

Research Vessel

BLUE HERON

Cruise Planning Manual

**Large Lakes Observatory
University of Minnesota, Duluth**

ABOUT THE RESEARCH VESSEL BLUE HERON

The Large Lakes Observatory operates the largest university-owned research vessel in the Great Lakes, the *R/V Blue Heron*. Built in 1985 for fishing on the Grand Banks, the *R/V Blue Heron* was purchased by the University of Minnesota in 1997, sailed from Portland, Maine up the St. Lawrence Seaway to Duluth, and converted into a limnological research vessel during the winter of 1997-98.

She is equipped with standard sampling gear and state-of-the-art acoustic remote sensing systems. The vessel is 86 feet long, has a draft of 12 feet, and a cruising speed of 9 knots. The *R/V Blue Heron* has berthing for 11 crew and scientists, and can operate 24 hours per day for up to 21 days in between port calls. She has a large working deck (800 sq. ft.), a 200 sq. ft. wet lab, and a 400 sq. ft. dry lab.

R/V BLUE HERON CRUISE PLANNING MANUAL

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Large Lakes Observatory
University of Minnesota
Research Lab. Building, room 109
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This manual has been prepared to acquaint you with the capabilities of the Research Vessel Blue Heron and procedures for her use in limnological research. Your suggestions for improvement of the vessel, this manual, or our operating procedures will be most welcome.

The Marine Superintendent is available to assist you in the planning of your scientific operations. The *Blue Heron's* Master and crew will assist you at sea. Our objective is to make your cruise a success, both professionally and personally.

Robert W. Sterner, Director
Large Lakes Observatory
University of Minnesota, Duluth

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A. CRUISE PREPARATIONS

1. Scheduling

The University of Minnesota is a member of UNOLS--the University National Oceanographic Laboratory System, and follows the UNOLS scheduling procedures. As such, scheduling is intended to maintain the following objectives: 1) maximum utilization of oceanographic facilities; and 2) maximum accessibility of these facilities by the oceanographic community.

Ship scheduling at the University of Minnesota is done by the Marine Superintendent. Requests for non-NSF funded projects should be submitted by contacting the Marine Superintendent (ricketts@d.umn.edu or 218-726-7826). For NSF funded projects the NSF-UNOLS Ship Time Request form is submitted electronically:

https://strs.unols.org/Public/diu_login.aspx

The deadline for submitting proposals to NSF that require ship time is **February 15th** for research planned in the following calendar year. Proposals submitted after the target date may be deferred to the following year. Once a proposal is funded, cruises are scheduled according to compatibility in terms of dates, area of operation, and equipment requirements.

2. Financing

Investigators should include ship costs (furnished by the Marine Superintendent) within the budget of their particular research project if the project is not funded by NSF. Operating days include all days away from Duluth, Minnesota, including days of departure and arrival. Port days (loading and unloading equipment from the vessel) in Duluth are charged a smaller amount. Any part of a day is considered a full operating day unless a ‘10 hour day cruise’ is requested. A ‘10 hour day cruise’ is a 10 hour cruise, leaving the Duluth dock at 7 AM and returning to the Duluth dock no later than 5 PM. Ship costs for a ‘10 hour day cruise’ are half the costs of a full day.

3. Cruises in Canadian Waters

Investigators planning to work in Canadian waters must have prior clearance from the Canadian Government. The Large Lakes Observatory will initiate the request for clearance through the U.S. State Department. The Master will not take the *R/V Blue Heron* into Canadian waters for scientific work unless proper clearance has been obtained. The State Department' website on Foreign Clearance Information can be found at:

<https://www.state.gov/marine-scientific-research/>

The Large Lakes Observatory must receive an Application for Consent to Conduct Marine Scientific Research (Appendix 1) at least **7 months** prior to the beginning of work in Canadian waters. Note that the application requests charts denoting cruise track lines, the CV of the scientist in charge of the project, as well as a passport photo of the scientist in charge of the project.

Within 30 days after completion of a cruise in Canadian waters, the investigator must submit a preliminary Cruise Report to the U.S. State Department for forwarding to Canadian Officials. Failure to submit this report will result in denial of Canadian clearance for future work that the investigator may wish to conduct in Canadian waters. A final report must also be submitted as specified by the State Department.

Non-U.S. citizens who may be in the scientific party will have no problems in Canadian waters as long as they remain on board the ship. Should they, however, contemplate going ashore in Canada they should inform themselves beforehand as to the requirements or restrictions that may apply in their case concerning entry into Canada and their subsequent re-entry into the U.S.A. As long as they remain on board the ship they are not considered to have left the U.S.A. even though the ship is in a Canadian port.

4. Cruise Plan

The cruise plan sets forth the requirements of the Principal Investigator for the ship, its people and equipment in relation to the scientific work. Some cruises require extensive advance planning.

General requirements for a cruise should be discussed with the Marine Superintendent when the cruise is scheduled. Beyond the minimum of a 7-month lead time for work in Canadian waters, use of sophisticated equipment, such as the Triaxus which is our towed underway vehicle, or techniques, such as the use of radioisotopes on board the vessel, will need multiple months of preparation. Some gear, such as our multibeam system, are used on the R/V Blue Heron and on vessels of opportunity, therefore must be reserved for use. When scheduling the vessel, a clear understanding of expectations will ensure a smooth cruise.

For multi-day cruises please use UNOLS Cruise Planner (<https://cruiseplanner.unols.org/>). You will need to create an account with UNOLS and the marine superintendent will send you a 'key' to give you access to the planning document. **For 10-hour cruises** please use the form in Appendix 2 and available at the RV Blue Heron web site:

https://scse.d.umn.edu/sites/scse.d.umn.edu/files/cruise_planning_form.docx

The cruise plans need to be completed at least THREE weeks prior to the date of departure for your cruise. The plan will contain:

1. Station locations:
 - A. a page size track chart showing your station locations,

- B. a list of the coordinates for each station along with a number and/or letter code identification that can be followed and logged by the watch officer (coordinates must be in Degrees decimal Minutes), and
 - C. all transits should be planned for at a speed of 9 knots. **Realistic estimates of time on planned stations should be provided.**
2. A list of shipboard activities that will be performed at each station.
 3. A list of gear and equipment that will be brought aboard, with dimensions and weights given for large items.
 4. **A list of chemicals including type, quantity, and material data safety sheets (MSDS) for each chemical and radioisotope that will be brought aboard.** Note: For safety reasons it is advised that only the quantity of chemical needed be brought aboard. Each chemical must be packaged in a break-proof container such as plastic or Teflon. Glass packaging is allowed only if for analytical purposes no other container is suitable. If chemicals are transported in glass containers, they must be secured in shock-proof metal containers. If you have further questions regarding these requirements, please contact the Marine Superintendent. Chemical spill kits and absorbent materials must be provided in quantities that are sufficient to deal with the chemicals brought aboard. Rules and regulations for use of radioisotopes aboard ship are outlined in Appendix 3.
 5. A list of deck equipment that will be needed for each station.
 6. A list of shared scientific gear (ship's gear) needed and quantities of each.
 7. Requirements for shipboard equipment including refrigerator and freezer space.
 8. Names and titles of all individuals in scientific party, indicating whether the numbers will change and the dates that the numbers will vary during the cruise. **Indicate if any members of the scientific party have known significant medical problems (e.g., extreme allergies, required medication, etc.).**
 9. Name of Chief Scientist and phone number for contact prior to the cruise. It is expected that the Chief Scientist will have had previous sea-going experience.
 10. Written permission must be obtained from the U.S. Coast Guard before any buoys, floats, or other equipment with a surface expression, will be left in the water. A copy of this written permission **must** be made available to the Master prior to departure.
 11. If trawling will be performed, a copy of the DNR permit must be provided with the cruise plan.
 12. Any cruise participant who will be on the vessel overnight must fill out a **Medical Survey and Consent form**

Appendix 4 https://scse.d.umn.edu/sites/scse.d.umn.edu/files/medical_information.docx prior to the cruise. This survey must be given to the Master at the start of the cruise. The information in the survey will be protected according to University of Minnesota HIPAA standards as indicated on the survey.

