

U.C. Santa Cruz
Environmental Health and Safety

A large yellow radiation warning symbol is centered on the page. It consists of a central circle with three curved blades extending outwards, forming a trefoil shape. The symbol is superimposed over the main title text.

Radioactive Waste Disposal Procedures

June 1999

RADIATION SAFETY

This guide provides users of radioactive materials with instructions for preparing radioactive waste for pick-up and disposal. Not all radioactive wastes generated at UCSC are described within this manual. If you have any questions regarding any procedure in this manual or need additional information please contact us:

Radiation Safety

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Bob Cummins, Technician..... 459-3911 rcummins@cats.ucsc.edu

Environmental Health and Safety

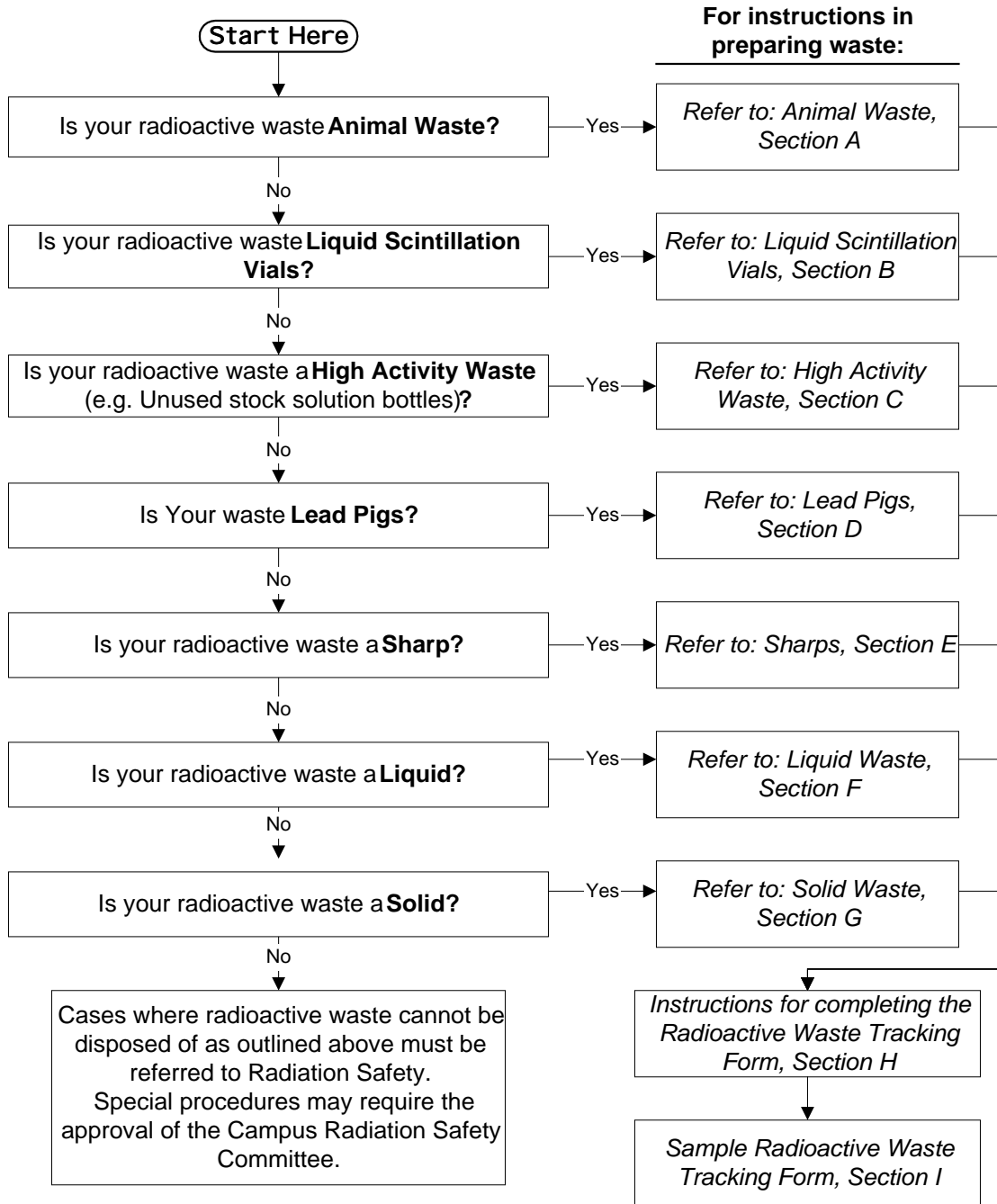
Ilse Kolbus, Director EHS..... 459-4030 ilse@cats.ucsc.edu

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GENERAL REQUIREMENTS

1. Laboratory permittees must ensure, prior to the procurement of radioactive materials, that a method of disposal for the materials presently exists or can be worked out to the satisfaction of Radiation Safety.
2. Each Radioisotope Laboratory must maintain accurate records of the types, quantities, and forms of radioisotopes which comprise the radioactive waste submitted from his/her laboratory to Radiation Safety (*Completion of a Radioactive Waste Tracking Form fulfills this requirement*). Records kept by the laboratories must be based on either calculations or on measurements.
3. It is the Principle Investigator's responsibility to secure proper storage for radioactive wastes generated in their laboratories. (Refer to the *UCSC Radiation Safety Manual Part III Sections F- H* for additional information.)
4. Radioactive waste containers shall be stored as close to the work area as feasible to minimize the possibility of spillage during the transfer of waste to the containers.
5. Waste containers shall NOT be stored in hallways, stairwells or other uncontrolled areas.
6. Radioactive waste containers shall be kept closed at all times when not in use. Liquid waste containers must be kept in secondary containment at all times.
7. Regardless of content, each radioactive waste container shall be labeled with a "Caution Radioactive Materials" sticker.
8. When handling or transferring radioactive waste, the individual shall wear appropriate laboratory attire including lab coat, disposable gloves, protective eye wear and closed toed shoes.
9. Radioactive wastes containing carcinogens, biohazards, or extremely hazardous chemicals must be handled separately and packaged in such a way that they present minimal hazards to people who handle the wastes. Contact Radiation Safety for specific requirements.
10. Do NOT combine different radioisotopes in the same waste container unless you have prior authorization from Radiation Safety to do so.
11. Under NO circumstance shall radioactive waste be released into the sewage disposal system.
12. Do NOT place any radioactive waste in regular trash receptacles.
13. Package the waste properly according to the attached instructions.

