

OFFICIAL RECORD COPY MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee		3. License Number	41-25370-01
1. Tennessee Valley Authority Resource Group		4. Expiration Date	October 31, 2001
2. 400 West Summit Drive		5. Docket or Reference No.	030-34258 (01-06113-03)
Knoxville, Tennessee 37902			
6. Byproduct, Source, and/or Special Nuclear Material	7. Chemical and/or Physical Form	8. Maximum Amount that Licensee May Possess at Any One Time Under This License	
A. Carbon 14	A. Any	A. 2.59 gigabecquerels (GBq) (70 millicuries)	
B. Phosphorus 32	B. Any	B. 111 GBq (3 curies)	
C. Phosphorus 33	C. Any	C. 37 GBq (1 curie)	
D. Sulfur 35	D. Any	D. 55.5 GBq (1.5 curies)	
E. Calcium 45	E. Any	E. 3.5 GBq (75 millicuries)	
F. Nickel 63	F. Any foil or plated source contained in a compatible detector cell registered pursuant to 10 CFR 32.210 or an equivalent Agreement State regulation	F. Not to exceed 0.74 GBq per source (20 millicuries)	
G. Cesium 137	G. Any sealed source registered pursuant to 10 CFR 32.210 or an equivalent Agreement State regulation	G. Not to exceed 4.55 GBq per source (150 millicuries)	
H. Americium 241	H. Any sealed neutron source registered pursuant to 10 CFR 32.210 or an equivalent Agreement State regulation	H. Not to exceed 1.85 GBq per source (50 millicuries)	
I. Any byproduct material with Atomic Nos. 1-94, special nuclear material and/or source material	I. Any environmental sample collected from an unrestricted area	I. Unspecified radioactivity content (samples collected from unrestricted areas)	

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|----|---|----|-----------------------------------|----|--|
| 6. | Byproduct, Source and/or Special Nuclear Material | 7. | Chemical and/or Physical Form | 8. | Maximum amount that may be licensee may possess at any one time under this license |
| J. | Mixed fission/activation products | J. | Mixed fission/activation products | J. | 37 megabecquerels (1 millicurie) |

9. Authorized Use:

- A. For research and development as defined in 10 CFR 30.4, including the project described in the letter received January 19, 1993.
- B. through E. For use in tagging of fertilizers, fertilizer components, and other materials and for transfer to authorized recipients.
- F. For use in a compatible gas chromatograph for sample analysis.
- G. Sealed sources contained in non portable gauging devices which have been registered pursuant to 10 CFR 32.210 and distributed in accordance with an NRC or Agreement State License for the purpose of measuring properties of materials and/or controlling industrial processes.
- H. Sealed sources contained in compatible portable gauging devices registered pursuant to 10 CFR 32.210 or an equivalent Agreement State regulation for measuring properties of materials.
- I. Possession and use of any radioactive material that may be contained in environmental samples that have been collected from unrestricted areas (as defined in 10 CFR 20) for analysis of non-radioactive constituents. The licensee may receive, use, transfer and/or dispose of these materials in accordance with procedures described in its application dated September 30, 1993.
- J. Physical and chemical characterization of the nonradioactive component of solid and liquid samples using laboratory instruments.

CONDITIONS

10. Locations of use:

- A. Licensed material identified in Items 6.A. shall be used only at the licensee's facilities located at:
 - 1. **Environmental Research Center**, Chemical Development Department, Muscle Shoals, Alabama, in laboratories designated by the licensee in accordance with the application dated September 30, 1993;
 - 2. licensee's property located 1 mile south of Norris Dam on the east side of US 441, Norris, Tennessee;
 - 3. licensed material may be used and stored at the Hickory Valley Building, 283 Hickory Valley Road, Chattanooga, Tennessee; and,
 - 4. may be used at temporary jobsites of the licensee anywhere in the United States.

