



UNITED STATES
DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY
Water Resources Division
1209 Orca Street
Anchorage, AK 99501

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January 17, 1984

U.S. Nuclear Regulatory Commission
Division of Fuel Safety Cycle
and Material Safety
Office of Nuclear Material
Safety and Safeguards
Washington, D.C. 20555

Attn: James W. Patterson

Gentlemen:

This reply is for Mail Control Number 16390, our application for a NRC license.

Thank you for the copy of regulatory guide 10.7. We will respond to your letter as your items are numbered.

1. USE OF LICENSED MATERIAL.

The primary productivity of aquatic systems will be studied using Carbon-14 as follows:

1. Water samples will be retrieved from the study lake and 60 milliliter aliquots will be used to fill approximately 30 glass incubation bottles.
2. Using a pipettor, each incubation bottle will be injected with 100 microliters of Carbon-14 solution taken from a glass ampoule with an activity of 23 microcuries in 1.1 milliliters of solution.
3. The incubation bottles will be tightly capped and exposed for 2 to 4 hours at various light levels in an incubation chamber residing in the laboratory trailer at 1209 Orca St.
4. After incubation, the glass bottles will be removed to the fume hood for processing. They will be processed in one of two ways depending on our experimental goals. In the first method, a 5 milliliter aliquot will be removed and placed in a glass liquid scintillation vial, then acidified and bubbled with air, and then fixed with 15 milliliters of scintillation fluor. In the second method, the contents of the incubated bottle will be filtered and the filter will be placed in a glass liquid scintillation vial.

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5. The scintillation vials will then be counted for activity on a scintillation spectrophotometer located at the Alaska Dept. of Fish & Game laboratory in Soldotna, AK.

Carbon-14 will not be released to the environment for experimental purposes; all experiments entail use of this tracer within sealed bottles.

The nutrient limitation studies of algae and aquatic plants will be done with Phosphorus-32 as follows:

1. Water samples will be retrieved from the study lake and 600 milliliters will be placed in a glass incubation flask.
2. The flask will be injected with sufficient Phosphorus-32 to achieve an activity of 2.7 microcuries.
3. The flask will be incubated at constant temperature and light for a six hour period.
4. Periodically, ten milliliter aliquots will be withdrawn from the incubation flask with a pipettor.
5. The aliquots will be filtered and the filters placed in glass liquid scintillation vials.
6. The scintillation vials will then be counted for activity on a scintillation spectrophotometer located at the Alaska Dept. of Fish & Game laboratory in Soldotna, AK.

Phosphorus-32 will not be released to the environment for experimental purposes; all experiments entail use of this tracer within sealed flasks.

The scintillation vials containing the filters or sample aliquot with fluor will be transported to Soldotna, Alaska by car or truck.

2. INDIVIDUALS WHO WILL USE LICENSED MATERIALS.

We do not have trained individuals other than Richard L. Snyder at this time. We will provide suitable training for Paul F. Woods and Timothy G. Rowe in the very near future. We will amend our license to include them as users when their training is complete. Radioactive material will not be used in the absence of Mr. Snyder.

3. INSTRUMENT CALIBRATION.

We will have our Ludlum-12, GM instrument with a $1.4-2.0 \text{ mg/cm}^2$ mica window calibrated with certification twice a year with two points separated by at least 50% of the scale by the manufacturer. This instrument will be used for surveying purposes.

4. RADIOLOGICAL SURVEY PROGRAM.

a. The frequency of direct radiation surveys conducted in the mobile trailer and laboratory will be after every period of use. The longest period of use would be two days before cleanup and a radioactive survey has been taken. There will be approximately 18 periods of use a year dependent on the experimental results as time progresses.

b. All radioactive materials will be hand (with gloves) carried between the trailer and laboratory in one of the following ways:

1. Factory sealed ampoules packed within a protective container.
2. Sealed bottles within a container similar to a plastic dish-pan usually with a separate lid.
3. Any waste, dry or damp, will be placed in a plastic pan and covered with a plastic bag.

c. To all authorized USGS-WRD Anchorage, Alaska personnel using radiation.

There will be no food, drink, or smoking in the mobile laboratory trailer and/or lab when radioactive material is being used nor until the work area is cleaned and a radiation survey completed indicating the absence of radiation above background. All non-authorized personnel are to remain out of the work area when radioactive materials are in use.

All authorized personnel working with radiation are required to wear protective aprons and gloves made of plastic or rubberized material. Personnel must also wear film badges and/or dosimeters. Remember to keep as much distance and mass between yourself and the radiation source to keep exposure to a minimum. All counter work will be done in a tray to contain radioactive material that might spill. All volumetric aliquot injections and removals of radioactive material will be with pipettors. The removal and placement of filters will be with tweezers. When ampoules containing radioactivity from the manufacturer are opened, this will be done with either an ampoule opener or with the ampoule wrapped in absorbent material.