MASTER FLOWCHART



ANIMAL WASTE

Definition:

Animal waste includes radioactively contaminated animal carcasses, tissue samples, excreta, blood, or bedding. Animal waste does not include microscopic tissue sections or slides.

Segregation:

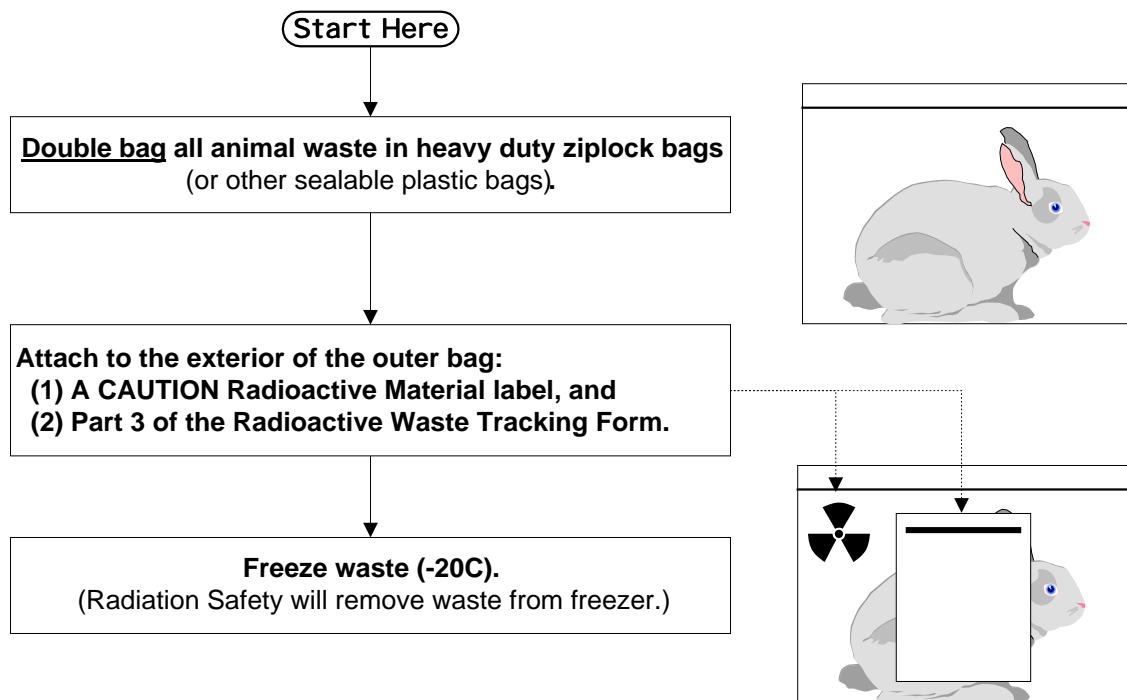
Liquid animal waste - Please contact Radiation Safety for specific instructions.

Solid animal waste must be segregated on the basis of radionuclides and their concentrations:

"Exempted" Radioactive Animal Waste: Contains ^3H and/or ^{14}C at a concentration of less than $0.05 \mu\text{Ci/gram}$, averaged over the entire mass of the animal waste.

"Non-exempted" Radioactive Animal Waste: All animal waste that does not qualify as "exempted" on the basis of ^3H and ^{14}C concentrations.

Packaging Instructions:



LIQUID SCINTILLATION VIALS

Definition:

Scintillation waste consists of liquid scintillation cocktails (including dissolved and suspended samples) and associated containers such as counting vials.

Campus policy treats all scintillation media as both **hazardous** and **radioactive** waste.

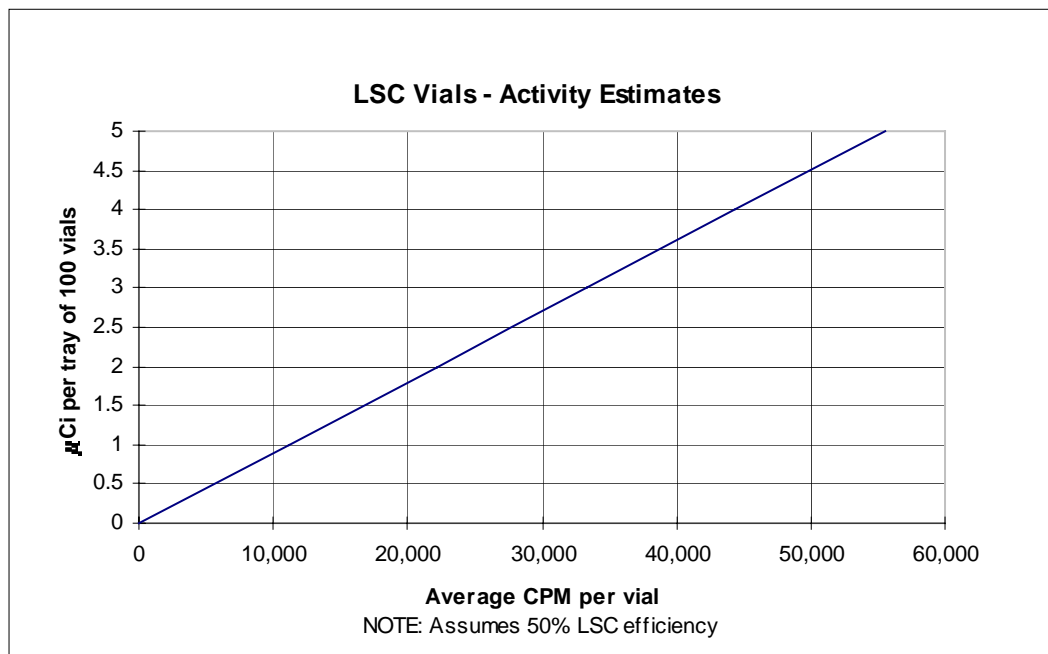
Note: Even the "Biosafe™" series of scintillation cocktail meets the California definition of Hazardous Waste. "Biosafe™" or any other counting cocktail should NEVER be poured down the drain.

