Such surveying would be conducted on a not-to-interfere basis with the ship's primary mission

D. Dive Plan

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

The Dive Plans encompassing Legs I-IV of HA-15-01 are presented in *Appendix 5* (attached file).

E. Applicable Restrictions

Conditions which preclude normal operations: Poor weather and sea conditions, equipment failure, safety concerns, and/or unforeseen circumstances, may alter or prohibit operations as planned. At these times, the Chief Scientist and Commanding Officer will determine the appropriate plan of action.

NMFS employees are not exempt from the requirements of the Marine Mammal Protection Act (MMPA) or the Endangered Species Act (ESA). PIFSC has developed mitigation measures for its fisheries and ecosystem research projects to avoid take and to comply with the Lecky, Murawski, and Merrick guidance. A copy of these documents is available at https://sites.google.com/a/noaa.gov/pifsc-science-operations/nepa-permits/protected-species-mitigation-measures and on the ship's bridge.

1. "Take" of Protected Species

    a. Under the MMPA and ESA it is unlawful to take a protected species. The MMPA defines take as "harass, hunt, capture, kill or collect, or attempt to harass, hunt, capture, kill or collect." The ESA defines take as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." An incidental take is one that is incidental to, but not the purpose of, otherwise lawful activities.

    b. In the event of an incidental take of a marine mammal or federally listed threatened or endangered species during the project, the Chief Scientist will report the incident to the ship's Commanding Officer then the PIFSC Director and Deputy Director IMMEDIATELY via IRIDIUM, INMARSAT, and email. Samples should not be collected from any incidentally taken marine mammals, sea turtles, or seabirds.

2. Activities in the Hawaiian Islands Humpback Whale National Marine Sanctuary

    a. The humpback whale season in Hawaii is November through May.

    b. Unless otherwise authorized under the MMPA and ESA, it is unlawful to approach, or cause a vessel or other object to approach, within 100 yards of any humpback whale within the Sanctuary. Please reference the complete list of prohibited activities and boundary maps at https://sites.google.com/a/noaa.gov/pifsc-science-operations/nepa-permits/protected-species-mitigation-measures. A copy of these materials will also be available on the ship's bridge.

III. Equipment

A. Equipment and Capabilities Provided by the Ship

1. **Equipment:** To successfully meet the project objectives, the scientific compliment aboard will need the ship to provide the items listed below. Prior to sailing, the ship's crew will inspect these items to ensure they are in proper working order for the project:

    J-frame
    A-frame
    Aft deck crane
    30-ft Metal Shark launch, HI-1
    26-ft Ambar launch, HI-2
    17-ft Northwind launch, HI-3
    17-ft Zodiac inflatable and 50hp motor, HI-7 (deflated)
    SCUBA compressor (Nitrox and Air)
    Recompression chamber
    Dive lockers
    Scientific freezer with shelving
    Wet Lab faucets and drains
    Acoustic Doppler Current Profiler (ADCP)
    Scientific Computer System (SCS)
    ThermoSalinoGraph (TSG)
    Sea Surface Sound Velocity (SSSV)
    CTD (Would only be required if multibeam echosounder project is possible; See "Additional Projects" section below.)
    Adequate fresh water for gear and small boat wash-down
    Iridium phone
    VHF radios for ship's small boats
    Global Positioning System (GPS) for ship's small boats
    Depth sounders for ship's small boats
    Ethanol and gasoline storage tanks
    Rack space for up to three standard (55-gal)

2. **Capabilities:** It is requested that the ship provide the following:

    a. Assistance from the Command and ship's Deck Department in conducting davit hook checkouts for program personnel prior to departure of HA-15-01.

    b. Permission for Scientists to ready scientific work spaces (e.g., set up computer server) during the week prior to departure.

    c. Assistance from the ship's Deck Department in craning and staging large gear during loading and off-loading.

    d. Support from the Engineering and Deck departments prior to sailing to transfer 2.84 kL (750 gallons) of program-provided gasoline into the ship's stainless steel fuel tank to be used as

outboard engine fuel. The gasoline will be delivered by truck and may be pumped directly into the deck tank.

e. Support from the Engineering and Deck departments prior to sailing to transfer three drums (~568 L / 150 gal) of program-provided ethyl alcohol into the ship's stainless steel deck tank to support scientific operations. Additional storage capacity for one standard drum of waste ethanol (~150 L / 40 gal) generated during the project is necessary.

f. *Hi'ialakai*'s HI-1 (Metal Shark), HI-2, and HI-3 will be required to support the program's dive teams on a daily basis. The ship's HI-7 may be required as a backup should one of the other boats become inoperable or to mitigate unforeseen events. The ship should plan to provide coxswains for the HI-1 (Metal Shark), HI-2, and HI-3 during all days of diving operations, as well as for the tiller-Avon (program provided) for ship to shore transfers of the USFWS terrestrial team to island beaches (specifically Howland, Baker, and Jarvis). Should one of these particular vessels become inoperable, a ship coxswain will be needed for the replacement platform, HI-7 or tiller-Avon (program provided).

g. Support from the medical officer and deck department to conduct neurological exams, boat familiarizations and station walk-throughs for new divers. This may be required up to five times: once in Honolulu prior to departure for as many Leg II-IV personnel as possible, once during the initial transit to Johnston Atoll for Leg I personnel, and during each of the three Pago Pago in-port periods (minimal new personnel only).

h. Mid-project support from the Command is requested to assist in arranging the logistics of purchase, delivery, and transfer of additional unleaded gasoline during all Pago Pago in-ports. Such logistics are typically facilitated through the ship's Port Agent, and payment for gasoline is made using program accounting codes. *Hi'ialakai* will be responsible for providing diesel fuel for HI-1 and HI-2.

i. Operable Wet Lab facilities are necessary to support water sampling and the cleaning of field equipment. Approximately 16 0.9 m x 0.6 m totes of the program's glass sample bottles and plastic sample bags filled with seawater will need to be stored onboard in an air conditioned space.

j. To support the ARMS Lab (10-ft container box), power, freshwater, saltwater and compressed air sources and connections on the fantail will be necessary.

k. To support CAU processing, deck power connection for one chest freezer (~ 6 ft x 3 ft x 3 ft) will be necessary. Note: Similar program freezers were carried previously on the bridge deck (starboard rail) and on the boat deck (port side).

l. To be consistent with the mission objectives, the ship and its compliment of small boats will employ all methods feasible to minimize damage to coral reef habitats during any anchoring operations that may be required.