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10. Locations of Use (Continued)

- B. Licensed material identified in Items 6.B. through 6.E. shall be used only at the licensee's facilities located at the **Environmental Research Center**, Chemical Development Department, Muscle Shoals, Alabama 35660.
- C. Licensed material identified in Item 6.F. shall be used at the licensee's facilities located at:
1. **Environmental Research Center**, Chemical Research Division, and the Atmospheric Science Department, Water Resources Division, Muscle Shoals, Alabama;
 2. Water Research Department, Fourth and Chestnut Street, Chattanooga, Tennessee; and,
 3. temporary jobsites of the licensee anywhere in the United States.
- D. Licensed material identified in Item 6.G. shall be used only at the licensee's facilities located at the **Environmental Research Center**, Chemical Development Department and/or Prototype Operations, Muscle Shoals, Alabama 35660.
- E. Licensed material identified in Item 6.H. shall be used only at the licensee's facilities located at the **Environmental Research Center**, Research Division, Muscle Shoals, Alabama and at temporary jobsites anywhere in United States.
- F. Licensed material identified in Item 6.I. shall be used at any permanent or temporary jobsites of the licensee anywhere in the United States.
- G. Licensed material identified in Item 6.J. shall be used at the licensee's facilities located at the **Environmental Research Center**, Chemical Development Department and/or Prototype Operations, Muscle Shoals, Alabama 35660, and at temporary job sites of the licensee anywhere in the United States.

11. The Radiation Safety Officer for the activities authorized by this license is **Jesse H. Coleman**.

12. Authorized user(s):

- A. Licensed material identified in Item 6.A. shall be used by or under the supervision of, Neil M. Woomer, Lisa J. Samuelson or individuals who meet the specifications of 10 CFR 33.15(b)(1) and (2) or individuals who have been trained as specified in application dated September 30, 1993. The licensee shall maintain records of individuals designated as users.
- B. Licensed material identified in Items 6.B through 6.E. shall be used by or under the supervision of, George T. Jones, or individuals who have been trained as specified in application dated September 30, 1993. The licensee shall maintain records of individuals designated as users.

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12. Authorized Users (Continued)

- C. Licensed material identified in Item 6.F. shall be used by or under the supervision of, Jesse H. Coleman, Kenneth J. Olszyna, Larry O. Hill, or individuals who have been trained as specified in application dated September 30, 1993. The licensee shall maintain records of individuals designated as users.
- D. Licensed material identified in Item 6.G. shall be used by or under the supervision of, Millicent M. Bulls, Johnny S. Smith or individuals who have been trained as specified in application dated September 30, 1993. The licensee shall maintain records of individuals designated as users.
- E. Licensed material identified in Item 6.H. shall be used by or under the supervision and physical presence of, Allan David Behel or individuals who have been trained as specified in application dated September 30, 1993. The licensee shall maintain records of individuals designated as users.
- F. Licensed material identified in Item 6.I. shall be used under the supervision of Jesse Coleman.
- G. Licensed materials identified in Item 6.J. shall be used by, or under the supervision of Dr. William J. Rogers or Dr. C. Henry Copeland

- 13. A. Sealed sources and detector cells shall be tested for leakage and/or contamination at intervals not to exceed 6 months or at such other intervals as specified by the certificate of registration referred to in 10 CFR 32.210.
- B. In the absence of a certificate from a transferor indicating that a leak test has been made within 6 months prior to the transfer, a sealed source or detector cell received from another person shall not be put into use until tested.
- C. Sealed sources need not be leak tested if:
 - (i) they contain only hydrogen 2; or
 - (ii) they contain only a radioactive gas; or
 - (iii) the half-life of the isotope is 30 days or less; or
 - (iv) they contain not more than 100 microcuries of beta and/or gama emitting material or not more than 10 microcuries of alpha emitting material; or
 - (v) they are not designed to emit alpha particles, are in storage and are not being used. However, when they are removed from storage for use or transferred to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source or detector cell shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.

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13. Leak Tests (Continued)

- D. The leak test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. If the test reveals the presence of 0.005 microcurie or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission in accordance with 10 CFR 30.50(b)(2), and the source shall be removed immediately from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. The report shall be filed within 5 days of the date the leak test result is known with the U.S. Nuclear Regulatory Commission, Region II, ATTN: Chief, Materials Licensing/Inspection Branch, Division of Nuclear Materials Safety, 101 Marietta Street NW, Suite 2900, Atlanta, GA 30323-0199. The report shall specify the source involved, the test results and corrective action taken.
- E. Tests for leakage and/or contamination shall be performed by the licensee or by other persons specifically licensed by the Commission or an Agreement State to perform such services.