Segregation:

Liquid scintillation waste must be segregated by radioisotope.

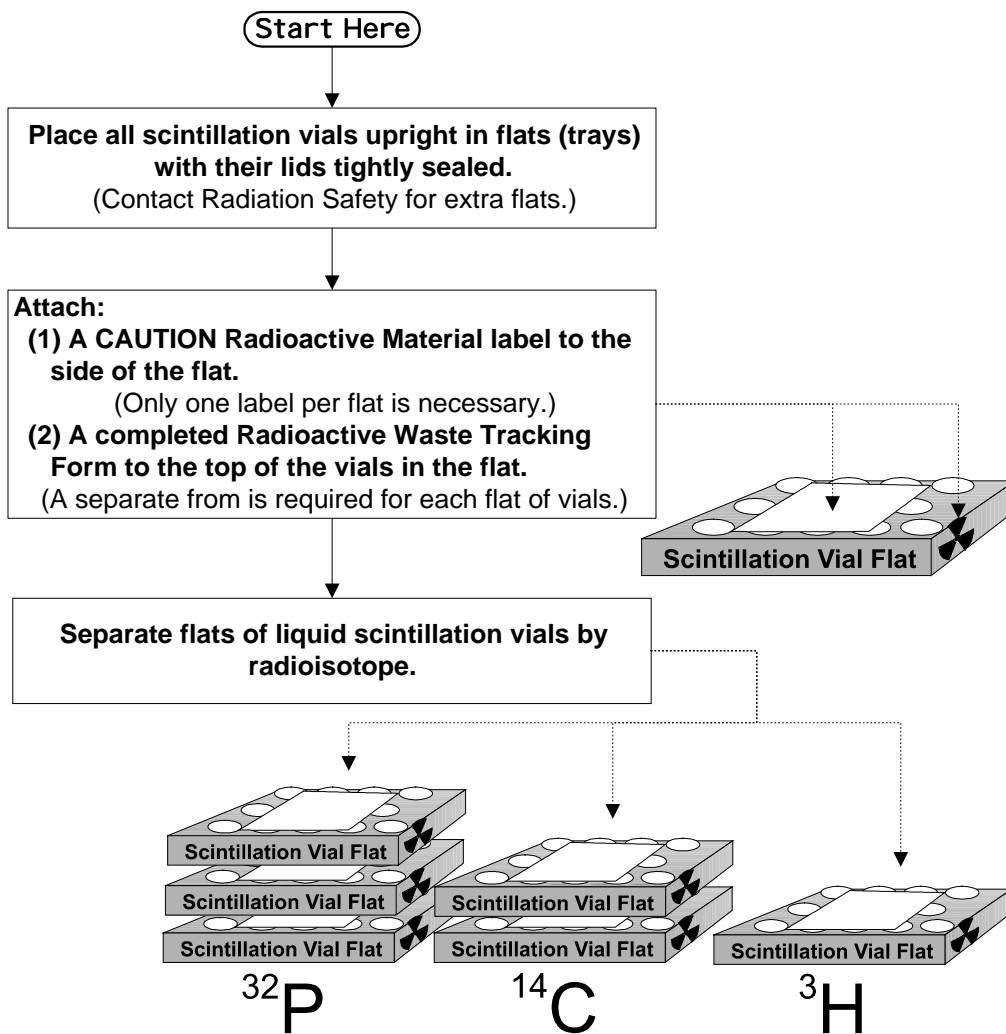
Packing Instructions:

Scintillation media for disposal requires accurate activity estimates. Please consult the following chart when preparing waste forms:



LIQUID SCINTILLATION VIALS

Packing Instructions (continued):



HIGH ACTIVITY WASTE

Definition:

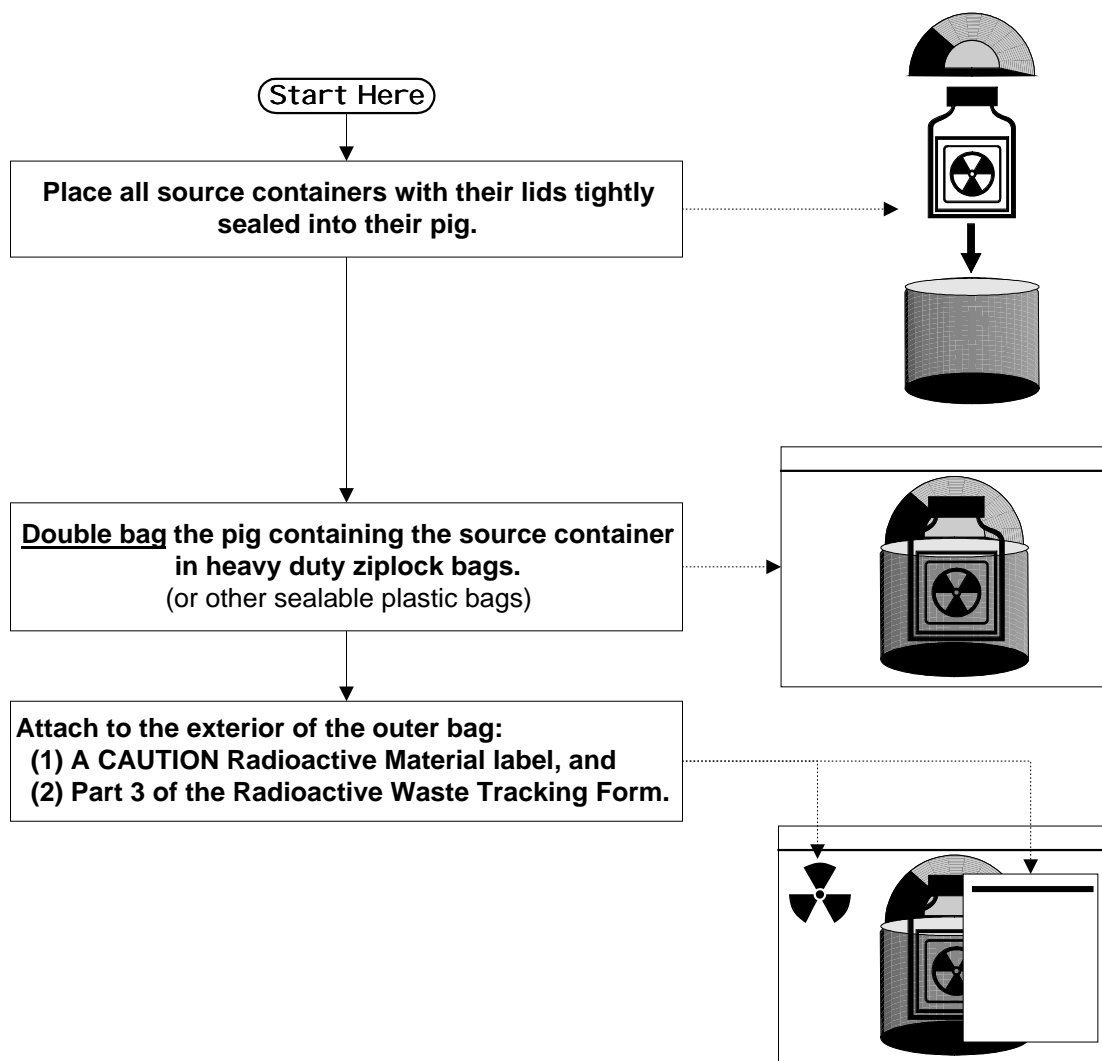
High Activity Wastes are stock vials with remaining activity and high concentration solutions ($\geq 100 \mu\text{Ci/mL}$).

Note: Stock vials without any remaining activity can be disposed of as solid waste in a Rad-Box.

Segregation:

High Activity Waste must be segregated by radioisotope.

Packaging Instructions:



LEAD PIGS

Definition:

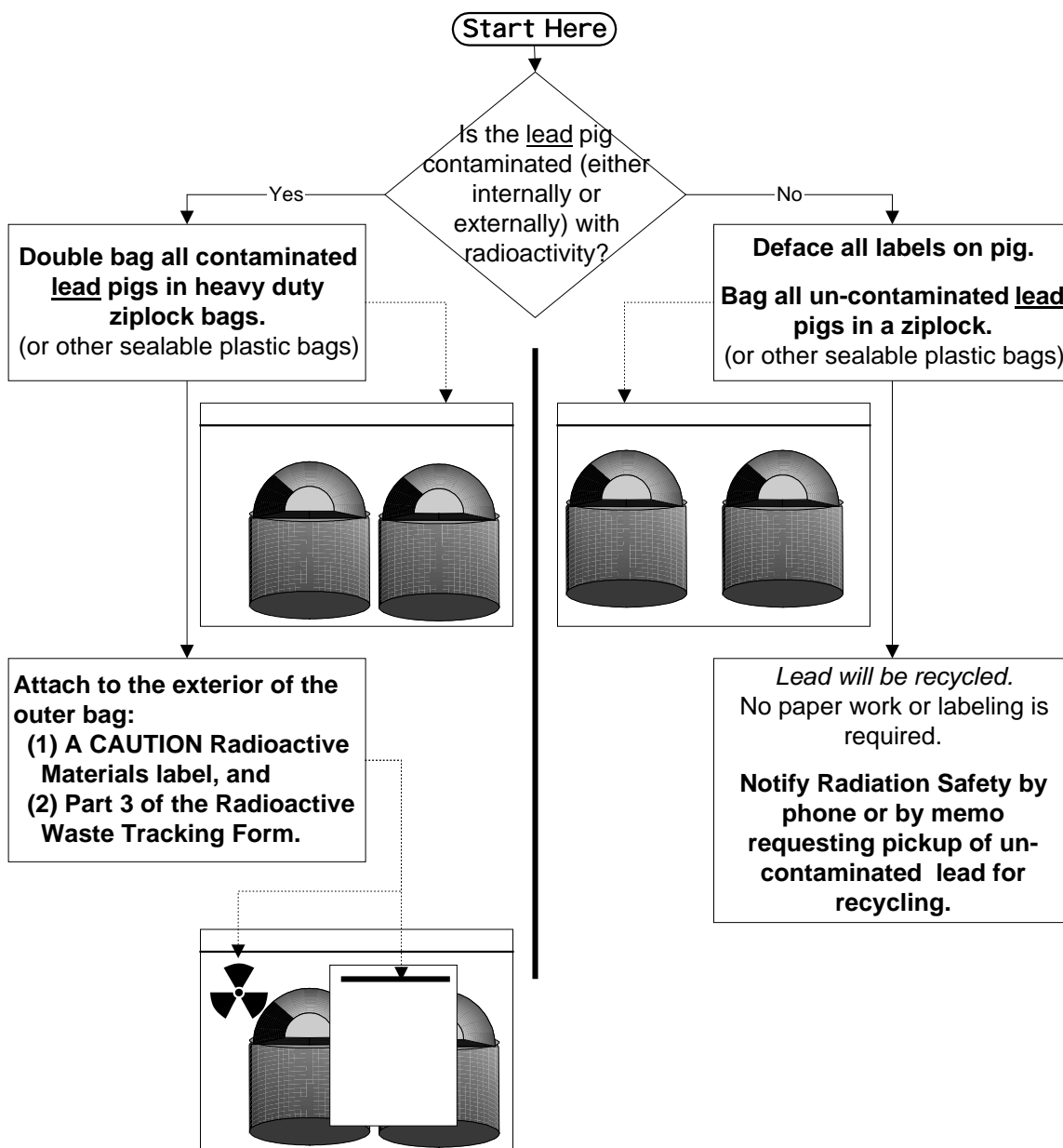
Lead Pigs are source vial enclosures that have lead integrated into them for use as shielding.