B. Equipment and Capabilities Provided by the Scientists

1. **Equipment**: The program's full equipment list is presented in *Appendix 6* (attached file).

2. **Capabilities**: In addition to scientific expertise, the program will provide coxswains and routine maintenance for program-provided boats.

IV. Hazardous Materials

A. Policy and Compliance

The Chief Scientist is responsible for complying with FEC 07 Hazardous Materials and Hazardous Waste Management Requirements for Visiting Scientific Parties (or the OMAO procedure that supersedes it). By Federal regulations and NOAA Marine and Aviation Operations policy, the ship may not sail without a complete inventory of all hazardous materials by name and quantity, MSDS, appropriate spill cleanup materials (neutralizing agents, buffers, or absorbents) in amounts adequate to address spills of a size equal to the amount of chemical brought aboard, and chemical safety and spill response procedures. Documentation regarding those requirements will be provided by the Chief of Operations, Marine Operations Center, upon request.

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

- List of chemicals by name with anticipated quantity
- List of spill response materials, including neutralizing agents, buffers, and absorbents

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

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

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

Upon departure from the ship, scientific parties will provide the CO or their designee an inventory showing that all chemicals were removed from the vessel. The CO's designee will maintain a log to track scientific party hazardous materials. MSDS will be made available to the ship's complement, in compliance with Hazard Communication Laws.

Scientific parties are expected to manage and respond to spills of scientific hazardous materials. Overboard discharge of hazardous materials is not permitted aboard NOAA ships.

B. Inventory of Hazardous Materials

See *Appendix 7.*

C. Chemical safety and spill response procedures

See *Appendix 8.*

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

V. Additional Projects

Supplementary (piggyback) and ancillary projects are secondary to the objectives of the project 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.

A. Supplementary ("Piggyback") Projects

1. USFWS Biological Inventorying and Monitoring

In support of ongoing USFWS biological inventorying and monitoring in the U.S. Pacific Remote Island Areas (PRIAs), and the National Wildlife Refuges within these areas, a team of two terrestrial wildlife biologists will be deployed during this project to the shores of Johnston Island, Howland Island, Baker Island, Rose Island and Jarvis Island. The team will remain on each island while the ship supports ASRAMP activities in the immediate vicinity of each island. The terrestrial team will be recovered to the ship prior to departing each island area and proceeding to the next.

Additionally, equipment and supplies will be opportunistically offloaded to Johnston Island by small boat to support a USFWS field camp stationed there (items detailed in *Appendix 6*).

2. Collection of Fish Genetic Samples

On behalf of the American Samoa Department of Marine Wildlife Resources, CRED fish REA divers will opportunistically collect fin clips of three species of fish around the waters of Swains Island and Rose Atoll. This will involve collecting the specified fish and obtaining pectoral fin clips. The fin clips to be stored in vials of 95% ethanol will be transported to DMWR in Pago Pago. The DMWR staff will later send these samples off-island for genomic DNA extraction, PCR amplification and DNA sequencing.

The objective of this project is to determine the population genetic connectivity of the populations of the three most abundant coral reef fish species in the local coral reef fishery in the Samoan Archipelago: the blue-lined surgeonfish, *Acanthurus lineatus*; the dark-capped parrotfish, *Scarus oviceps;* and the big-scaled soldierfish, *Myripristis berndti*. The study will focus on the Territory of American Samoa, but will also include two islands from the Independent State of Samoa. There is current interest in the potential connectivity of the coral reef ecosystems in Samoa and American Samoa. Their close geographic proximity might also mean that marine fish and invertebrate populations are actively exchanging larvae

across political boundaries, which would imply the need for trans-boundary resource management.

All permits for this project will be obtained by DMWR, with CRED divers identified as the sample collectors. A copy of the permit will be provided by the Chief Scientist to the Command prior to initiating this Supplementary Project.

B. NOAA Fleet Ancillary Projects

Collection of multibeam echosounder data: This ancillary project requires the assistance of the ship's Senior Survey Technician, if aboard, or similarly trained individual, to run the multibeam surveying operation. Although extensive multibeam surveying has been conducted throughout the Pacific Islands Region, gaps in coverage remain that preclude characterizing the suitability of uncovered areas as habitat for deep sea corals, and may limit the ability to effectively survey and study these areas with other technologies. Using multibeam bathymetry data supplied by the Pacific Islands Fisheries Science Center/Coral Reef Ecosystem Division, services of the ship's Senior Survey Technician or other trained shipboard personnel are requested to identify data gaps that are within range of shipboard multibeam echosounders and conduct survey operations to collect multibeam data to fill them. Multibeam data should be collected following standard practices for insuring high quality data, including collecting sound velocity profiles with the ship's CTD and applying them before beginning a multibeam survey session, and every six hours thereafter, or more frequently if required. Surveying will be conducted on a not-to-interfere basis with the ship's primary mission. Data collected, including both multibeam and sound velocity data, should be provided to the Chief Scientist at the conclusion of the project using a program supplied hard drive and will include information on all system specifications, settings and offsets required to enable the development of metadata records meeting ISO 1911 standards.

