
Procedures for Using Radioactive Materials Aboard R/V *Sikuliaq*

All activities involving radioisotopes shall be sanctioned by the University of Alaska Fairbanks Radiation Safety Committee (UAF RSC) and be monitored as appropriate by the UAF Radiation Safety Officer (UAF RSO).

For information or assistance concerning other radiation safety matters, please contact the UAF RSO at (907) 474-6603 or tamartinson@alaska.edu.

Pre-cruise procedures

1. The Shiptime request form for the planned cruise shall include the proposed use of radioisotopes by the Principle Investigator (PI), including the isotopes, chemical forms and total activity.
2. At least 60 days prior to a scheduled cruise, the PI will email the UAF RSO with a detailed written Radioisotope Use Plan. The Cruise Radioisotope Use Plan is in addition to the Cruise Plan, and must include:
 - a. A one- or two-sentence statement describing the general nature of the proposed work and its objectives.
 - b. A one-sentence statement of anticipated start and end dates, as well as of any anticipated repetitions of the experiments at a later date.
 - c. A description of the location of the proposed work (latitude/longitude, or distance and direction from a recognized landmark).
 - d. The name and pertinent experience of the person who will be in charge of the radioisotope work onboard *Sikuliaq*.
 - e. The name(s) and experience of any additional persons who will handle radioisotopes aboard ship.
 - i. All UAF personnel must have prior approval as Authorized Users (AU) or Supervised Users (SU) of radioactive materials.
 - ii. All non-UAF personnel must submit a statement signed by the RSO of their institution stating that they have received radiation safety training to satisfy the requirements of 10 CFR 19.12.
 - f. A list of all radioisotopes to be used, including the chemical and physical forms of each, the total activity to be brought onboard, and the total activity to be “in use” at any time.

- g. A description of proposed research activities. Sufficient detail must be given to allow the UAF RSO to determine the nature and extent of any radiological hazards associated with the work.
- h. A list of facilities to be used aboard R/V *Sikuliaq*. Unsealed radioactive isotopes may only be used in a designated radioisotope van. Sealed radioactive sources contained in instruments may be permitted in lab spaces if prior approval from the Marine Superintendent and the UAF RSO has been obtained.
- i. A discussion of safety procedures related to use of radioactive materials, including:
 - i. Use of gloves, lab coats, and other safety apparel
 - ii. Availability of radiation survey equipment during the cruise (e.g., Geiger counters, liquid scintillation counters)
 - iii. Survey methods and frequency
 - iv. Use of shielding or other devices to keep exposures ALARA, if applicable
 - v. Procedures for handling gaseous radioisotopes
 - vi. Storage locations of radioactive materials, including samples, and a description of security measures
- j. A waste disposal plan.
 - i. All radioactive wastes must be packaged and disposed of onshore in accordance with federal and state requirements. No radioactive waste may be disposed of at sea.
 - ii. All PIs must:
 - 1. Provide a brief description of how radioactive wastes will be stored on board.
 - 2. Provide a brief description of how radioactive wastes will be packaged and marked prior to removal from the ship.
 - 3. Make arrangements for their materials to be shipped back to the home institution or to UAF, whichever is applicable.
 - a. Non-UAF personnel
 - i. Are responsible for providing proper packaging, labels, and any necessary written documentation for their shipment. They are also responsible for packaging, marking, and labeling of their shipment, and for ensuring that the shipment is tendered to an appropriate hazardous materials carrier at the conclusion of the cruise.
 - ii. Must provide a brief description of how the materials will be offered for shipment, including either proof of DOT/IATA training for shipping

radioactive materials or a signed statement from your RSO naming who is responsible for shipping and verification that they have received the training required by 49 CFR and/or IATA.

- b. UAF personnel must
 - i. Ensure that radioactive materials remain in the custody of an AU or SU until they are tendered to a hazardous materials carrier (e.g., FedEx, Lynden) or to a designated employee of the Seward Marine Center with prior written approval. Under no circumstances shall radioactive wastes or materials, including samples, be left aboard the ship, abandoned, or transferred to a non-UAF individual or to a UAF employee who is not authorized to possess radioactive materials.
 - c. If materials will not be shipped, the PI must describe who will receive the materials at the conclusion of the cruise.