Note: Plastic pigs (either contaminated or uncontaminated) that don't contain lead can be disposed of as solid waste in a Rad-Box.

Segregation:

Lead Pigs must be segregated between contaminated and uncontaminated pigs.

Packaging Instructions:



SHARPS WASTE

Definition:

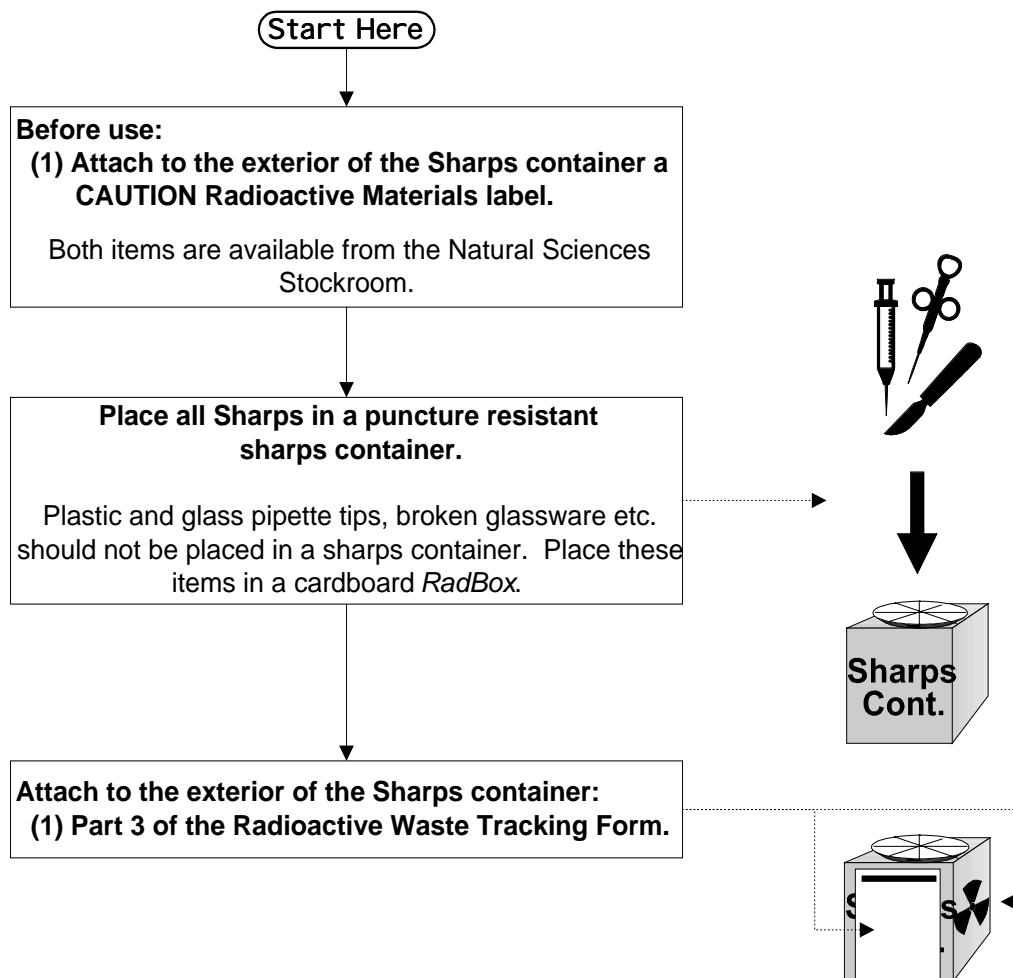
Sharps include: hypodermic needles, syringes (with or without the attached needle), scalpel and razor blades.

Segregation:

Sharps must be segregated by radioisotope.

Packaging Instructions:

All Sharps must be placed in a puncture resistant sharps container (available from the Nat. Sci. Stockroom).



LIQUID WASTE

Definition:

Liquid waste may consist of a variety of chemical constituents, provided that the waste is homogeneous, is "pourable", and is segregated by radioisotope.

Although small amounts of non-soluble materials may be unavoidably present, liquid waste should generally not contain solid materials, especially plastic laboratory equipment such as pipette tips, microcentrifuge tubes etc. (Please indicate on the waste tracking form if the waste does contain solids and/or precipitates.)

Note: Small volumes of high concentration radioactive liquids (e.g. stock solutions) should not be placed into liquid waste containers. Instead, such liquids should be capped and stored separately for disposal as High Activity Waste (refer to Section B).

Segregation:

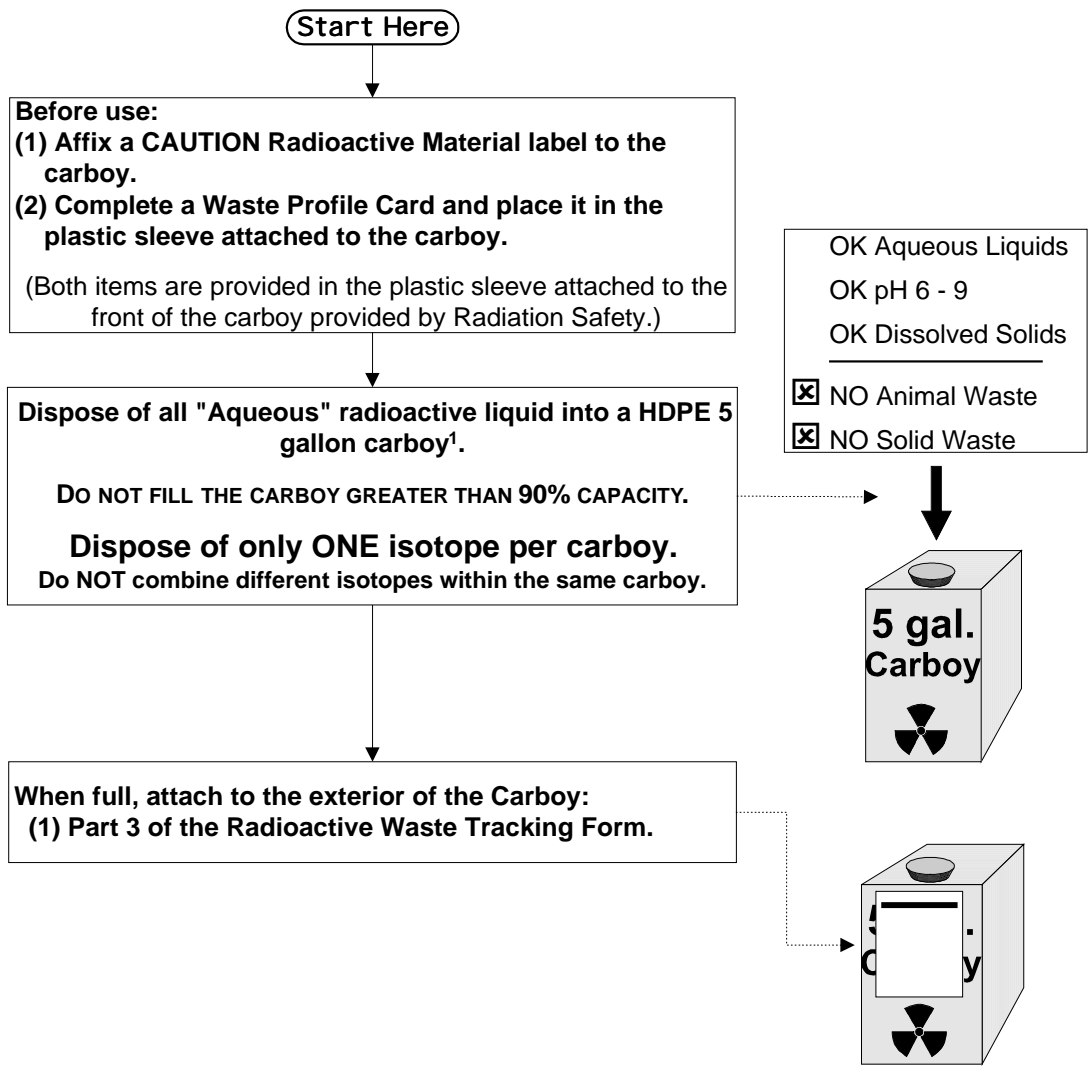
Liquid waste must be segregated on the basis of radionuclides and by chemical composition (Aqueous vs. Mixed):

"Aqueous" Radioactive Liquid: Liquid waste in which the waste materials are either dissolved in water or evenly distributed in a liquid which is mainly composed of water. Such waste after decay will be disposed into the sewage disposal system.

"Mixed" Radioactive Liquid: Radioactive liquid waste which is contaminated with a toxic, flammable, poisonous or reactive material. This material is disposed of as hazardous waste after it has decayed. *The University strongly discourages the generation of radioactive mixed waste.* When generation of mixed waste is unavoidable it must be segregated from non-hazardous aqueous solutions. Contact Radiation Safety for assistance in managing mixed waste.

LIQUID WASTE - *Aqueous Liquids*

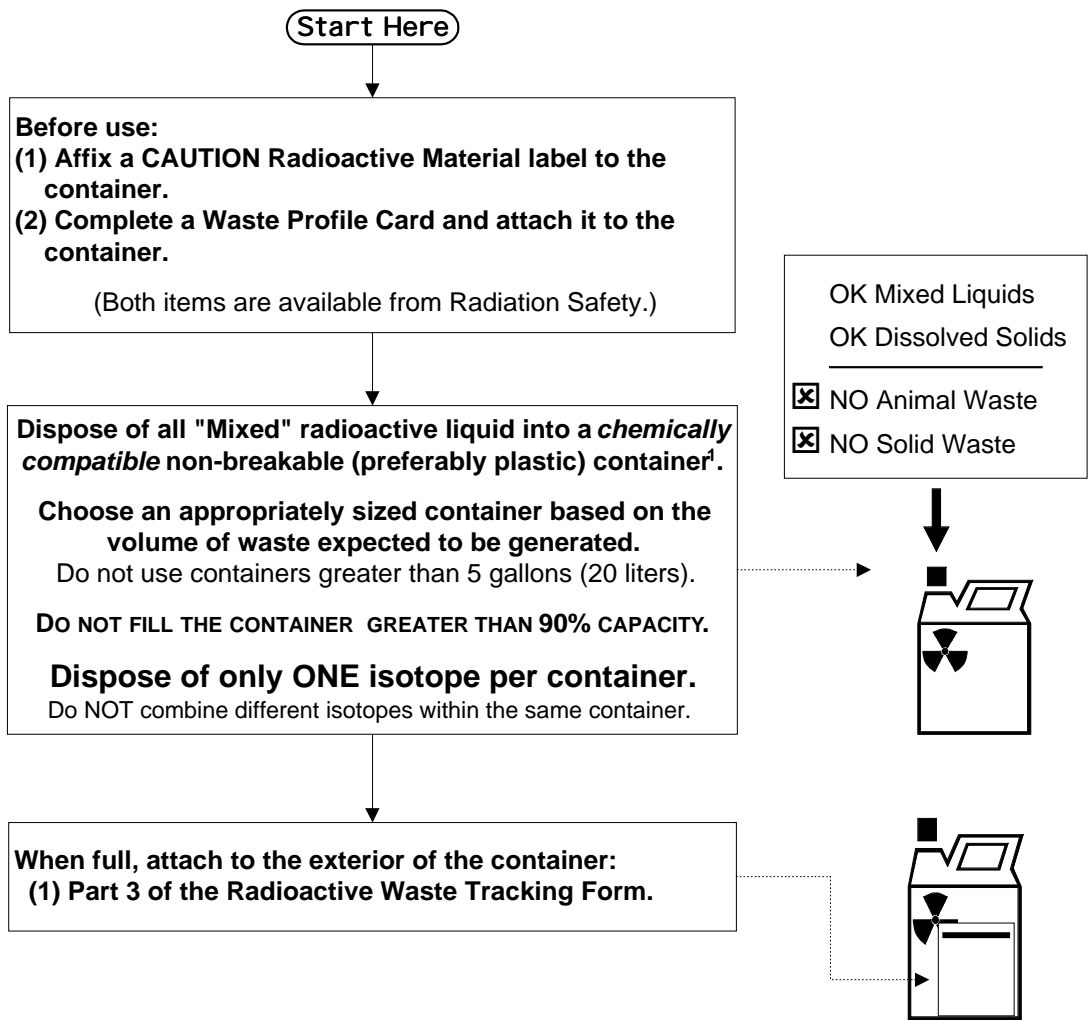
Packaging Instructions: *For Aqueous Liquids Only*