Surveying should prioritize the shallowest gaps first and work progressively deeper. Depths as shallow as the ship is able to safely navigate may contain black corals, wire corals or other azoothanthellate coral species and are a high priority. It is anticipated that the NOAA Ship *Okeanos Explorer* will conduct multibeam surveying at depths below 500 m throughout the region between FY15 – FY17, so gaps at those depths should receive the lowest priority. However, if gaps shallower than 500 m have been filled and survey time is available, gaps between 500 m and 3000 m those deeper areas should also be surveyed.

VI. Disposition of Data and Reports

The project will follow the current PIFSC and CRED data management plans, both of which comply with NOAA requirements. Disposition of data gathered aboard NOAA

ships will conform to NAO 216-101 *Ocean Data Acquisitions* and NAO 212-15 *Management of Environmental Data and Information.* To guide the implementation of these NAOs, NOAA's Environmental Data Management Committee (EDMC) provides the *NOAA Data Documentation Procedural Directive* (data documentation) and *NOAA Data Management Planning Procedural Directive* (preparation of Data Management Plans). OMAO is developing procedures and allocating resources to manage OMAO data and Programs are encouraged to do the same for their Project data.

A. Data Classifications: *Under Development*

1. OMAO Data

2. Program Data - *Under Development.*
   Contact Nori Shoji (noriko.shoji@noaa.gov), PIFSC Directorate - Science Operations Lead, for PIFSC data policy updates.

B. Responsibilities: *Under Development*

Integrated ecosystem observations of coral reefs are collected to characterize the spatial and temporal variability of the distribution, abundance, and diversity of corals, algae, other macroinvertebrates, and fishes in the context of their benthic habitats and oceanographic environments. All data are quality assured, processed, and made available to region managers and stakeholders.

VII. Meetings, Vessel Familiarization, and Project Evaluations

A. Pre-Project Meeting: The Chief Scientist and Commanding Officer will conduct a meeting of pertinent members of the scientific party and ship's crew to discuss required equipment, planned operations, concerns, and establish mitigation strategies for all concerns. This meeting shall be conducted before the beginning of the project with sufficient time to allow for preparation of the ship and project personnel. The ship's Operations Officer usually is delegated to assist the Chief Scientist in arranging this meeting.

B. Vessel Familiarization Meeting: The Commanding Officer is responsible for ensuring scientific personnel are familiarized with applicable sections of the standing orders and vessel protocols, e.g., meals, watches, etiquette, drills, etc. A vessel familiarization meeting shall be conducted in the first 24 hours of the project's start and is normally presented by the ship's Operations Officer.

C. Post-Project Meeting: The Commanding Officer is responsible for conducting a meeting no earlier than 24 hrs before or 7 days after the completion of a project to discuss the overall success and shortcomings of the project. Concerns regarding safety, efficiency, and suggestions for future improvements shall be discussed and mitigations for future projects will be documented for future use. This meeting shall be attended by the ship's officers, applicable crew, the Chief Scientist, and

members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.

D. Project Evaluation Report: Within seven days of the completion of the project, a Customer Satisfaction Survey is to be completed by the Chief Scientist. The form is available at http://www.omao.noaa.gov/fleeteval.html and provides a "Submit" button at the end of the form. Submitted form data is deposited into a spreadsheet used by OMAO management to analyze the information. Though the complete form is not shared with the ship, specific concerns and praises are followed up on while not divulging the identity of the evaluator.

VIII. Miscellaneous

A. Meals and Berthing

The ship will provide meals for the scientists listed above. Meals will be served 3 times daily beginning one hour before scheduled departure, extending throughout the project, and ending two hours after the termination of the project. Packed lunches will be required for scientists on all full-day small boat operations. Since the watch schedule is split between day and night, the night watch may often miss daytime meals and will require adequate food and beverages (for example a variety of sandwich items, cheeses, fruit, milk, juices) during what are not typically meal hours. Special dietary requirements for scientific participants will be made available to the ship's command at least seven days prior to the project.

Berthing requirements, including number and gender of the scientific party, will be provided to the ship by the Chief Scientist. The Chief Scientist and Commanding Officer will work together on a detailed berthing plan to accommodate the gender mix of the scientific party taking into consideration the current make-up of the ship's complement. The Chief Scientist is responsible for ensuring the scientific berthing spaces are left in the condition in which they were received; for stripping bedding and linen return; and for the return of any room keys which were issued. The Chief Scientist is also responsible for the cleanliness of the laboratory spaces and the storage areas utilized by the scientific party, both during the project and at its conclusion prior to departing the ship.

All NOAA scientists will have proper travel orders when assigned to any NOAA ship. The Chief Scientist will ensure that all non NOAA or non Federal scientists aboard also have proper orders. It is the responsibility of the Chief Scientist to ensure that the entire scientific party has a mechanism in place to provide lodging and food and to be reimbursed for these costs in the event that the ship becomes uninhabitable and/or the galley is closed during any part of the scheduled project.

All persons boarding NOAA vessels give implied consent to comply with all safety and security policies and regulations which are administered by the Commanding Officer. All spaces and equipment on the vessel are subject to

inspection or search at any time. All personnel must comply with OMAO's Drug and Alcohol Policy dated May 17, 2000 which forbids the possession and/or use of illegal drugs and alcohol aboard NOAA Vessels.

B. Medical Forms and Emergency Contacts

The NOAA Health Services Questionnaire (NHSQ, NF 57-10-01 (03-14)) must be completed in advance by each participating scientist. The NHSQ can be obtained from the Chief Scientist or the NOAA website http://www.corporateservices.noaa.gov/~noaaforms/eforms/nf57-10-01.pdf.

All NHSQs submitted after March 1, 2014 must be accompanied by NOAA Form (NF) 57-10-02 - Tuberculosis Screening Document in compliance with OMAO Policy 1008 (Tuberculosis Protection Program).