5. Loading and Port Services

Any advance staging requirements should be coordinated with the Marine Superintendent and Captain well ahead of cruise departure. For your protection, unannounced or unaccompanied shipments will not be accepted.

Unless you tell us otherwise, the ship will normally be loaded on the scheduled day of departure (beginning at 0600) and off loaded on the day of return. Cruise preparation requiring more port time, vessel services, or crew assistance will require careful planning to prevent interference with scientists off-loading equipment or crew performing standard maintenance. Routine vessel maintenance and logistics can interfere with laboratory set-up due to the congestion of conflicting traffic. Consult with the Marine Superintendent well in advance so we can plan for your loading and set-up requirements.

The ship's crane is normally available on scheduled days for loading (1,500 pounds at maximum reach).

6. Meals

In home port (Duluth) and one-day port calls in other ports the scientific party will normally board the vessel at or after 0600 on the day of departure from port. Meals will be served at regularly scheduled times after departure. Meals are not served while the ship is in home port. Where cruise preparation periods in advance of schedule departure have been arranged, the scientific party and support personnel may berth on the vessel within the limit of available scientific berths.

Special circumstances may require modification of these procedures. Cruise planners should consult with the Marine Superintendent in advance.

7. Scientific Berthing

There are accommodations for six scientists on board the vessel. The number of berths is dependent on crewing requirements.

8. Shipboard Clothing and Personal Items

- a. **Shoes** - Open-toed shoes or sandals are hazardous to the wearer on board ship and should not be worn when working on deck. The recommended minimum requirement on duty is a completely enclosed shoe (toe and heel) of any material. Persons handling heavy gear on deck should consider safety shoes (reinforced toe).
- b. **In the Dining Area at Meals** - The close proximity of persons eating in the dining area requires a high standard of neatness and cleanliness. Shoes and shirts are required. The minimum requirement for a shirt is a quarter-sleeve T-shirt clearly designed as an outer shirt (not an undershirt). Coveralls or clothes smelling strongly of fish, chemicals, diesel oil, etc.; dirty or ragged clothing; hats or caps; swimwear; or extremely abbreviated shorts are not acceptable.
- c. **Rain Gear** - Individuals should provide their own cold/foul weather gear. Work gloves and a cap are recommended.
- d. **Personal Items** - Individuals should provide shaving gear, toothbrush and toothpaste, etc. Bed linen and towels are provided on board. Items for food preparation, such as coffeepots, hot plates, and so on, are not permitted. Avoid strongly scented items (cologne, aftershave, perfume, etc.).

9. Status/Release Form

A status/release form must be completed by each member of the scientific party and given to the Master before sailing (Appendix 5). The vessel will not leave port unless this form is on file with the Master.

10. Hazardous Materials

- a. Notify the Marine Superintendent well in advance of your plans for use of special chemicals, compressed gases, and radioactive materials. USE OF RADIOISOTOPES ABOARD REQUIRES PRIOR AUTHORIZATION OF THE UNIVERSITY of MINNESOTA DEPARTMENT OF ENVIRONMENTAL HEALTH AND SAFETY. SEE APPENDIX 3 FOR DETAILS.
- b. **IMPORTANT** - Federal Occupational Health and Safety (OSHA) rules require chemical manufacturers, importers, and distributors to label containers of hazardous chemicals. State of Minnesota rules require persons bringing hazardous materials into a laboratory (*R/V Blue Heron*) to ensure labels are not removed from containers and that Material Safety Data Sheets (MSDS) are available and accessible in the laboratory. In addition, Chief Scientists must brief all persons on board who work with, or who could come in contact with, such materials on such items as:
 - Applicable laboratory rules;

- The general physical and health hazards involved;
- Appropriate personal protective equipment;
- How to handle spills, accidents, and injuries; and
- The location of and how to use MSDS.

The MSDS for hazardous material brought on board shall be made available to the Master for copying and inclusion in the ship's emergency files.

- c. Lithium Battery use – Lithium battery powered equipment and lithium cells must be stored in the Wet Laboratory. Include Material Safety Data Sheets (MSDS) for lithium batteries in the hazardous materials inventory that is brought to the ship. Lithium batteries should be treated as Hazardous Materials and the Chief Scientist must provide information about the type, size and any special handling instructions to the crew. Appendix 7 as well as RVSS section 9.4 (https://www.unols.org/sites/default/files/RVSS_10_Most_Current_Master_Copy_Jan_2019_2.pdf) includes definitions and other guidelines for the use of Lithium batteries on board the vessel.
- d. Compressed Gases - Must be securely held to the ship structure with metal brackets or positive cargo straps to hold them in place. Ropes or other similar lashings must be avoided. All gas cylinders must have their safety cap in place unless they are in use with a regulator. No cylinder should be moved without the cap in place.

11. Refrigerated/Frozen Storage

The ship's refrigerated and frozen food storage areas may not be used for the storage of chemicals, samples, or specimens. The ship has freezer and refrigerator space in the laboratories available exclusively for scientific use.

B. SHIP'S EQUIPMENT AND CAPABILITIES

1. General

Length Overall:	86' 03"	Propulsion:	One Caterpillar 3508TA diesel, 775 BHP; reverse red. gear 4.07:1; kort nozzle; 5.5 SS 4-blade prop.
Waterline:	78' 04"		
Beam:	23' 04"	Aux. Power:	One Caterpillar C4.4: 86 KW, 3φ-208 v, 110 v.
Molded Depth:	13' 05"		One Caterpillar C4.4: 76 KW, 3φ-208 v, 110 v.
Draft, DWL:			
Forward	10'03"		
Aft	11' 09"	Tankage:	Fuel: 5,200 gals
Displacement			Freshwater 3,000 gals
DWL	275 Ltons		Sewage 5,200 gals
Lightship	227 Ltons	Accommodations:	
Admeasurement:	<200 GRTons		
Speed:			4 crew

Cruising:	9 knots	6 scientists + 1 marine tech.
Maximum:	10 knots	Science Areas: Workdeck: 800 sq. ft.
Range:	21 days	Wet Lab: 200 sq. ft.
Endurance:	21 days	Dry Lab: 400 sq. ft.

Owner: The University of Minnesota
Operator: The Large Lakes Observatory
Built: 1985
Home Port: Duluth, Minnesota
Cellular phone: (218) 390-7501
Marine Superintendent: (218) 726-7826
FAX: (218) 726-6979

2. Winches and Wire Rope

- SeaMac 220H, ship hydraulics with a drum holding ~700 meters of ½” 6/19 wire.
- SeaMac 310H, ship hydraulics with a drum holding ~500 meters of ¼” 6/19 wire.
- SeaMac 305H, ship hydraulics with a drum holding ~600 meters of .322” EM wire.
- SeaMac 210H, ship hydraulics with a drum holding ~500 meters of ½” 6/25 wire.

3. Deck Equipment and Capabilities

- Deck Crane M95-20A3 (DMW) capable of lifting 1500 lb. at 33 ft.
- A-Frame (Hydraulic) 5 ton capacity, 13.5’ vertical clearance, 7.5’ horizontal clearance, 6’ off-board reach, 4’ in-board reach
- Power capstan (Electric) 2 ton capacity
- Anchor windlass (Hydraulic) 500 ft. chain

4. Laboratories

- Wet Lab- main deck, 10 x 22 ft., counters, clean and utility power lines, sink, hot and cold potable water, continuous flow of sea water can be provided.
- Dry Lab- lower deck, 21 x 22 ft., counters, electronics racks, clean and utility power lines, communication and computer links with pilot house, Millipore DirectQ3-UV clean water, fume hood, safety shower.
- Laboratory Van- back deck, 10 x 10ft., counters, clean and utility power lines, hot and cold potable water, air conditioner, heater, liquid scintillation counter, fume hood.