¹ The only suitable container for liquid aqueous radioactive waste are carboys supplied by Radiation Safety. Always keep liquid waste stored in secondary containment.

LIQUID WASTE- *Mixed Liquids*

Packaging Instructions: *For Mixed Liquids Only*



¹ Always keep liquid waste stored in secondary containment.

SOLID RADIOACTIVE WASTE

Definition:

Solid waste consists of dry, radioactively contaminated materials (typically paper, plastics, microcentrifuge tubes, glassware, empty vials¹, and gloves

Although small amounts of damp materials may be present, solid waste must not contain any free-standing² liquids.

Note: Massive uncompactable items (motors, centrifuges and rotors, etc.) shall not be placed in the Rad-Boxes. (Contact Radiation Safety for specific disposal procedures.)

Solid waste must not contain any metals, lead pigs, high activity waste (stock vials with remaining activity), sealed sources, or sharps (refer to the applicable section in this manual for additional information).

Short-lived Solid Radioactive Waste: Solid wastes which contain short-lived radioisotopes with **half lives less than or equal to (\leq) 90 days** are held for decay on-site (for a minimum of 10 half lives) until the nominal radioactivity levels have become indistinguishable (statistically) from background levels. Then the materials are incinerated as non-radioactive medical waste to destroy any radioactive markings.

Long-lived Solid Radioactive Waste: Long-lived (**half-life greater than ($>$) 90 days**) solid radioactive waste are inventoried and placed in on-site storage indefinitely. Long-lived waste generated at UCSC is destined to be disposed of by shipment to and subsequent burial at the yet to be built Ward Valley low-level radioactive waste disposal site in California. Since the establishment of this site is subject to political and social factors, the University of California cannot assume that this disposal site will be available within the next 10 to 20 years. Consequently, all radioisotope users are required to MINIMIZE the volume of long-lived radioactive waste generated in their laboratories.

Segregation:

All solid waste must be segregated by radioisotope

Packaging Instructions:

Small quantities of finely divided radioactive solids (e.g. dust, powders, fibers) must be sealed within plastic containers (such as centrifuge tubes) before being placed into solid waste receptacles. Please contact Radiation Safety when disposal of larger quantities of such materials is necessary.

Radioactive Biohazardous material requires special handling. Contact Radiation Safety for specific instructions.

All solid radioactive waste must be placed in a Rad-Box (available from the Nat. Sci. stockroom).

¹ Empty means no liquid or liquid-containing mixture, such as LSC gel and no observable movement of liquid when shaken.

² Free standing liquid is that amount which can readily run, and thus could easily be emptied from centrifuge tubes, pipettes, etc. It is not droplets retained in containers by surface tension or capillary action.

RADIOACTIVE WASTE TRACKING FORM INSTRUCTIONS

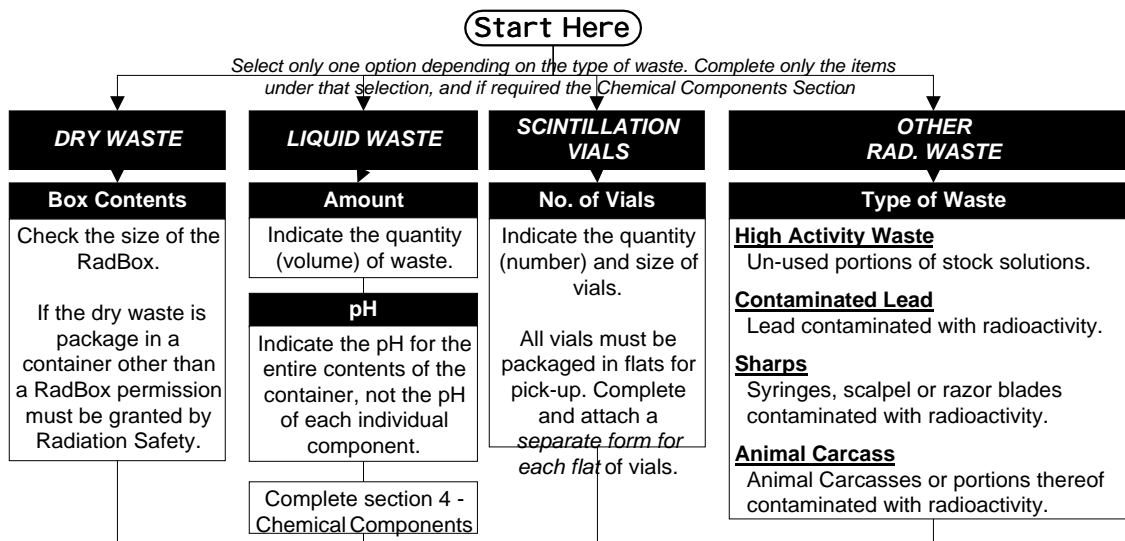
GENERAL INSTRUCTIONS

1. To request pick up of radioactive waste, fill out a Radioactive Waste Tracking Form for each container (or item) of waste. A separate form is required for each container.
2. The form should be filled out completely and accurately. All forms must be signed and dated.
3. Please type or print neatly with a ball point pen, PRESS HARD.