4. Failure to comply with these waste procedures may result in the loss of radioisotope use privileges.

- 3. If written materials and documentation are deemed acceptable to the UAF RSO, the Marine Superintendent, and the UAF RSC, written authorization for the proposed radioisotope work will be provided by the UAF RSO. The written Radioisotope Use Authorization will include
 - a. a description of the work that has been authorized (location, personnel, radioisotopes)
 - b. a description of the specific requirements concerning routine surveys, post-cruise surveys, clean-up, and disposal of materials.
 - c. The appropriate signatures of affected parties, including the PI (i.e., the authorized user), the RSO, and the Marine Superintendent.

Cruise procedures

- 1. Authorized use areas
 - a. Unsealed radioisotopes may only be used in the assigned radioisotope van. Their use is strictly prohibited in any other areas on board the ship, including indoor laboratories and other vans.
 - i. The purpose of this prohibition is to maintain the integrity of the ship's labs for researchers involved in natural abundance isotope work.
 - b. Exceptions may be made for sealed sources of radioactivity, such as liquid scintillation counters, where there is no chance that radioactive material will be released into the lab space.

- i. Exceptions do NOT include gas chromatographs containing Nickel-63 foils in electron capture devices, as these devices can release small amount of Nickel-63.
 - c. If solutions containing radioactive material must be transported to other areas on deck (i.e., for incubation in sunlight), the sealed incubation bottles must be in a clean secondary container that is sealed for transport to the incubation location. At the incubation location, signs must be posted to indicate the presence of radioactive materials, including the radioisotope, the amount of activity, and the name of the authorized user.
2. Monitoring and surveying
 - a. Radioisotope use areas shall be monitored by an authorized radioisotope user and/or the marine technician, using the onboard survey meter or via wipe tests for isotopes that cannot be detected with a survey meter.
 - b. Monitoring and surveying will be conducted at a frequency specified in the written Radioisotope Use Authorization.
 - c. All monitoring results shall be recorded on prepared forms, properly dated, and signed by the person conducting the monitoring. Each monitoring location shall be numbered, and values will correspond with marked locations on a floor plan of the radioisotope van.
3. Spill response and clean-up
 - a. If a spill or other release of radioactive materials occurs, the Marine Technician must be notified. After clean-up of the materials, monitoring must be conducted immediately. Cleaning and monitoring shall be continued until background levels of radiation are achieved.
 - i. All spills and releases of radioactive materials must be documented on prepared forms, and shall include the radioisotope, an estimate of the quantity spilled, the name of the authorized user, the name of the person responsible for the spill or release, the name(s) of the persons involved in cleaning up the spill, and a description or drawing of the area where the spill occurred.
 - ii. Verification of proper clean up shall be documented using the same form used for routine monitoring (see 2c), except that only those areas involved in the spill need be monitored. Note: the possibility of contamination outside of the immediate area of the spill should not be overlooked.
 - iii. Some clean-up supplies are available onboard, in order of increasing severity of the spill:
 1. Detergent and water
 2. Decontamination solution and water (i.e., Count-Off)
 - b. Spill clean-up procedures shall be conducted according to the written Radioisotope Use authorization.
 - c. All materials used for spill clean-up shall be collected, including any water used to wash the affected areas.
 - i. Collect solid spill clean-up materials in a sturdy plastic bag (2 mil thick), and label with a tag to indicate that it contains solid waste contaminated with radioactive materials. Indicate the isotope and an estimate of the amount of activity.
 1. NOTE: do not dispose of aerosol cans or other hazardous materials in the solid radioactive waste bag. If aerosol cleaners were used

- and the outside of the can is believed to be contaminated, the can must be cleaned with soap and water and wipe tested prior to disposal in regular ship trash. All wash water must be collected and added to other liquids resulting from clean-up of the spill.
- ii. Collect liquid wastes from spill clean-up, including any water used to clean surfaces or contaminated items, in the liquid radioactive waste drum provided. If the drum is not already labeled, create a tag for it to indicate the isotope and an estimate of the quantity.
4. Safety and protective equipment
 - a. Normal precautions for using radioisotopes shall be used onboard the vessel, and include:
 - i. Dispensing aliquots or diluting stocks of radioisotopes shall be done in a contained area, such as a non-porous tray lined with absorbent paper.
 - ii. The authorized user must do all dilutions or dispensing aliquots of stocks, or must directly supervise the activity.
 - iii. All containers of radioactive materials must be sealed at all times except when material is being added to the container. This includes incubation bottles, stock vials, test tubes, microfuge tubes, etc.
 - iv. All liquids containing radioactive materials must be kept in secondary containment at all times (when transporting, filtering, incubating, etc.), and must have an affixed lid.
 1. An exception is made for samples that must be incubated in the sunlight, and therefore cannot be covered with a lid. However, during transport to the incubation area, the secondary containment tub must be sealed with a lid.
 - v. Wearing proper personal protective equipment, including lab coats and chemical-resistant gloves.
 5. Waste storage on board
 - a. Solid wastes shall be placed in 2 mil thick plastic bags and stored in a well-labeled, transportable container with a tight-fitting lid. Acceptable containers include 5 gallon plastic pails or 30 gallon plastic drums.
 - i. Solid wastes must be labeled with the radioisotope, the activity (note, this may change as wastes are added), and the name of the authorized user.
 - ii. Tags shall be provided for this purpose.
 - b. Liquid wastes shall be placed in leak-proof plastic containers and stored in secondary containment.
 - i. Liquid wastes must be labeled with the radioisotope, the activity (note, this may change as wastes are added), and the name of the authorized user.
 - ii. Tags shall be provided for this purpose.
 - c. All wastes shall be stored in the assigned radioisotope van during the cruise.
 6. Authority
 - a. The ship's Master has absolute authority on all safety matters onboard R/V *Sikuliaq*.