5. Instrumentation

- SeaBird Model 911 plus CTD (deck unit) with D.O. sensor, pH/ORP sensor, Chl-a fluorometer, CDOM, transmissometer, PAR sensor, and altimeter.
- Seabird 32 Carousel with 12 8-liter bottle capacity
- Triaxus towed vehicle with 911+ CTD, Chl-a fluorometer, transmissometer, D.O. sensor, and PAR sensor.
- Knudsen Model 1602 Echo Sounder with 28/200 kHz transducers, analog and digital output to computers in dry lab, wet lab and pilot house.

- e. Applanix POS-MV OceanMaster RM Motion Referencing Unit (Inertial with twin differential GPS)
- f. Teledyne RDI Ocean Surveyor Acoustic Doppler Current Profiler, 150 kHz
- g. Reson Sea Bat Model 7101 Multi-Beam Sonar, 240 kHz, 511 beams, 150 deg swath width, with side scan.
- h. Underway sea surface water data with a meteorological sensor suite, temperature sensor, Chl-a fluorometer, CDOM, transmissometer, SPAR, thermosalinograph, and pCO₂ sensor..

6. Navigation

- a. Two Furuno MFD8 GPS
- b. Furuno NavNet 3D radar, 12kw transmitter
- c. Furuno NavNet 3D radar 6kw transmitter
- d. Furuno Nav-500 Autopilot
- e. Furuno SC-502 Satellite Compass
- f. Furuno FE 700 Sounder
- g. Furuno FA-150 AIS system
- h. Furuno DS-80 Doppler Speed Log

7. Communications

- a. Uniden UM 525
- b. Standard Horizon Infinity
- c. Cellular Telephone and intercom
- d. FleetBroadBand Sailor 500 Satellite communications

8. Other Available Instrumentation

- a. Ocean Instruments Multi-Corer
- b. Benthos gravity corer
- c. Heavy Piston corer
- d. Kullenberg Piston corer
- e. Peterson Grab sampler
- f. Plankton nets
- g. 60' Stauffer midwater trawl with a trawl sonar system.
- h. Geopulse High Resolution Seismic Reflection Profiling System (1-3 kHz)
- i. Bolt Model 600B airguns with 1, 5, 10 and 40" chambers
- j. Edgetech Side Scan/CHIRP system.
- k. bbe FluoroProbe III
- l. Satlantic ISUS V3 Nitrate analyzer
- m. McLane WTS-LV (Large Volume Pumps)
- n. McLane Paraflux Mark78H-21 Sediment Traps

9. Priorities and Procedures

Equipment use priorities

- 1. NSF funded projects on the Blue Heron

2. Non-NSF funded projects on the Blue Heron
3. NSF funded projects by LLO investigators on other lakes
4. NSF funded projects on other vessels
5. Non-NSF funded projects on other vessels

Plans to use the shared-use equipment must be outlined in the P.I. Cruise Plan Form. Equipment may be unavailable (due to maintenance or use of the equipment by other investigators) therefore the principal investigator must contact the marine superintendent about his/her desire to use shared-use equipment prior to submission of the Cruise Plan Form.

C. ON BOARD

1. Responsibilities of the Chief Scientist at Sea

- a. One member of the scientific party performs the duties of Chief Scientist on each cruise. The Chief Scientist is responsible for supervising the scientific party on board in matters of organization, administration, safety, compliance with shipboard regulations, and performance of the scientific work.
- b. Assignment of a Chief Scientist is the responsibility of the Principal Investigator of the primary project for which the vessel is scheduled. The individual selected should be of faculty, senior staff, or senior graduate student rank with previous sea experience.
- c. The Chief Scientist should exercise common sense in choosing cruise personnel and in supervising multiple party cruises. Due to motion characteristics, a ship is an inherently hostile environment for persons with significant physical disabilities. Any stress-related physical or emotional illness is apt to be exacerbated by conditions at sea. Persons subject to severe motion sickness may be, at best, unable to perform adequately or, at worst, be debilitated to the point they place themselves and others at risk. Such problems are best avoided by planning and forethought. Be advised that it is the duty and responsibility of the Master to discharge at the next available port any persons whose condition or behavior constitutes a safety hazard.
- d. Some of the specific duties of the Chief Scientist include the following:
 1. Supervise the work and safety of the scientific party. Ensure safe working conditions and avoid hazards. Instruct scientific personnel.
 2. Conduct a pre-cruise briefing for the ship's Master and key crew members to cover cruise planning and procedures for each station. This should take place prior to leaving dock.
 3. Exchange information daily with the ship's Master and crew concerning the progress of the scientific work, need for changed procedures or additional assistance, changes required in the cruise plan, or other actions necessary to ensure success of the scientific mission and smooth operation of the vessel.
 4. Personally ensure that all members of the scientific party are aware of and comply with the shipboard rules and regulations.

5. Prepare a detailed pre-cruise plan and all post-cruise paperwork necessary for the sponsoring agency and the Large Lakes Observatory.

e. Chief Scientist Check List

Long Lead Time Items (more than 6 months before the cruise:

- _____ 1. Seek foreign clearance to work in Canadian waters (Appendix 1).
- _____ 2. Discuss the use of long-lead-time gear (the Triaxus system, multibeam system or radioisotope laboratory van) with the Marine Superintendent.
- _____ 3. Schedule cruise dates (done in February of the cruise year).

At least 120 days before the cruise:

- _____ 1. Determine operational areas, stations, etc., in detail.
- _____ 2. Read this Manual and the UNOLS Safety Training Manual (<http://www.unols.org/document/rvoc-safety-training-manual-chapter-1-research-party-supplement>)
- _____ 3. For multi-day cruises, consult with your physician regarding your suitability for a multi-day cruise (Appendix 4).
- _____ 4. Review the Cruise Planning Form (Appendix 2) and communicate with the Marine Superintendent. Include shared-use scientific gear that you need in this conversation.

At least 60 days before the cruise:

- _____ 1. Complete training to use radioisotopes aboard the vessel (Appendix 3).

At least 21 days before the cruise:

- _____ 1. Submit a completed Cruise Planning Form (<https://cruiseplanner.unols.org/> or Appendix 2 depending on the cruise length) to the Marine Superintendent.

Mobilization day or 1st day of the cruise:

- _____ 1. For multi-day cruises: watch the Safety video and the Shipboard Civility videos. These videos can be watched prior to the cruise.
- _____ 2. For multi-day cruises: give the captain your party's completed Medical Survey and Consent Form (Appendix 4).

Upon completion of the cruise, complete and submit:

- _____ 1. Post Cruise Assessment (http://strs.unols.org/Public/diu_faq_view.aspx?short=HowdoIsubmitaPCAR)

2. Shipboard Procedures for Scientific Party

- a. *Introduction* - These regulations are deliberately brief and do repeat some earlier material. If you have questions, please ask the appropriate crew member.

b. *Safety* - The Master is responsible for the overall safety of the vessel, crew, and scientific party. The ship's crew will assist you in carrying out your operations safely. It is the Master's duty to judge when working conditions become unsafe and to correct unsafe working practices. The Master is also responsible for ensuring that the functioning of the ship and the performance of the crew are such that there is maximum potential for accomplishing the scientific objectives. A safety talk will be given at the beginning of every voyage – a version of the information in that talk is at the end of this manual as Appendix 8.

1. For participants of multi-day voyages, prior to arriving on board or immediately upon joining the ship you should watch the UNOLS videos entitled '*Ship Safety Orientation*' and '*Shipboard Civility Module 1 & 2*'.
2. Immediately upon joining the ship, you should inform yourself of the following:
 - A. The location and use of exposure suits.
 - B. Location of life rafts and other life saving equipment.
 - C. Location of fire fighting equipment and exits.
 - D. Your emergency station and respective alarm signals as set forth on the Station Bill. A copy is printed in Appendix 6. Emergency station location is posted on each bunk.
3. Wear a life vest when participating in the periodic fire and boat drills. Everyone is required to participate.
4. Wear a life vest when paying out or taking in towed cables over the stern, when working on deck in rough seas, when working on deck at night, and when working from the ship's utility boat.
5. Wear a life vest when going between the ship and the dock in docking and undocking operations. Don't take unnecessary chances between the ship and dock in these operations; if the distance is too great to step across, wait until the ship is brought closer.
6. Do not climb about on the sides of the ship or superstructure.
7. Do not stand or sit on bulwarks or rails.
8. Do not climb the ladder to the top of the pilot house unless you have permission from the Master or the Watch Officer. Radars are mounted on top of the pilot house and serious injury can result from close proximity to operational radar.
9. Report accidents, illnesses, and injuries immediately to the Master. If at any time you notice anything that presents immediate or potential danger to the ship, personnel or equipment, report this to the Master or the Watch Officer.
10. Wear closed shoes when working on deck. Sandals, clogs, or other floppy footwear can lead to foot injury or falls. Non-slip safety shoes are recommended.