All liquid waste ^{14}C will be flushed down the 1209 Orca St. sink and containers rinsed with a slow stream of tap water using tongs when possible. All ^{14}C dry or damp waste will be dilute acid (Hydrochloric Acid) rinsed or soaked using tongs in the fume hood with the hood turned on. The acid will then be poured down the sewer with adequate flushing. Items that have been acid rinsed will be rinsed in tap water and radiation surveyed to make sure material is equal to background radiation. The process will be repeated if radiation is not at background levels. As a last alternative, items will be placed in a glazed ceramic evaporating dish and oxidized in a muffle furnace in the fume hood. Only ^{14}C free

solids will be put in the trash. If there are ever any spills or other problems, the radiation protection officer should be contacted.

In case of an emergency, from whatever cause, when radioactive material is involved the main things to remember are to contain the radiation, and prevent radiation exposure of all personnel and contamination of other areas. To limit exposure keep all unnecessary personnel away. If there is a spill it can be contained with absorbent towels which can be transferred to a plastic tray or pan with tongs. Keep as much distance between yourself and radiation sources as possible. If a ^{14}C spill occurs outside of the fume hood in the main building, the spill should be contained and picked up with absorbent towels; then the building should be temporarily evacuated while doors and windows are opened and dilute acid is applied to the area to convert HCO_3 to $^{14}\text{CO}_2$ gas and allowed to dissipate with the increased ventilation. Depending on the size of the spill, the building could probably be entered after thirty minutes. The dilute acid should then be cleaned up and the area radiation surveyed. If the use of acid is impractical, available decontamination cleaners can be used but might subject cleanup personnel to higher levels of radiation. After all cleanups a radiation survey must be made.

If ^{32}P is spilled decontamination cleaners should be used. It might be necessary to use acid if the cleaners do not work. With ^{32}P use long-handled sponges or long tongs and absorbent towels during cleanup to eliminate close contact with the source of radiation as much as practical. All material used for cleanup must be held for decay for 200 days. The area must be cleaned until a radiation survey indicates background radiation levels.

In case of fire that cannot be contained by building personnel, the fire department must be notified and informed of areas where radiation is in use. The fire department has been informed where the radiation storage area is located within 1209 Orca St. The objectives remain the same as for a spill, i.e. prevent radiation exposure to all personnel if possible, contain the radiation to prevent radioactive contamination of other areas. The radiation protection officer must be notified. R.L.Snyder's phone numbers are: home 279-2808 & work 271-4153. The ampoules or other shipping containers containing ^{14}C or ^{32}P that are in the storage cabinet will be inside a fire safe that has a Safe Manufacturers National Association rating of one hour. The maximum temperature can be 927 degrees C (1700 degrees F). There will be some vermiculite on the safe bottom for absorption purposes in case of shipping container breakage due to high temperature.

When entering an area where there was a fire with radiation material present, the burned area should be cooled to ambient temperature. The area should be radiation surveyed in concentrically smaller circuits thus mapping the area of possible contamination. Protective footwear must be worn. If contamination is extensive and

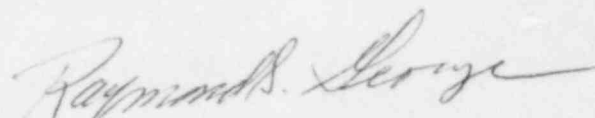
radiation levels high, the area will be blocked off and professional decontamination experts contacted for assistance. The NRC must be notified at 1450 Maria La., Suite 210, Walnut Creek, CA 94596.5368, phone (415) 943-3700 or FTS 463-3700. If the contamination is neither extensive or of high radiation, the cleanup will be similar to a spill.

4.e.1. The ampoules or shipping containers containing ^{14}C or ^{32}P that are in the storage cabinet will be inside a metal fire safe that has a Safe Manufacturers National Association rating of one hour. The maximum temperature can be 927 degrees C (1700 degrees F). The radiation storage cabinet door, inside wall, and top of the cabinet will have lucite shielding. The top 2/3 of the door and part of the inside wall will have lead shielding outside of the lucite.

4.e.2. Extremity dosimeters will be worn when millicurie quantities of ^{32}P are used as well as the normally used film badges.

4.e.3. A lucite counter shield will be used as much as possible when using ^{32}P .

4.e.4. Tongs will be used to handle contaminated vessels and indirectly shielded materials except when placing in and removal of bottles from the water bath incubator.



Raymond S. George
Associate District Chief