Post-cruise procedures

1. Monitoring and surveying
 - a. The authorized radioisotope user shall make a final survey of the radioisotope use area(s) and complete a written report before departing the ship. Surveys must be

done in a manner that is appropriate for the isotope(s) in use (e.g., wipe tests for low-energy beta emitters).

- i. The RSO will specify the material and the conditions of the survey in the written Radioisotope Use Authorization.
 - ii. All final monitoring results shall be recorded on prepared forms, properly dated, and signed by the person conducting the monitoring. Each monitoring location shall be numbered, and values will correspond with marked locations on a floor plan of the radioisotope van.
 - b. The Marine Technician may choose to conduct a baseline survey of the ship to ensure that radioisotopes have not been inadvertently introduced to non-radioisotope areas. This may be done by a representative of the University of Miami (for the UNOLS Swab Program).
2. Clean-up procedures
 - a. Clean-up of the radioisotope van is the sole responsibility of the authorized isotope user and members of his/her scientific party.
 - b. All radioactive materials, including wastes, must be removed from the van and all surfaces must be thoroughly cleaned.
3. Waste disposal
 - a. Sealed, labeled containers of solid and liquid radioactive waste shall be offloaded from the vessel under the direct supervision of the authorized user.
 - b. The waste containers shall be shipped to the home institution of the authorized user by the authorized user or another member of the scientific party who is trained and authorized to ship radioactive materials.
 - i. Responsibility for these shipments is the sole responsibility of the authorized user and his/her home institution.
 - c. UAF radioisotope users shall receive instructions from the UAF RSO regarding specific instructions on handling their radioactive wastes as part of their Radioisotope Use Authorization.
4. Shipment of unused/unopened isotope stocks and standards
 - a. Sealed, labeled containers of radioactive stock solutions shall be offloaded from the vessel under the direct supervision of the authorized user.
 - b. All unused or unopened isotopes must be shipped back to the home institution of the authorized user under the authority of the home institution's radioactive materials license.
 - i. Responsibility for these shipments is the sole responsibility of the authorized user and his/her home institution.
 - ii. Shipments must be done in accordance with all applicable State and Federal regulations.
 - c. UAF radioisotope users shall receive instructions from the UAF RSO regarding procedures for shipping and handling their radioactive materials as part of their Radioisotope Use Authorization.
 - d. Under no circumstances are unsealed/unused radioisotopes to remain onboard the R/V Sikuliaq after the authorized user has departed the vessel at the conclusion of a cruise.
5. Reports
 - a. A written "Post-cruise Radioisotope Use Report" shall be prepared by the authorized user and given to the ship's Master at the end of the cruise.
 - b. The report will be on the form provided, and shall include:

- i. All of the survey and wipe-test records, and any reports of spills.
 - ii. A final disposition of all materials to include:
 - 1. The original amount brought on board
 - 2. The amount used and the disposition of that material into waste streams
 - 3. The amount remaining
 - c. The ship's Master will include the report and any addenda with a preliminary cruise report to the Marine Superintendent.
 - i. The Marine Superintendent will distribute copies to the RSO and to the PI.
 - ii. Copies will be available to subsequent PIs upon request.
- 6. Costs

The authorized user is responsible for all the removal of all radioactive materials and the cleanup of any contamination that may be required.

If it is necessary for the UAF RSO to perform any of these tasks, the authorized user will be charged for the costs incurred, including any travel to the location of the vessel.