11. Hard hats are available on board. Wear them when working with suspended loads that may swing and cause injury.
 12. The Chief Scientist is responsible at all times for safe handling, use, and disposition of radioactive, toxic, and corrosive chemicals and materials. The waste should be disposed of according to the U of MN DEHS Hazardous Chemical Waste Management handbook and U of MN Radioactive Material Services' Radioactive Waste Information handbook. Accidents or problems should be reported to the Master immediately.
 13. All electrical equipment that is to be run on the deck will be powered through ground-fault interrupt circuits.
 14. Keep all doors and watertight doors secured in the closed position if not in use, as swinging doors can cause serious injury.
 15. Non-swimmers must wear a life vest at all times when on the weather decks.
 16. Keep hands off all dials, switches, valves, and controls of all equipment and instrumentation that you are not responsible for, or involved in the use of. Keep out of the engine room at all times unless accompanied by a crew member.
 17. Keep all laboratories, work areas, and decks clean and organized at all times. Keep equipment and supplies lashed down or otherwise secured at all times to prevent damage if the weather becomes rough.
 18. Do not stand on the upper deck in front of the pilothouse while the ship is underway. This blocks the view of the Master and Watch and creates a hazard to navigation.
 19. **If you have a potentially serious medical condition (e.g. heart condition, diabetes, pregnancy, etc.) we strongly suggest that you consult with your doctor regarding the advisability of participating on the cruise prior to boarding the ship.**
- c. *Fire* - Use common sense. Most fires can be prevented. Do not smoke in bunks. Smoking is not allowed on the vessel as per University of Minnesota policy. Empty trash cans frequently. Learn the location of fire extinguishers in your areas. Notify the Watch Officer immediately if fire starts. Fire and safety drills will be made prior to the start of each cruise. It is the individual's responsibility to know his/her function during an emergency (see Station Bill, Appendix 6).
- d. *Emergency Procedures* (See Station Bill - Appendix 6)
1. General - Assemble on the working deck or on the upper deck aft of the bridge as announced and await instructions. Wear a jacket, trousers, cap, shoes, and your life vest.
 2. Fire and Emergency - Announced by continuous sounding of ship's alarm bells and whistle for ten seconds.

3. Abandon Ship - Announced by seven short and one long blast on alarm bells and whistle. Break out exposure suits and life vests when you hear this signal. Assemble on aft deck ready to go in the water.
 4. Man Overboard - Call out "MAN OVERBOARD" and location (i.e., port or starboard) loudly, throw a life ring near the person overboard, and notify the Deck Watch Officer immediately. KEEP THE PERSON CONSTANTLY IN SIGHT.
 5. Life Vests and survival suits are in each stateroom. Additional PFDs and survival suits are in the chest on the 01 deck starboard side.
- e. *Alcohol and Drug Policy* - The possession or use of alcoholic beverages, narcotics, marijuana, or other controlled substances is PROHIBITED (see Appendix 5).
1. It is the policy of the Large Lakes Observatory to prohibit the use, possession, transportation, or distribution of illegal or unauthorized dangerous drugs by any person or persons while on board the vessel or premises.
 2. The use, possession, sale, or transport of any illegal drug on the vessel or premises is cause for immediate discharge and referral to law enforcement agencies.
 3. All personnel including visitors on board the vessel are required to abide by these regulations. Failure to do so will result in immediate removal from the vessel at the closest suitable port facility.
 4. The prohibited drugs shall include all dangerous drugs including but not limited to cocaine, marijuana, prescription drugs not properly prescribed for bona fide medical use, so called "look alike" drugs, and drug paraphernalia.
 5. Discovery of any amount of illegal drugs on a vessel may lead to the seizure of the vessel and the arrest, where appropriate, of those on board. Crew members and the Master are alert to the use and possession on board of prohibited articles.
- f. The University of Minnesota is committed to tolerance, diversity and respect for differences ([Code of Conduct](#)). It is the policy of the University of Minnesota Duluth to maintain an academic and work environment free of illegal discrimination, harassment (including [Sexual Harassment](#)) and intimidation for students, faculty, and staff. Discrimination, harassment and intimidation are contrary to the standards of the University community. They diminish individual dignity and impede equal employment and educational opportunities and equal access to freedom of academic inquiry. It is important that a professional atmosphere is maintained at all times through mutual respect for all your shipmates. Incidents should be reported to the Chief Scientist, Captain, Marine Superintendent or [UMD's Department of Human Resources](#).
- g. As per University Policy, smoking is not allowed on the vessel.

- h. As per [University Policy](#), firearms are not permitted on board.
- i. Bed linen and a towel are provided. **There is no laundry facility on board the vessel.**
- j. Personal coffeepots, hot plates, etc. for food preparation are not permitted at any time.
- k. Limited recreational reading material is available aboard the ship.
- l. The crew members will instruct and assist you in the use of the ship's permanent scientific electronic equipment in the labs. Crew members will also assist with matters relating to deck gear.
- m. The Chief Scientist is responsible for coordination of all shipboard scientific activities with the Master. All scientific personnel on board, including those involved in ancillary projects, should make their needs and requests known to the Chief Scientist.
- n. Ship's crew members are expected to assist with deck operations and operate the crane, winches, and bridge equipment, but any assistance to the scientist's party beyond this should be discussed with the Master well in advance.
- o. Do not borrow personal, project, or ship's tools without permission. Return things promptly to the person or place from which they were obtained. Do not remove ship's equipment, furnishings, or supplies from the ship at any time.
- p. Do not congregate in the pilothouse. Stay out, except for business. When there, stay clear of the Watch Officer and others who are working. Stay clear of the chart desk, instruments, and controls.
- q. Scientific personnel may be asked to assist with lines during docking and undocking. If your assistance is not requested, stay clear of line handling operations.
- r. Keep your living quarters clean and organized at all times, and your berth made up. When departing from the ship clean your quarters and strip the berth.
- s. Return coffee cups, glasses, etc. to the galley immediately when finished. Wash all dishes used during the night with soap and hot water and place them on the drain rack.
- t. Keep voices down when others are trying to sleep.
- u. The Steward will make cabin assignments, with consultation of the Chief Scientist.
- v. Prior to departing, each member of the scientific party will sign a Status/Release Form (Appendix 5). This form **must be signed and on file** with the Master before the ship will leave port.
- w. Never put any equipment over the side without permission of the Master and/or Watch Officer.

- x. Use the water sparingly; the shipboard supply is limited. Keep shower time to a minimum. Report any leaking faucets or pipes to the Master and/or Watch Officer at once.
- y. When shifting from ship power to shore power there will be a short power outage. The crew will make every effort to remind you of this outage, but be aware that this loss of power will occur.
- z. When not in use, the doors to the heads should remain open.

3. Shipboard Procedures in the Dining Area

- a. Meals will be served as follows:
 - BREAKFAST 0700 - 0800
 - LUNCH 1200 - 1300
 - DINNER 1700 - 1800

To allow the ship's Steward time to prepare for meals, do not congregate in the dining area for 1 hour before posted meal times. Keep the dining area clean at all times. You are expected to dress properly for meals.

With agreement between the Master, Steward, and Chief Scientist, meal times may change to allow for stations, work, etc. No meals will be provided while the ship is in home port.