14. A. Each gauge authorized by Item 9.G. shall be tested for the proper operation of the on-off mechanism and indicator, if any, upon installation and at intervals not to exceed six months or at such longer intervals as specified by the device manufacturer, not to exceed three years, and at the same interval as the leak test specified in Condition 13.A.
- B. Installation, initial radiation survey, relocation, or removal from service of devices containing sealed sources authorized by Item 7.G. shall be performed by or under the supervision and physical presence of licensee personnel of the RS & C, Occupational Hygiene Branch in accordance with the procedures in the application dated September 30, 1992 and the letter dated March 28, 1994 or by persons specifically licensed by the Commission or an Agreement State to perform such services. Maintenance and repair of devices and installation, replacement, and disposal of sealed sources shall be performed only by persons specifically licensed by the Commission or an Agreement State to perform such services.
- C. Prior to initial use and after installation, relocation, dismantling, alignment, or any other activity involving the source or removal of the shielding, the licensee shall assure that a radiological survey is performed to determine radiation levels in accessible areas around, above and below the gauge with the shutter open.
- D. The licensee shall operate each gauge within the manufacturer's specified temperature and/or environmental limits such that the shielding and shutter mechanism of the source holder are not compromised.
- E. The licensee shall assure that the shutter mechanism is locked in the closed position during periods when a portion of an individual's body may be subject to the direct radiation beam. The licensee shall review and modify as appropriate its "lock-out" procedures whenever a new gauge is obtained to incorporate the device manufacturer's recommendations.

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15.
 - A. Any cleaning, maintenance or repair of portable nuclear gauges that requires removal of the source rod shall be performed only by the manufacturer or by other persons specifically licensed by the Commission or an Agreement State to perform such services.
 - B. Each portable nuclear gauge authorized shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The gauge or its container must be locked when in transport, storage or when not under the direct surveillance of an authorized user.
16.
 - A. This license does not authorize commercial distribution of licensed material
 - B. Licensed material shall not be used in or on human beings or in products distributed to the public.
 - C. The licensee shall not use licensed material in field applications where activity is released except as provided otherwise by specific condition of this license.
17.
 - A. Sealed sources containing licensed material shall not be opened by the licensee.
 - B. Detector cells containing licensed material shall not be opened or the sources removed from the detector cell by the licensee.
18. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under this license.
19. The licensee may transport licensed material in accordance with the provisions of 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."
20. The licensee is authorized to hold radioactive material with a physical half-life of 90 days or less including Sulfur 35 for decay-in-storage before disposal in ordinary trash provided:
 - A. Radioactive waste to be disposed of in this manner shall be held for decay a minimum of 10 half-lives.
 - B. Before disposal as normal waste, radioactive waste shall be surveyed at the container surface with the appropriate meter set on its most sensitive scale and with no interposed shielding to determine that its radioactivity cannot be distinguished from background. All radiation labels shall be removed or obliterated.
 - C. A record of each disposal permitted under this License Condition shall be retained for three years. The record must include the date of disposal, the date on which the byproduct material was placed in storage, the radionuclides disposed, the survey instrument used, the background dose rate, the dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal.

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20. Waste Disposal (Continued)

- D. Waste materials with a half-life exceeding 65 days shall be segregated from waste with half-lives less than or equal to 65 days.
- E. Waste materials with half-lives more than 65 days shall be packaged such that the waste form is compatible with the container.

21. Pursuant to 10 CFR 20.1301 and 20.2002, the licensee is authorized to dispose of liquid phosphorus 32, phosphorus 33, sulfur 35 and calcium 45 by release to a storm sewer provided the liquid effluent from release does not exceed the limits specified for water in Appendix B, Table II, 10 CFR Part 20.

22. The licensee shall maintain records of information important to safe and effective decommissioning at the location specified in Item 2 pursuant to the provisions of 10 CFR 30.35(g) until this license is terminated by the Commission.

23. In addition to the possession limits in item 8, the licensee shall further restrict the possession of licensed material as follows:

- A. For unsealed sources to quantities less than 10^4 times the applicable limits in Appendix B, 10 CFR 30 as specified in 10 CFR 30.35(d) and
- B. For sealed sources, to quantities less than 10^{10} times the applicable limits in Appendix B, 10 CFR 30 as specified in 10 CFR 30.35(d).

24. This license supersedes License Numbers 01-06113-03, 01-06113-01, 01-06113-02, 41-06832-08, 41-06832-09, and 41-08165-07.