The completed form should be sent to the Regional Director of Health Services at Marine Operations Center. The NHSQ and Tuberculosis Screening Document should reach the Health Services Office no later than 4 weeks prior to the project to allow time for the participant to obtain and submit additional information should health services require it, before clearance to sail can be granted. Please contact MOC Health Services with any questions regarding eligibility or completion of either form. Ensure to fully complete each form and indicate the ship or ships the participant will be sailing on. The participant will receive an email notice when medically cleared to sail if a legible email address is provided on the NHSQ.

The participant can mail, fax, or email the forms to the contact information below. Participants should take precautions to protect their Personally Identifiable Information (PII) and medical information and ensure all correspondence adheres to DOC guidance (http://ocio.os.doc.gov/ITPolicyandPrograms/IT_Privacy/PROD01_008240).

The only secure email process approved by NOAA is Accellion Secure File Transfer which requires the sender to setup an account. Accellion's Web Users Guide is a valuable aid in using this service, however to reduce cost the DOC contract doesn't provide for automatically issuing full functioning accounts. To receive access to a "Send Tab", after your Accellion account has been established send an email from the associated email account to AccellionAlerts@doc.gov requesting access to the "Send Tab" function. They will notify you via email usually within 1 business day of your approval. The 'Send Tab" function will be accessible for 30 days.

Contact information:

Regional Director of Health Services
Marine Operations Center – Pacific
2002 SE Marine Science Dr.
Newport, OR 97365

Telephone 541-867-8822
Fax 541-867-8856
Email MOP.Health-Services@noaa.gov

Prior to departure, the Chief Scientist must provide an electronic listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: contact name, address, relationship to member, and telephone number.

C. Shipboard Safety

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 with chin straps 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 program when required.

All scientists will comply with standing safety regulations of PIFSC and that of the vessel's standing orders from the Commanding Officer:

NOAA Ship* Hi'ialakai *Working Rules (14 March 2014):

1.20 FOOTWEAR
For the purpose of promoting safety, proper footwear shall be worn at all times outside an individual's own stateroom except when in the immediate process of changing shoes (such as changing from dive boots to other suitable footwear when exiting one of the small boats).
Closed-toe footwear with a heel retainer shall be worn on the weather decks during all operations including loading and unloading small boats as addressed in Ship Specific Instruction 1701-06-HA Personal Protection Equipment. Use common sense regarding the wearing of sandals and "flip-flops" aboard ship under any circumstances, underway or in port. This style of footwear is substantially less suitable and less safe aboard ship than more protective styles.

Inside the house of the ship:
Open-toed shoes may be worn by program personnel and off-duty ship's personnel in the lounge (except during meal hours), passageways, and to, at, and from smoking areas. Open-toed shoes include flip flops in good repair, which fit properly, have good traction, and provide coverage for the sole of the foot.

Outside the house of the ship and on weather decks:
Open-toed shoes are not permitted except when the wearer is in the immediate process of embarking or disembarking the ship via the gangway. Sandals such as

certain varieties of Keen brand shoes are popular among ship's personnel are permitted as they provide (1) very significant coverage of the toes, (2) a heel retainer, (3) traction on a wet platform, and (4) lateral stability for the foot. Flip-flops, Birkenstocks, Crocs, etc., which do not provide significant coverage of the toes, traction when wet, or much lateral stability are not suitable for wear outside the house of the ship and on weather decks. Dive boots are acceptable. Shoes will be in reasonable repair, fit properly, and provide coverage for the sole of the foot. No flip-flops will be worn by crew or scientific personnel while alongside and loading or unloading gear.

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.
4. Provide the Electronics Technician with a spreadsheet of the following information:

Device	Name	Operating System	LAN MAC Address	WAN MAC Address
Iphone	*Scientist*	*MAC OS*	*21:34:6K:P8:W6:77*	*21:34:6K:P8:W6:78*
Laptop	*Scientist*	*Windows XP*	*23:34:6K:P8:M6:77*	*23:34:6K:P8:M6:78*

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 prior to embarking. Arrangements to take the Course and/or achieve security clearance for any non-NOAA computers should be coordinated with PIFSC/CRED administration well in advance of the project.

F. Foreign National Guests Access to OMAO Facilities and Platforms

The foreign national participants for project HA-15-01 are Cynthia Silveira, Adel Heenan, Marc Nadon, Mareike Sudek, and no others. Chamber Operator James Bostick will serve as the onboard foreign national sponsor for these participants.

All foreign national access to the vessel shall be in accordance with NAO 207-12 and RADM DeBow'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 Deemed Exports point of contact to assist with the process.

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 for providing 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 Security Officer.

4. Export Control – Ensure that approved controls are in place for any technologies that are subject to Export Administration Regulations (EAR).

The Commanding Officer and the Chief Scientist will work together to implement any access controls necessary to ensure no unlicensed export occurs of any controlled technology onboard regardless of ownership.

Responsibilities of the Commanding Officer:

1. Ensure only those foreign nationals with DOC/OSY clearance are granted access.

2. Deny access to OMAO platforms and facilities by foreign nationals from countries controlled for anti-terrorism (AT) reasons and individuals from Cuba or Iran without written approval from the Director of the Office of Marine and Aviation Operations 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 or Servicing Security Office 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 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 and a 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.