- b. Other Use. There may be times when it becomes necessary to use the dining area tables for scientific paper work. To prevent any misunderstanding arising from such occasional use, consult with the Steward. Please do not allow such use to interfere with meal preparation and clean-up or to monopolize facilities such that they are not available for normal use by others.

4. Communication with the R/V BLUE HERON

The vessel is in communication with the Large Lakes Observatory daily while away from home port. Messages can be left for personnel aboard the vessel by calling (218)-726-8522. Any communication (voice or internet) via the ship's cellular or satellite phones to or from the vessel should be limited.

D. POST CRUISE REQUIREMENTS

1. Shipboard Clean-up Procedures

In order to provide clean laboratories for the next scientific party, it is necessary that each group clean the labs before departing from the ship. They should be cleaned as follows.

- a. Sweep and swab the deck (both the lab decks and the aft deck), wipe down bench tops and cabinets, scour sinks, empty trash cans into the dumpster on the dock.
- b. Label and pack all waste according to the University of Minnesota's Hazardous Chemical Waste Management handbook.
- c. Remove all your data files from data system. This will ensure ample file space for the next user. Any files left on the system will be dumped prior to the next cruise. The Large Lakes Observatory does not take responsibility for any files left on the system once you depart the vessel.
- d. Clean up berths by stripping the bunks and putting soiled linens in the pillowcase. Leave the filled pillowcase on the bunk.

2. Offloading

- a. When the vessel returns to Duluth all scientific and personal gear should be taken off the ship. Offloading requirements should be noted in the Cruise Plan.
- b. Before departing the vessel make one final sweep of the vessel to make sure that everything is packed and cleaned.

3. Cruise Assessment

It is required that the Chief Scientist fills out a **UNOLS Research Vessel Post Cruise Assessment form**. This form is an evaluation of the ship and its operations. This information is used to assist ship users, operating institutions, and funding agencies to improve the quality of research vessel operations. Please follow the instructions found at:

http://strs.unols.org/public/diu_faq_view.aspx?short=HowdoIsubmitaPCAR

Appendix 1 – Application for Consent to Conduct Marine Scientific Research

Application for Consent to Conduct Marine Scientific Research
in Areas Under National Jurisdiction of

--

(name of coastal state)

Date:

1. General Information

1.1 Cruise name and/or #:	
---------------------------	--

1.2 Sponsoring institution:	
Name:	
Address:	
Name of Director:	

1.3 Scientist in charge of the project (include CV and passport photo):	
Name:	
Address:	
Telephone:	
Fax:	
Email:	

1.4 Scientist(s) from coastal state involved in the planning of the project:	
Name(s):	
Address:	

1.5 Submitting officer:	
Name and address:	
Nationality:	
Telephone:	
Fax:	
Email:	

2. Description of Project (Attach additional pages as necessary)

2.1 Nature and objectives of the project:

2.2 Relevant previous or future research cruises:

2.3 Previously published research data relating to the project:

3. Methods and Means to be Used

3.1 Particulars of vessel:	
Name:	
Nationality (Flag state):	
Owner:	
Operator:	
Overall length (meters):	
Maximum draught (meters):	
Displacement/Gross tonnage:	
Propulsion:	
Cruising & Maximum speed:	
Call sign:	
Method and capability of communication (including emergency frequencies):	
Name of master:	
Number of crew:	
Number of scientists on board:	

3.2 Aircraft or other craft to be used in the project:

3.3 Particulars of methods and scientific instruments		
Types of samples and data	Methods to be used	Instruments to be used

3.4 Indicate whether harmful substances will be used:

3.5 Indicate whether drilling will be carried out:

3.6 Indicate whether explosives will be used:

4. Installations and Equipment

Details of installations and equipment (dates of laying, servicing, recovery; exact

locations and depth):

5. Geographical Areas

5.1 Indicate geographical areas in which the project is to be conducted (with reference in latitude and longitude):

5.2 Attach chart(s) at an appropriate scale (1 page, high-resolution) showing the geographical areas of the intended work and, as far as practicable, the positions of intended stations, the tracks of survey lines, and the locations of installations and equipment.

6. Dates

6.1 Expected dates of first entry into and final departure from the research area of the research vessel:

6.2 Indicated if multiple entry is expected:

7. Port Calls

7.1 Dates and names of intended ports of call:

7.2 Any special logistical requirements at ports of call:

7.3 Name/Address/Telephone of shipping agent (if available):

8. Participation:

8.1 Extent to which coastal state will be enabled to participate or to be represented in the research project:

8.2 Proposed dates and ports for embarkation/disembarkation:

9. Access to data, samples and research results

9.1 Expected dates of submission to coastal state of preliminary reports, which should include the expected dates of submission of the final results:
No more than 30 days from the end date of the cruise.

9.2 Proposed means for access by coastal state to data and samples:

9.3 Proposed means to provide coastal state with assessment of data, samples and research results or provide assistance in their assessment or interpretation:

9.4 Proposed means of making results internationally available:

(Revised June 5, 2002)

Appendix 2 - R/V Blue Heron Cruise Plan

1. Date:

2. Principal Investigator:

3. Chief Scientist:

4. Phone/Fax:

5. Cruise Title:

6. Requested date and time of loading:

7. Requested date and time of departure from port: **6:55 A.M. on**
SAFETY LECTURE AND FIRE DRILL WILL START ONCE THE ENTIRE SCIENCE PARTY IS ASSEMBLED ON THE MAIN DECK 10 MINUTES PRIOR TO DEPARTURE – SHIP WILL NOT LEAVE THE DOCK PRIOR TO COMPLETION OF THE LECTURE AND DRILL

8. Requested date and time of return to port: 5:00 P.M. on

9. Requested date and time of off-loading:
YOU MUST OFF-LOAD WITHIN 24 HOURS OF RETURNING TO PORT

10. Are you planning on working in Canadian waters? No

11. If you are planning on working in Canadian waters, do you have the necessary clearances? No

12. **Attach** track chart showing station locations and coordinates, as per instructions on page 2 of the cruise manual. Please give coordinates in decimal minutes: DD° mm.ddd'

13. Please provide detailed information on each station's activities. Attach separate sheets if necessary. Please estimate time on each station:

14. List the equipment and gear that will be brought aboard. For large items give the size and weight. Attach separate sheets if necessary:

15. List **ALL** chemicals brought aboard. Include type and quantity. Bring three copies of the Material Safety Data Sheets for each chemical to the boat (copies for the wet lab, dry lab and pilot house – and additional copy for the radioisotope van if it is in use):

NOTE: BRING ONLY THE QUANTITY OF CHEMICALS THAT YOU NEED. EXCESSIVE AMOUNTS SHOULD BE AVOIDED. PACKAGE EACH IN BREAK-PROOF CONTAINERS IF POSSIBLE.

NOTE: UPON RETURN TO PORT, WASTE CHEMICALS SHOULD BE PROPERLY PACKAGED, LABELED, AND DISPOSED OF ACCORDING TO THE UNIVERSITY OF MINNESOTA'S HAZARDOUS CHEMICAL WASTE MANAGEMENT HANDBOOK.

16. List all radioactive materials. Include volume, total activity, and chemical form of the isotope. Use of radioisotopes must be discussed with the ship's manager prior to the cruise:

17. List shipboard scientific equipment (Niskin bottles, CTD profiler, etc.) and quantity of each that will be needed for each station:

18. List deck equipment that will be needed at each station:

19. List refrigerator and freezer space needed for the cruise:

20. Water and Power needs:

21. Will fish trawling be performed? No

If yes, **attach** a copy of a Minnesota DNR permit.

22. **List of scientific personnel.** Use separate sheets if necessary. Please indicate if any individual has any significant medical problems.