SECTION 1: LABORATORY INFORMATION

Investigator	Enter the name of the Principle Investigator (PI) in charge of the unit originating the waste. This is the permittee name listed on the use permit for the lab generating the waste.
Authorized User	Enter the name of the person responsible for the waste in the lab. Their signature is required for pickup approval.
Date	Enter the date that this form is completed.
Lab Phone	Enter the extension where the Authorized User can be reached.
Waste Location	Enter the actual location (building and room) where the waste is located.

SECTION 2: WASTE INFORMATION



Radioisotope	Identify the radioisotope. Do NOT combine different isotopes within the same container.
Decay Start Date	Record the date on which the container was filled and closed.
Activity	Record the activity level in millicuries (mCi) for each isotope listed. Do not use any other unit of measurement (i.e. Becquerels, CPM or DPM).

SECTION 3: GENERATORS CERTIFICATION

Signature / Date	All forms, after being completed, must be signed and dated by the Authorized User listed above.
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RADIOACTIVE WASTE TRACKING FORM INSTRUCTIONS (CONTINUED)

SECTION 4: CHEMICAL COMPONENTS (MUST BE COMPLETED FOR ALL LIQUIDS)

Chemical Name	List each chemical (either hazardous or non-hazardous) that forms the composition of the waste.
% Composition	Record the percent concentration for each chemical in the waste. List this on the same line as the chemical.
Notes	Include any other information here.

Please note that each container of waste must have attached a Radioactive Waste Tracking Form in order to be picked up by Radiation Safety. Any container without a Tracking Form will NOT be picked up.

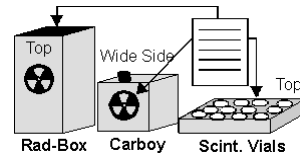
WHEN COMPLETE

1. Tear off and mail Part 1 (White copy) to Radiation Safety.
2. Retain Part 2 (Pink) for your records.
3. Attach Part 3 (Yellow - Tag) to the waste container as shown at the upper-right of the form using the self-adhesive strip on the back of Part 3.

Please call Radiation Safety if you have any questions.

Form Instructions:

1. Complete entire form (sections 1-3, and if applicable section 4)
2. Tear off and submit part 1 to EHS via Campus Mail
3. Attach part 3 to waste container as shown, or if uncertain about its placement, just leave with waste and EHS will attach. Retain part 2 for your records.



RADIOACTIVE WASTE TRACKING FORM

SECTION 1: LABORATORY INFORMATION

SAMPLE WASTE ID NUMBER: **W**

Investigator _____ Authorized User _____ Date _____

Lab Phone _____ Waste Location (Bldg. & Room) _____

Available from Radiation Safety

SECTION 2: WASTE INFORMATION

Start Here
Select only one option

Dry Waste (Rad-Box)	Liquid Waste	Scintillation Vials	Other Rad. Waste
If other than glass and/or lab debris contaminated with radioactivity complete the Chemical Components section (4) below. <input type="checkbox"/> 2 ft3 RadBox <input type="checkbox"/> 1 ft3 RadBox <input type="checkbox"/> Other: _____ ft3 <input type="checkbox"/> Ziplock <input type="checkbox"/> Carboard box Decay Start Date _____ Radioisotope _____ Activity _____ mCi/box	Complete the Chemical Components section (4) for all liquid waste. <input type="checkbox"/> 5 gal carboy <input type="checkbox"/> 2.5 gal carboy <input type="checkbox"/> Other plastic container _____ gallons pH _____ Decay Start Date _____ Radioisotope _____ Activity _____ mCi/cont.	Please complete and attach a separate form for each flat of vials. Number of vials: <input type="checkbox"/> 100 <input type="checkbox"/> 200 <input type="checkbox"/> Other _____ vials Vial size: _____ mL Decay Start Date _____ Radioisotope _____ Activity _____ mCi/flat	Select only one option: <input type="checkbox"/> High Activity Waste <input type="checkbox"/> Contaminated Lead <input type="checkbox"/> Sharps (In sharps Container) <input type="checkbox"/> Animal Carcass (Keep Frozen) Decay Start Date _____ Radioisotope _____ Activity _____ mCi/cont.

SECTION 3: GENERATORS CERTIFICATION

I certify that the above information is complete and true to the best of my knowledge. I am aware that the law provides penalties for submitting false information.

Signature: _____ Date: _____ Questions? Call, EH&S, Bob Cummins, x9-3542
(Authorized User)

SECTION 4: CHEMICAL COMPONENTS

Please list each chemical constituent (hazardous or non-hazardous) separately and include it's percent composition

_____	_____ %
_____	_____ %
_____	_____ %
_____	_____ %
_____	_____ %
_____	_____ %
_____	_____ %

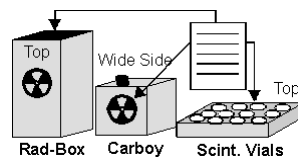
Notes: _____

SECTION 5: DISPOSAL INFORMATION (EHS USE ONLY)

<input type="checkbox"/> On-site STORAGE	<input type="checkbox"/> Entered into HPA
<input type="checkbox"/> On-site DECAY	Decay Finish Date: _____
Survey Date: _____	
Inst. used: Ludlum	ESP-1 Berthold NaI LSC
Rad. < 2 x Bkg.:	Flame: + / - pH: _____
<input type="checkbox"/> Off-site INCINERATION	<input type="checkbox"/> Off-site LANDFILL
Disposal Facility: _____	Transporter: _____
Shipment Date: _____	Cont. Defaced: _____
<input type="checkbox"/> Mixed-Waste	HW Tracking #: _____
(Transfer to HW	Transfer Date: _____
<input type="checkbox"/> Scintillation VIALS	Drum #: _____
<input type="checkbox"/> Drum COMPACTED	Date Packed: _____

Form Instructions:

1. Complete entire form (sections 1-3, and if applicable section 4)
2. Tear off and submit part 1 to EHS via Campus Mail
3. Attach part 3 to waste container as shown, or if uncertain about its placement, just leave with waste and EHS will attach. Retain part 2 for your records.



SAMPLE

Available from Radiation Safety