APPENDICES

Appendix 1: Operating Area for HA-15-01 Leg I ASRAMP

Appendix 2: Operating Area for HA-15-01 Leg II and III ASRAMP

Appendix 3: Operating Area for HA-15-01Leg IV ASRAMP

Appendix 4: Station/Waypoint List (attached file; coordinates in Latitude, Longitude: decimal degrees)

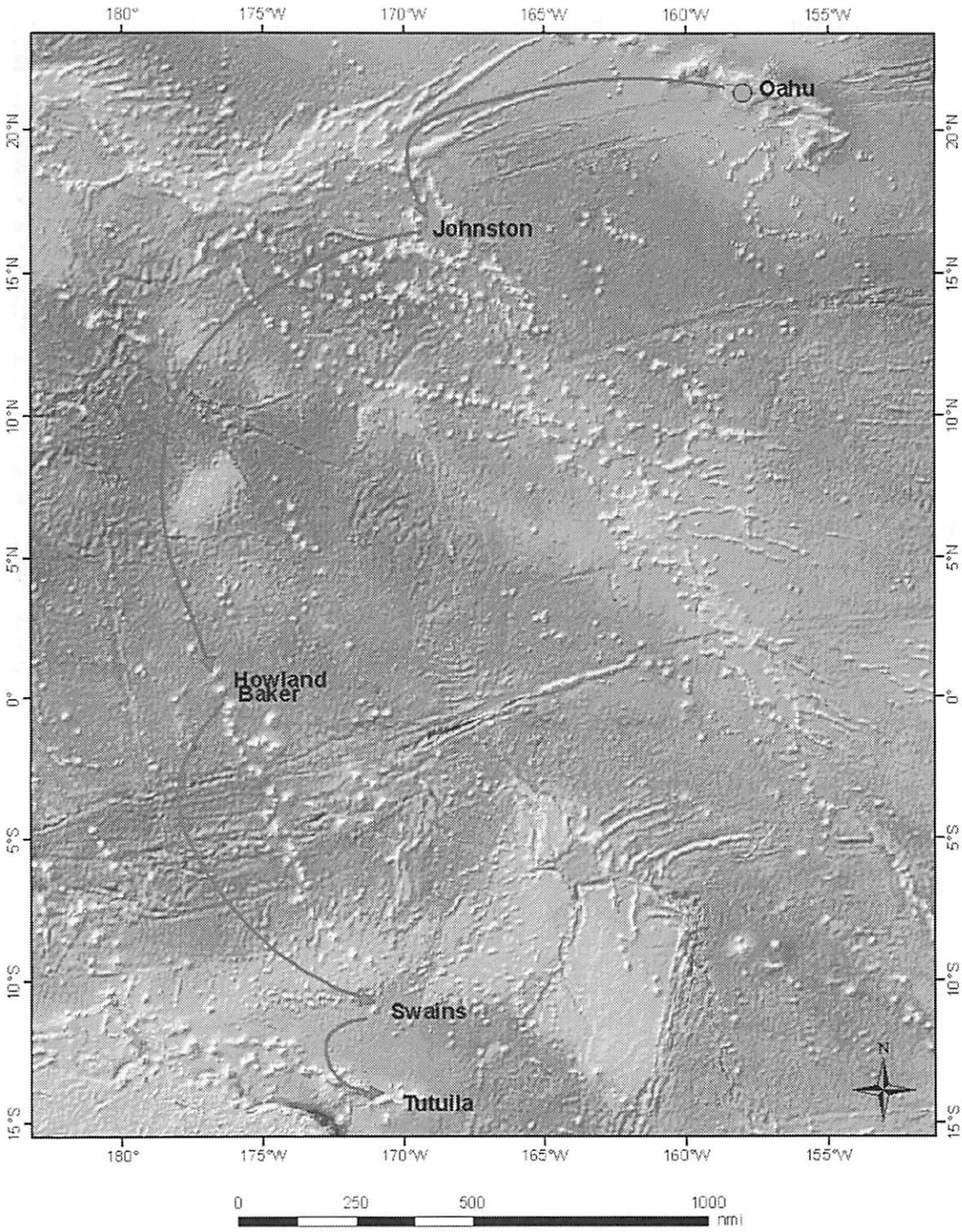
Appendix 5: Dive plans (attached file)

Appendix 6: Program Equipment List (attached file)

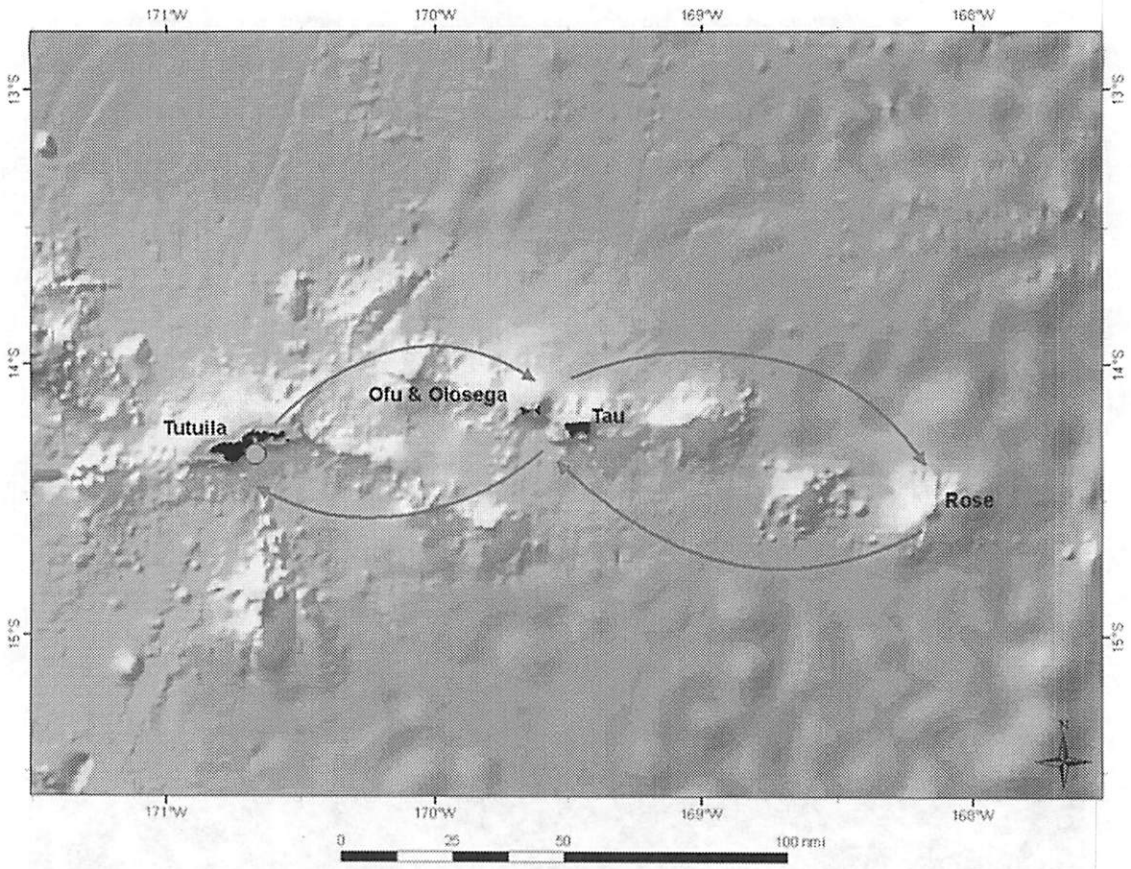
Appendix 7: Section IV.B. Hazardous Materials Inventory