Name and Title (e.g. Professor, graduate student, etc.)	Dates Aboard
Marine Technician	all

23. List special dietary needs and/or preferences (i.e., diabetic, vegetarian, etc.):

NOTE - FOR OVERNIGHT CRUISES: Please give a copy of the **Medical Survey and Consent** form (found on the Blue Heron website) to each cruise participant prior to the cruise. Each member of your party should fill out the form and bring it to the vessel on the first day of the cruise. The form will be kept on the vessel in a lock-box and the information on the form will only be used in case of emergency. **If one of your science party has a potentially serious medical condition (e.g. heart condition, diabetes, pregnancy, etc.) we strongly suggest that they consult with their doctor regarding the advisability of participating on the cruise prior to boarding the ship.**

Return the completed CRUISE PLANNING form to:

e-mail: ricketts@d.umn.edu

Appendix 3 – Use of Radioisotope Materials

Radioactive materials on board ship pose problems not found in shore laboratories. Instead of a dedicated laboratory often used for no other purpose, radioactive materials at sea occupy laboratory spaces that will be used by other researchers. Because of this, research ship operators and scientists have a particular obligation to assure the most careful procedures, including monitoring, clean-up, and record keeping. These precautions are necessary not only for the protection of personnel but also to ensure the integrity of measurements made by different investigators of environmental levels of natural or artificial radionuclides. In most cases it is necessary for these programs to measure as close to zero values of radionuclides as is possible. The work is therefore sensitive to contamination by very small amounts of radioactivity lost by others, amounts far below those having any public health significance.

All users of radioactive materials shall comply with the rules and regulations as set forth by the Nuclear Regulatory Commission (NRC) and the University of Minnesota's Department of Environmental Health and Safety. For current information consult the University of Minnesota Department of Environmental Health and Safety website entitled "Radiation Protection" (<http://www.dehs.umn.edu/rad.htm>).

Additional regulations for use of radioactive materials on the vessel are as follows:

1. Transport to and from the vessel will be according to the NRC "small quantities" regulations.
2. Users of the radioactive material must be licensed through the University of Minnesota Department of Environmental Health and Safety. People from outside the University must either apply and be granted a license or be working with a University person who is currently licensed.
3. Only currently licensed personnel will be allowed to work with the radioactive material on the vessel and they will be responsible for safe use and disposition of the material.
4. The Chief Scientist will ensure that all personnel that will handle radioisotopes are properly trained.
5. The Chief Scientist will delineate the science party's use of radioisotopes in the Cruise Plan. In addition, the Chief Scientist will contact the Master by email alerting the Master to the use of radioisotopes on the vessel and will receive an acknowledgement.
6. The radioactive material will be limited to the radioisotope laboratory van.
7. Samples will be brought to the radioisotope laboratory van for study. In no case will the radioactive material be allowed to be used throughout the vessel.
8. When radioactive material is on board, all members on board the vessel must be over the age of eighteen years.
9. Swab surveys will be taken before, after, and once a week during a cruise involving radioactive materials.
10. A separate use log will be maintained by the Marine Superintendent showing type of material, date of arrival, volume and activity upon arrival, date of departure, and volume and activity upon departure. Please convey this information to the Marine Superintendent upon arrival and departure.

Appendix 4

RV Blue Heron Medical Information

Submission of this form constitutes acknowledgement that you have no physical defects or ailments which would prevent the performance of duties at sea for extended periods of time. There is limited medical service available on board. The crew and technical staff have been trained in first aid and UMN subscribes to a 24 hour phone and email medical advisory service called MedAire. While filling out the form, please provide all information you would want emergency response personnel both on board and at MedAire to know about you if you are incapacitated. **THIS INFORMATION WILL BE KEPT CONFIDENTIAL** with the Chief Scientist, Master, and shore personnel that need to know. The form will be destroyed by shredding at the end of the sailing season.

If you use prescription and/or over the counter medications bring enough medication to last the duration of the cruise.

Please provide your doctor's contact information so that the crew and/or shoreside MedAire professional can interact with them if necessary during an emergency at sea:

Doctor's full name: _____ Phone number: _____

It is strongly recommended that you consult with your doctor regarding the advisability of participating on the cruise prior to boarding the ship.

Emergency Contact (spouse/parent/etc.): _____ Phone number: _____

yes no Do you have any food allergies or dietary restrictions? If yes, enter them below and inform the Chief Scientist so the information can be incorporated into the Cruise Planning Form.

yes no Do you use any medicines regularly? If yes, list them below. Including where they are stored and rules for dosage and administration if you are incapacitated. Also ensure that you have a sufficient supply for the entire trip, including potential unexpected delays.

yes no Do you have any medical conditions that could flare up and require prompt administration of special medica- -tions or other therapies? For example, diabetes, heart problems, ulcers, asthma, etc. If yes, please describe:

yes no Do you have any conditions that might lead to sudden unconsciousness or loss of motor control or normal coordination? For example, epilepsy or fainting spells. If yes, please describe:

yes no Do you have any impairments of normal coordination and agility? For example, an artificial limb or partial paralysis. If yes, please describe:

yes no Do you have any uncorrectable impairments of normal sensory perception (sight, hearing, etc.). If yes, please describe:

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yes no Have you received any medical advice, pertinent to the time you are scheduled to be at sea, to the effect
 that you should not travel far away from full medical care facilities? If yes, please describe:

yes no Do you have enough experience at sea to know if you are subject to chronic seasickness?

yes no If you answered Yes to the above, are you subject to chronic seasickness to an extent that may threaten
 your health and/or impair your ability to complete your planned tasks?

yes no Do you have any medical condition not noted above which could cause an emergency at sea?
 An *emergency* means that the ship may be required to divert from its planned operations to seek or coordinate medical attention for you. If yes, please describe:

yes no Do you have any other medical concerns or medical information that you would like to bring to
 our attention in the interest of safeguarding you own health? If you need more space, you may attach a written explanation, or discuss in person with the Chief Scientist or captain.

Summarized Drug and Alcohol Policy

To help ensure the safety and well-being of faculty, staff, students, and the general public, the Large Lakes Observatory (LLO) is committed to maintaining a shipboard environment that is free of alcohol and illegal drugs. The LLO prohibits the unlawful possession, use, distribution, or manufacture of alcohol, marijuana or controlled substances on LLO vessels. Violation of the LLO's drug and alcohol policy is cause for disciplinary or other appropriate action.

Summarized Smoking Policy

In accordance with University of Minnesota Duluth policy, smoking is not permitted on board the ship.

Summarized Footwear Policy

Proper closed toed and heeled footwear is required to be worn on board in common work areas or lab spaces without exception. Sandals, clogs, or other floppy footwear can lead to foot injury or falls and are not acceptable. Non-slip safety shoes with protected toes are recommended.

Summary of Harassment Policy

It is the [policy](#) of the University of Minnesota Duluth to maintain an academic and work environment free of illegal discrimination, harassment and intimidation for students, faculty, and staff. Discrimination, harassment and intimidation are contrary to the standards of the University community. They diminish individual dignity and impede equal employment and educational opportunities and equal access to freedom of academic inquiry. It is important that a professional atmosphere is maintained at all times through mutual respect for all your shipmates.

Acknowledgement of Risk and Consent for Treatment For Field Research Trip Participants

I acknowledge that I understand that there are certain risks inherent in field research aboard vessels. I acknowledge that all risks cannot be prevented and I assume those risks beyond the control of the University of Minnesota Duluth staff. I represent that I am able, with or without accommodation, to participate in this field research, and am able to use the equipment and/or supplies described by the field research trip leader.

Should I require emergency medical treatment as a result of accident or illness arising during the field research trip, I consent to such treatment. I acknowledge that the University of Minnesota Duluth does not provide health and accident insurance for field research trip participants and I agree to be financially responsible for any medical bills incurred as a result of emergency medical treatment. I have provided in this form any medical conditions about which emergency medical personnel should be aware.

Signature

Date

Appendix 5 – Status Release Form

This form is to be signed by every person who sails on the R/V Blue Heron, except the regularly assigned members of the crew. Each person must sign one of the four parts. The Captain will not allow any person who has not done so to sail with the ship, without exception.

R/V Blue Heron CRUISE PERIOD _____ DATE SIGNED _____

I acknowledge that I understand that there are certain risks inherent in field research aboard vessels. I acknowledge that all risks cannot be prevented and I assume those risks beyond the control of the University of Minnesota Duluth staff. I represent that I am able, with or without accommodation, to participate in this field research, and am able to use the equipment and/or supplies described by the field research trip leader.

Should I require emergency medical treatment as a result of accident or illness arising during the field research trip, I consent to such treatment. I acknowledge that the University of Minnesota Duluth does not provide health and accident insurance for field research trip participants and I agree to be financially responsible for any medical bills incurred as a result of emergency medical treatment.

I understand that (1) The University of Minnesota supports the Federal "ZERO TOLERANCE POLICY" which strictly enforces the prohibition aboard vessels of illegal drugs (narcotics, marijuana, stimulants, or other similar controlled substances); (2) guns, alcoholic beverages and smoking are prohibited on board at all times; (3) there is no expert medical service on board and I will inform you of any medical concerns that I may have; (4) it is the policy of the University of Minnesota Duluth to maintain an academic and work environment free of illegal discrimination, harassment and intimidation for students, faculty, and staff.

(1) Paid U of MN employee

I certify that I am an employee of the University of Minnesota and that my presence aboard this ship for this cruise is in the course of my assigned duties.

NAME PRINTED	SIGNATURE	TITLE	FUNCTION ON CRUISE (Technician, Observer, Scientist, etc.)
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Appendix 6 – Station Bill

GENERAL INSTRUCTIONS

1. Each person shall familiarize themselves with their assigned location in the event of an emergency immediately upon boarding the vessel.
2. All crew members shall be thoroughly familiar with the duties they are assigned to perform in the event of an emergency.
3. Each person shall participate in emergency drills and shall be properly dressed during drills, including a properly donned personal flotation device (PFD) or exposure suit.
4. The *STEWARD* shall be responsible for warning personnel, seeing that personnel are properly dressed and have correctly donned their PFDs or exposure suits, assembling and directing personnel to their appointed stations, keeping order in passageways and stairways, and controlling personnel movement.
5. The *ENGINEER* shall be responsible for the maintenance and readiness of all lifesaving and firefighting appliances and equipment.

FIRE AND EMERGENCY INSTRUCTIONS

1. Any person discovering a fire shall notify the bridge and then take appropriate initial actions.
2. All scientific party are to report to their assigned station, the after deck, taking with them a PFD and exposure suit. Ship's crew members are to report to their assigned stations.
3. Upon hearing the fire and emergency signal, all air ports, watertight doors, and fire doors shall be closed and all fans and blowers are to be stopped. All safety equipment will be prepared for immediate service and the fire pumps are to be started.
4. Upon seeing a person overboard, immediately throw a life ring and notify the bridge by reporting "MAN OVERBOARD." In all cases keep the person in sight.

EMERGENCY CREW STATIONS

CAPTAIN: On bridge in command.

FIRST MATE: At scene of the emergency in charge; start fire pumps.

ENGINEER: Assisting at scene of the emergency; manning fire hoses.

STEWARD: Close all watertight doors and port lights, and shut down fans and blowers. Assist scientific personnel with exiting to emergency station and donning life saving gear.

MARINE TECHNICIAN: Assisting at scene of the emergency; manning fire hoses.

EMERGENCY SIGNALS

Fire and Emergency Signal (_____)

The fire and emergency signal shall be a continuous blast of the whistle for a period of not less than 10 seconds followed by a continuous ringing of the general alarm for not less than 10 seconds.

Man Overboard Signal (— — —)

The man overboard signal shall be the letter “0” sounded several (at least 4) times on the ship’s whistle followed by the same signal on the general alarm.

Abandon Ship Signal (_ _ _ _ _ _ _)

The abandon ship signal shall be at least 7 short blasts followed by one long blast on the ship’s whistle followed by the same signal sounded on the general alarm.

Dismissal (— — —)

Dismissal from fire and emergency stations shall be three short blasts on the ship’s whistle followed by the same signal sounded on the general alarm.

NUMBER AND LOCATION OF FIRE FIGHTING AND EMERGENCY EQUIPMENT

Fire Extinguishers:

Pilot house (2), port cabin (1), starboard cabin (1), galley (1), fidley (1), wet lab (2), boson’s locker (1), engine room (2), dry lab (2), lazerette (1).

Fire Stations:

Hose #1—Starboard side of companion way to mess/galley in wet lab.

Hose #2—Aft of Pilot House on 01 Deck

Fire Axe Stations:

Axe #1 — Wet lab.

Axe #2—Aft of Pilot House on 01 Deck

Man Overboard Stations:

#1—Ring buoy main deck, starboard side.

#2—Ring buoys main deck, two on port side.

#3—Ring buoys 01 deck, pilot house port and starboard.

#4—Ring buoys 01 deck, aft of pilot house, port and starboard trawl winch

#5—Life Sling main deck port side aft.

Abandon Ship Station:

#1- main deck

Life rafts, PFDs and exposure suits:

#1—2 10-person life rafts located on foredeck, port and starboard sides.

#2—22 personal flotation devices; 1 per bunk in berthing; 11 in box located on the 01 deck.

#3—22 exposure suits; 1 per bunk located in berthing, 3 in fidlay, 8 in box on the 01 deck

Appendix 7 – Lithium Battery Safety

R/V BLUE HERON

Lithium Battery Safety and Handling Guide

Feb. 2015

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PURPOSE

The intent of this guideline is to provide the users of lithium and lithium ion batteries with guidance to facilitate the safe handling of battery packs and cells under normal and emergency conditions.

DEFINITIONS

There are two types of lithium battery cells in common use:

Primary (non-rechargeable) metallic lithium cells

- These cells are constructed with metallic lithium. The metallic lithium in a non-rechargeable primary lithium battery is a combustible alkali metal that self-ignites at 352°F, and when exposed to water or seawater reacts exothermically and releases hydrogen.

Secondary (rechargeable) lithium ion cells

- Rechargeable secondary cells utilize lithium ions that are intercalated into graphite, lithium metal oxides and/or lithium salts. There is no metallic lithium in a lithium ion battery.

Cell

- A single Primary or Secondary battery.

Battery Pack

- An assembly of cells that are connected in series or parallel. Each Battery Pack typically contains only one type of cell, primary or secondary.

General Provisions for Science Parties:

Obtain and review the battery manufacturers Material Safety Data Sheet (MSDS), Technical Specification sheet(s) and/or other available documentation prior to use on board R/V Blue Heron.

- If the batteries and/or equipment containing batteries require special handling notify Ship Operations in advance of cruise.
- Include Material Safety Data Sheets and/or Technical Data Sheets in the hazardous materials inventory that is transmitted to the ship.
- Notify ship's crew when the batteries and/or equipment arrive on the boat.

R/V BLUE HERON

Lithium Battery **Safety and Handling Guide**

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- Ensure that written standard operating procedures (SOPs) for Lithium and Lithium Ion powered devices are developed that include mechanisms to mitigate possible battery failures that can occur during: assembly, deployment, data acquisition, transportation, storage, and disassembly/disposal.

CELL STORAGE

- Store Lithium Cells/ Lithium Battery powered equipment in the Wet Lab.
- Cells should be stored in their original containers.
- Store the cells in a well ventilated, dry area. The temperature should be as cool as possible to maximize shelf-life. Observe the manufacturers minimum and maximum storage temperatures.
- Store the cells in an isolated area, away from combustible materials. Store depleted cells in an area separate from fresh cells. Allow space for complete encapsulation with Lith-X in the event of a fire.
- Any Primary Lithium battery storage area should have immediate access to both a class D and an ABC fire extinguisher.
- Never stack heavy objects on top of boxes containing lithium batteries to preclude crushing or puncturing the cell case. Severe damage can lead to internal short circuits resulting in a cell venting or explosion.
- Do not allow excessive quantities of cells to accumulate in any storage area.