Appendix 8: Section IV.C. Chemical Safety and Spill Response Procedures

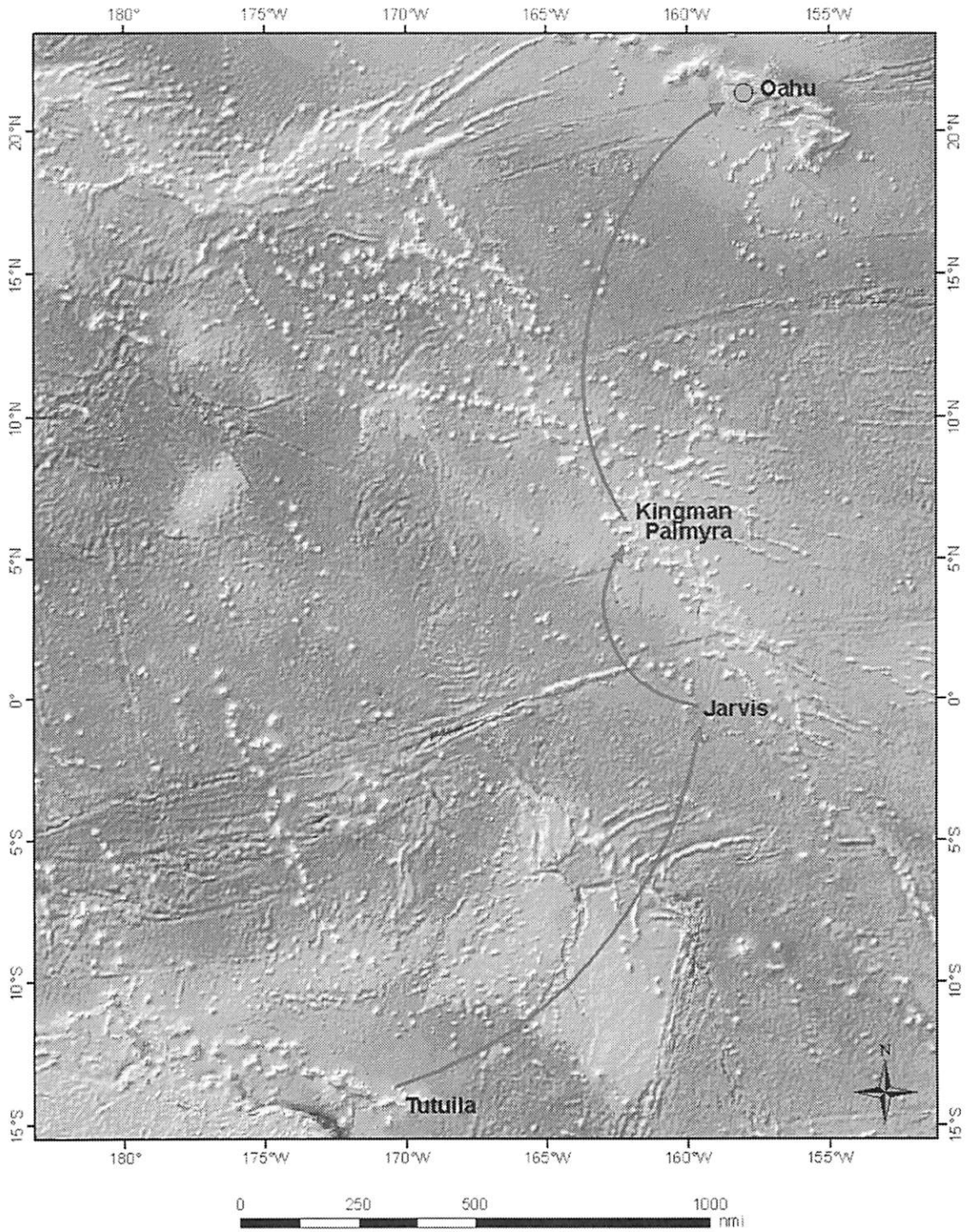
Appendix 1: **Operating Area for HA-15-01 Leg I ASRAMP**



Appendix 2: **Operating Area for HA-15-01 Legs II and III ASRAMP**



Appendix 3: **Operating Area for HA-15-01 Leg IV ASRAMP**



Appendix 4: **Station/Waypoint List of Instrument Deployments and Retrievals (coordinates in Latitude, Longitude: decimal degrees)**

(Attached File)

Appendix 5: **Dive Plans**

(*Attached File*)

Appendix 6: Program Provided Equipment List

(*Attached File*)

Appendix 7: Section IV.B. Hazardous Materials Inventory

Inventory of Hazardous Materials

Common Name	Quantity	Notes	Trained Individual	Spill Control*
10,000X SYBR Gold (nucleic acid stain)	1 ml	Stored in sealed container in Scientific refrigerator	(I) Cynthia Silveira (II/III) Ben Knowles (IV) Gur Hevroni	NT
25% Glutaraldehyde (disinfectant/fixative)	10 ml	Stored in sealed plastic container in Scientific refrigerator	(I) Cynthia Silveira (II/III) Ben Knowles (IV) Gur Hevroni	F
32% Paraformaldehyde (disinfectant/fixative)	10 ml	Stored in Hazmat cabinet in wetlab	(I) Cynthia Silveira (II/III) Ben Knowles (IV) Gur Hevroni	F
5% Hydrochloric Acid	5 L	Stored in sealed plastic bucket in wet-lab	(I) Cynthia Silveira (II/III) Ben Knowles (IV) Gur Hevroni	A
95% Ethyl Alcohol (190 proof)	568 L	Highly Volatile, Flammable Bulk stored in ship's fantail tank. Daily use quantity (19 L carboy) stored in ARMS lab in secondary containment. Preserved samples stored in secondary containment in Scientific freezer.	Bulk: Ship's Chief Engineer Daily use and sample quantities: (I) Noah Pomeroy (II-IV) Kerry Reardon	Ship SOP (bulk) AL (Daily use)
Chloroform	70 ml	Stored in Hazmat cabinet in wet-lab within sealed metal secondary container and padding	(I) Cynthia Silveira (II/III) Ben Knowles (IV) Gur Hevroni	F
Commercial Bleach	9.5 L	Stored in ARMS lab in secondary containment	(I) Kevin O'Brien (II-IV) Kerry Reardon	F
Conservation Inert Mouse Bait (dry)	275lbs	Stored in sealed 5-gal buckets on the weather deck	(I, III) Hope Ronco (II) Russell Reardon (IV) Alex Wegmann	NT
DAPI Nucleic Acid Stain	500 µg	Stored in sealed plastic container in Scientific fridge	(I) Cynthia Silveira (II/III) Ben Knowles (IV) Gur Hevroni	NT
DMSO Buffer	10 L	Stored in Hazmat cabinet in wetlab	(I) Noah Pomeroy (II-IV) Kerry Reardon	F

Common Name	Quantity	Notes	Trained Individual	Spill Control*
Dynamic Descaler (Aqueous Hydrogen Chloride)	76 L	Biodegradable; neutralize with copious amounts of water Inventory stored in ½ pallet tote on fantail In-use quantity held in ½ pallet tote behind ARMS lab	(I) Noah Pomeroy (II-IV) Kerry Reardon	A
Gasoline, unleaded	3.4 kL	Volatile, Flammable Stored in ship's fantail tank & drum rack	Ship's Chief Engineer	Ship SOP
Glyo-Fixx (aldehyde-based fixative)	5 gal (x2)	Volatile, Flammable Stored in Hazmat cabinet in wetlab; Offloaded upon reaching Pago Pago.	Hatsue Bailey	AL
Liquid Nitrogen	12 L	Stored in wetlab Scientific dewar	(I) Cynthia Silveira (II/III) Ben Knowles (IV) Gur Hevroni	LN
Mercuric Chloride (Saturated solution, 7g $HgCl_2$ in 60 ml of deionized water)	60 ml	Scientific samples consist of 200 µl $HgCl_2$ solution in 500 ml of seawater	(I) Noah Pomeroy (II-IV) Charles Young	M
Mytomycin (antibiotic)	1mg	Stored in program mini-fridge	(I) Cynthia Silveira (II/III) Ben Knowles (IV) Gur Hevroni	P
Nitrox50 *~50% Oxygen* *~50% Nitrogen*	5 Cylinders (3,000 psi) (80 ft^3 each)	Breathing gas; Non-flammable; vigorously accelerates combustion. Stored in location TBD. Offloaded upon reaching Pago Pago.	Kevin O'Brien	GNF

Common Name	Quantity	Notes	Trained Individual	Spill Control*
Oxygen	4 Cylinders (3,000 psi) (20 ft^3 each)	Breathing gas; Non-flammable, non-toxic; vigorously accelerates combustion. Stored in location TBD (Also a component of Tri-mix and EAN gas cylinders). Offloaded upon reaching Pago Pago	Kevin O'Brien	GNF
Pool Time Shock XtraBlue 6 in 1 Pool Shock (primarily Sodium Dichloro-s-Triazinetrione-Dihydrate)	4.6 kg	Corrosive Contained in ten 1-lb bags within lidded 5-gal bucket on Grated Deck	(I) Kevin O'Brien (II-IV) Kerry Reardon	P
Propane	12x16oz canisters	Store in Flammables cabinet	(I, III) Hope Ronco (II) Russell Reardon (IV) Alex Wegmann	G
RNAlater	500ml	Stored in undersink cabinet	(I) Cynthia Silveira (II/III) Ben Knowles (IV) Gur Hevroni	NT
Sodium Hydroxide (NaOH) pellets	500 g	Highly caustic Stored in Hazmat cabinet in wetlab	(I) Cynthia Silveira (II/III) Ben Knowles (IV) Gur Hevroni	B
Sofnolime CO2 Absorbant	5 kegs (44lb each)	Non-hazardous. Stored in location TBD. Offloaded upon reaching Pago Pago	Kevin O'Brien	B/NT
Tri-mix 12/70 *~70% Helium* *~12% Oxygen* *~18% Nitrogen*	11 Cylinders 3,000 psi 3-80 ft^3 8-20 ft^3	Breathing gas; Non-flammable. Stored in location TBD. Offloaded upon reaching Pago Pago	Kevin O'Brien	GNF
Z Fix (buffered zinc formalin fixative)	3.8L	Toxic Stored in Hazmat cabinet in wetlab	(I/IV) Hatsue Bailey (II/III) Bernardo Vargas-Ángel	F

Appendix 8: **Section IV.C. Chemical Safety and Spill Response Procedure**

***Spill Control Key**

A: Acids

- Wear appropriate personal protective equipment (PPE) 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 ahead of spill for containment. 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 to original containers for re-use.
- Neutralize spill area and washings with soda ash or lime. Collect in a non-combustible container for disposal.
- J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this type.