CELL HANDLING PROCEDURES

Inadvertent short circuits are the major cause of failures for both Lithium (Primary) and Lithium Ion (Secondary) cells. Problems associated with shorting as well as other hazardous conditions can be reduced by observing the following general guidelines:

- Written work instructions or checklists should be generated for assembly and testing procedures.
- Wear safety glasses whenever handling batteries.
- Remove jewelry items such as rings, wristwatches, pendants, etc., that could come in contact with the battery terminals.
- All dented cells or batteries with dented cells should be disposed, regardless of electrolyte leakage. Denting of sides or ends increases the likelihood of developing an internal short circuit at a later time.
- **Cover all metal work surfaces with an insulating material.** Work areas should be clean and free of sharp objects that could puncture the insulating sleeve on each cell.

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Lithium Battery **Safety and Handling Guide**

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- If cells are removed from their original packages for inspection, they should be arranged to preclude shorting. Do not stack or scatter the cells. They should be placed in non-conductive carrying trays with **individual compartments for each cell**.
- Cells should be transported in non-conductive carrying trays. This will reduce the chances of cells being dropped, causing shorting or other physical damage.
- **Battery pack disassembly, repair, or cell replacement may ONLY happen with direct permission of the Captain.**

Emergency Actions

In the event of any emergency situation:

- Notify the Bridge.
- Warn others and report the emergency.
- Evacuate to a safe area.
- Attend to any person that has been exposed to the material, if safe to do so.

EMERGENCY PROCEDURES

Fires

- Battery fires that are beyond the incipient stages may require personnel protective equipment, such as SCBA and Turn-Out gear.
 - In addition to the battery itself, packaging materials, plastics, electronic components and flammable solvents may be involved in a fire.
 - **Fires involving Lithium produce dense white smoke** that can cause severe irritation to the respiratory tract, eyes and skin. All precautions must be taken to limit exposure to these fumes.
 - In the event of a fire involving the Li/SOCl₂ batteries, **standard shipboard firefighting methods should be used. Apply copious amounts of water. Class D extinguishers should be used on raw lithium**, but lithium fires that have spread to other fueling materials should be extinguished based on the most abundant fuel.
 - In all fires set a **standoff distance of 20-50 feet** from the vehicle, due to the potential for violent pressure release.
- **1. Lithium (Primary, Non-Rechargeable) Batteries**
 - Lithium will burn in a normal atmosphere and **reacts explosively with water to form hydrogen**. The presence of minute amounts of water may ignite the material and the hydrogen gas. Lithium fires can also throw off highly reactive molten

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lithium metal particles. Cells adjacent to any burning material could overheat causing a violent explosion.

- Use an extinguishing agent that is best suited to quench the bulk of the fuel that is available. For example, if a single cell were to start burning, a Lith-X Class D extinguisher should be used to quench the fire.
- If other combustibles catch fire as result of the lithium battery, then use the appropriate extinguishing agent to douse these secondary fires. It is important to address each type of fire with the appropriate extinguishing agent.
- When using Lith-X, completely bury the burning material with the Lith-X to extinguish the fire. Lith-X functions by forming a layer or crust of material over the burning metal.

2. Lithium Ion (Secondary, Rechargeable) Batteries

- **Rechargeable**, secondary cells utilize lithium ions that are intercalated into graphite, lithium metal oxides and/or lithium salts. There is **no metallic lithium** in a lithium ion battery.
- Because there is **no metallic lithium** in a lithium ion battery, ordinary extinguishing agents (e.g., ABC extinguisher) can be used effectively on a fire involving lithium ion batteries

Handling a Hot Cell

- As soon as it has been determined that a hot cell situation exists, completely evacuate all personnel from the area. The area should be secured such that no unnecessary persons enter.
- Initiate the vessel emergency response procedures.
- If it is safe to do so before evacuating the area, quickly determine if an external short-circuit is present and remove it as quickly as possible. Note that some cell chemistries may enter a thermal runaway reaction above a certain temperature; thus, a cell may continue to gain heat and there may be a cascade to other cells.
- The area should remain evacuated until the cell has cooled to room temperature.
- Monitor cell temperature with infrared thermometer (found in engine room).
- Using appropriate personal protective equipment and after the hot cell has cooled to normal temperature, the cell should be removed from the work area. All “hot” cells should be disposed as universal waste.

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Releases from Cells (Vented, Leaked or Exploded)

- The electrolyte contained within the lithium cells can cause severe irritation to the respiratory tract, eyes and skin. In addition, violent cell venting could result in a room full of hazardous air contaminants, including corrosive or flammable vapors. All precautions should be taken to limit exposure to the electrolyte vapor. Review the MSDS or product information sheet PRIOR to working with cells, so that you are familiar with the steps to take in the event of a release.

Hazards

- Lithium may emit a colorless to pale yellow gas with a sharp, pungent odor.
- The electrolyte contained in lithium cells can cause severe irritation to the respiratory tract, eyes, and skin.
- Potential hazards may include the release of:
 1. Thionyl chloride, bromine, chlorine dioxide, hydrochloric acid, sulfur dioxide and sulfuryl chloride gasses
 2. Strongly acidic wastewater
 3. Hydrogen from the reaction with water

Cleanup Procedures:

- Don appropriate personal protective equipment (e.g., gloves, safety glasses, respirator).
- Place leaking cell in a sealable plastic bag and cover with a mixture of neutralizing agent (soda ash or baking soda) and absorbent material (vermiculite). Double-bag the leaking cell and seal the bag. Absorb/neutralize any spilled electrolyte with absorbent material and neutralizing agent.
- Collect the contaminated absorbent into a sealable bag.
- After removing the cells and any absorbent/neutralizing materials, the areas can be cleaned with water or an ammonia-based cleaner.
- Place all waste materials in an appropriate container.

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FIRST AID PROCEDURES

In case of contact with electrolyte, gases, or combustion byproducts from a lithium battery or lithium ion battery release, the following first aid measures should be considered:

- **EYES:** Immediately flush eyes with a direct stream of water for at least 15 minutes with eyelids held open, to ensure complete irrigation of all eye and lid tissue. Get immediate medical attention.
- **SKIN:** Flush with cool water or get under a shower, remove contaminated garments. Continue to flush for at least 15 minutes. Get medical attention, if necessary.
- **INHALATION:** Move to fresh air. Monitor airway breathing and circulation. Taken appropriate first aid and/or CPR actions, as necessary. Get immediate medical attention.
- **INGESTION:** Dilute by giving plenty of water and get immediate medical attention. Ensure that the victim does not aspirate or that mucus does not block the airway. Do not give anything by mouth to an unconscious person.

Disposal

Dispose of Lithium Batteries on shore according to University Policy.

Contact Environmental Health and Safety Office, University of Minnesota Duluth at 726-7273 for details.

Appendix 8 – Safety Talk
Key Points of Pre-cruise Safety Talk

1. Work vests are available and to be used.
Wear a work vest when: paying out or taking in towed cables over the stern, when working on deck in rough seas, when working on deck at night, when working from the ship's utility boat, when participating in fire and boat drills, and if assisting in docking/undocking operations.
2. Hard hats are available and to be used.
Wear a hard hat when winches or the deck crane are being used.
3. Never place any equipment over the side without the permission of the Master and/or Watch Officer.
4. No sandals – closed toed shoes only, steel toed safety shoes recommended.
5. Report accidents, illnesses, and injuries immediately to the Master
6. No smoking on board the vessel.
7. No drugs or alcohol on board the vessel.
8. No firearms on board the vessel.
9. The University of Minnesota is committed to tolerance, diversity and respect for differences. It is important that a professional atmosphere is maintained at all times through mutual respect for all your shipmates. Incidents should be reported to the Chief Scientist, Captain, Marine Superintendent or UMD's Department of Human Resources.
10. When shifting from ship power to shore power there will be a short power outage to non-UPS protected outlets. The crew will make every effort to remind you of this outage, but be aware that this loss of power will occur.
11. You will receive a shipboard safety, fire, and man over board lecture immediately prior to your cruise. Please pay attention and feel free to ask pertinent questions at that time. You will learn how to don a type 1 life vest and an immersion suit.
12. Talk to the Master/crew about lithium batteries that are brought on board. Refer to the Cruise Manual for additional information.

When not in use the doors of the heads should remain open.