AL: Alcohols (daily use quantities)

- Extinguish smoking lamp. Remove all sources of ignition.
- Wear appropriate PPE and clothing during clean-up.
- Ventilate closed spaces before entering them.
- Use absorbent socks to surround spills or to divert fluid flow.
- Use vermiculite or kitty litter to soak up and absorb fluid.
- Do not use combustible materials, such as saw dust.
- Use absorbent pads/diapers to wipe up the spill or a dust pan to sweep up vermiculite/kitty litter.
- Place used absorbents in plastic bag or pail.
- Clean surface thoroughly to remove residual contamination.
- Bags containing used absorbents will be properly disposed of once the ship returns to port.

B: Bases

- Wear appropriate PPE 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 ahead of spill for containment. 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 to original containers for re-use.
- Neutralize spill area and washings with product such as Grainger Base Eater Spill Kit. Collect in a non-combustible container for prompt disposal.

F: Fixatives/Formalin/Formaldehyde

- Wear appropriate PPE (gloves, goggles, breathing mask).
- Ventilate area of leak or spill. Remove all sources of ignition.
- Isolate hazard area. Keep unnecessary and unprotected personnel from entering.
- Contain and recover liquid when possible.
- Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e.g., vermiculite, kitty litter, absorbent pads), and place in a chemical waste container. A dust pan and plastic bags are available to aid in cleanup and disposal.
- Do not use combustible materials, such as saw dust.

LN: Liquid Nitrogen

- Wear appropriate PPE (close-toed shoes, cryogloves, goggles, long-sleeved and long-legged clothes are of particular importance).
- Ventilate area.
- Contain spill where safe to do so.
- Nitrogen is more harmful in its liquid state than in its gaseous state, in a well-ventilated area. Minimally handle or interfere with the spilled LN, and allow it to sublimate off after restricting personnel access to the contained spill area under well maintained ventilation.

M: Mercury

- Wear appropriate PPE and clothing during clean-up (a minimum of nitrile gloves and eyewear).
- Stop the flow of fluid by using absorbent material (e.g. cloth, fleece, paper) to dike and soak up the spilled solution.
- Use Mercury Spill Kit if need be.
- Sprinkle area with sulfur or calcium polysulfide to suppress mercury.
- Contaminated area should be wiped with water dampened absorbent material, until one feels the area is sufficiently clean.
- Pick up used absorbents and place in a suitable container for reclamation or disposal in a method that does not generate dust
- If all the $HgCl_2$ solution from a spill is not wiped up, then potential exists for the $HgCl_2$ to come out of solution, and $HgCl_2$ crystals are more problematic (from a health perspective) than $HgCl_2$ in solution.
- All PPE and absorbent material contaminated with $HgCl_2$ should be contained in a zip-top bag labeled "$HgCl_2$ Waste," kept within the ship's HAZMAT locker, and properly disposed of once the ship returns to port.

- The concentration of $HgCl_2$ in solution, once mixed with copious amounts of fresh/salt water, will rapidly dilute the concentration of $HgCl_2$ relieving concern for further contamination by effluent, as concentrations will be below environmental toxicity, see MSDS for toxicological information.
- Areas of skin contact should be thoroughly rinsed under fresh/salt water for a minimum of 15 minutes.
- $HgCl_2$ solution contact with eyes/ingestion should be immediately addressed by the ship's doctor, rinse eyes for a minimum of 15 minutes.

NT: Non-toxic

- Wear appropriate PPE and clothing during clean-up.
- Ventilate area.
- Contain spill where safe to do so.
- Absorb liquid with paper towel while wearing gloves; place waste in sealed plastic container until processed on land.

P: Powdered Chlorine Salts

- Wear appropriate PPE (gloves, eyewear, dust mask, etc.) and clothing during clean-up.
- Ventilate area.
- Keep upwind. Avoid inhalation of salts, granules or dust.
- **Large Spills**: Sweep or scoop all spilled material, contaminated soil or other materials and place into clean, dry containers for disposal. Do not close containers containing wet or damp material. If wet or damp, container should be left open in a well-ventilated area to disperse any hazardous gases that may form. Once cleaned, neutralize/flood the spill area with large amounts of water as appropriate.
- **Small Spills**: Sweep or scoop up spilled material and add it to dive gear "disinfectant" rinse tote if available and full of water. If dive gear "disinfectant" rinse tote is not available, dispose of collected material into a clean, dry container. Once cleaned, neutralize/flood spill area with large amounts of water as appropriate.
- Never return spills to original containers for re-use.

G: Flammable gases (ex. Propane)

- Wear appropriate PPE (gloves, goggles, breathing mask).
- Eliminate sources of ignition.
- Isolate hazard area and deny entry to unnecessary or unprotected personnel.
- Stay upwind and keep out of low areas.
- Disperse vapor clouds with water spray.
- Shut off source of leak only if it can be done safely.
- Containers should be left in well-ventilated areas to allow for gas to disperse.

GNF: Non-Flammable gases (ex. Oxygen, Nitrogen, Helium)

- Ventilate area.

- Isolate cylinder and move exposed personnel to fresh air.

Inventory of Spill Kit Supplies

Product Name	Amount	Chemicals useful against	Amount of clean up possible
Absorbent pads	20	A, AL, F, M	~4 L
Base Eater	Large Kit	B	~19 L
Dust pan	1 set	A, F, P	n/a
Goggles	1 pair	A, F, G, LN, M	n/a
Kitty litter	5.4 kg	A, AL, F	~4 L
Nitrile gloves	6 pairs	A, F, G, LN, M	n/a
NEUTRASORB®	3.2 kg	A	Varies with acid concentration
Plastic bags	5	A, AL, F, P	~4 L (each)
Vermiculite	2.5 kg	AL, F, NT, M	~6 L of chemical spilled
Vinyl gloves	20 pairs	A, F, G	n/a