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CONDITIONS

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25. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations and procedures in the licensee's application and correspondence are more restrictive than the regulations.

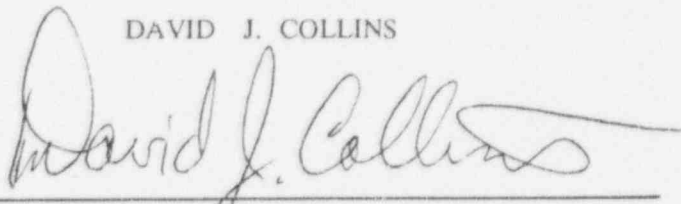
A. Application dated September 30, 1993

B. Letters and attachments dated

1. January 19, 1993 [rec'd request for C-14 ozone research, Norris, TN]
2. March 5, 1993 [assess ozone research compliance with 10 CFR 20]
3. February 24, 1994 [assess ozone research on environment]
4. March 28, 1994 [telefax response to deficiency letter, 2/17/94]
5. January 27, 1995 [Change RSO, qualifications previously submitted]
6. July 12, 1996 [Change official address, add authorization for physical laboratory examination of radioactive materials, add authorized users, add training requirements for same activity]

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

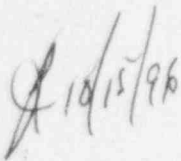
DAVID J. COLLINS

DATE OCT 15 1996

BY

Region II, Division of Nuclear Materials Safety
101 Marietta Street, N.W., Suite 2900
Atlanta, Georgia 30323-0199

N:\MLICENSE\41-25370.N01



: (FOR LFMS USE)
: INFORMATION FROM LTS
: -----
:
: Program Code: _____
: Status Code: 3
: Fee Category: _____
: Exp. Date: 0
: Fee Comments: _____
: Decom Fin Assur Req'd: _____
: ::::::::::::::::::::::::::::::

BETWEEN:

License Fee Management Branch, ARM
and
Regional Licensing Sections

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED

Applicant/Licensee: TENNESSEE VALLEY AUTHORITY
Received Date: 960722
Docket No: 3034258
Control No.: 257222
License No.:
Action Type: New Licensee

2. FEE ATTACHED

Amount: _____
Check No.: _____

3. COMMENTS

Signed _____
Date _____

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered /__/))

1. Fee Category and Amount: _____

2. Correct Fee Paid. Application may be processed for:

Amendment _____
Renewal _____
License _____

3. OTHER _____

Signed _____
Date _____

Tennessee Valley Authority, 400 West Summit Hill Drive, Knoxville, Tennessee 37902-1499

Kathryn J. Jackson, Ph.D.
Senior Vice President
Resource Group

July 12, 1996

Ms. Diane Heim
Materials Licensing Section
U.S. Nuclear Regulatory Commission
101 Marietta Street, Northwest
Atlanta, Georgia 30323

Dear Ms. Heim:


REQUEST FOR AMENDMENT TO BY-PRODUCT LICENSE 01-06113-03

This is a request for an amendment to by-product license No. 01-06113-03. This amendment changes the name of the licensee, names a replacement user of licensed material, and describes a new activity to be added to this license.

In a separate letter I am requesting that the level of financial assurance for decommissioning for this license be increased from \$150,000 to \$750,000.

If you have any questions, please write me or call Jesse Coleman at (205) 386-2993.

Sincerely,



Kathryn J. Jackson

Enclosure

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257132

Enclosure
Amendment to By-Product License 01-06113-03

1. License Items 1 and 2
Please change the name and address of the licensee to:
 - Tennessee Valley Authority
Resource Group
400 West Summit Hill Drive
Knoxville, Tennessee 37902
2. License Items 6H and 12E, authorizing Am-241 in soil moisture gauges.
 - Only one moisture gauge containing Am-241 remains in our possession. The Radiation Safety Officer has taken temporary custody of this gauge and is pursuing its disposal. Allan David Behel remains an authorized user of this gauge. The gauge is currently being stored in a locked cabinet in the Multipurpose Building on the TVA Reservation in Muscle Shoals Alabama. The storage location is surveyed and posted in accordance with NRC regulations.
3. License Item 12, C, Authorized Users:
 - Please remove B. Paul Bernauer as a user and supervisor of the licensed material described in item 6F. Mr. Bernauer is no longer associated with this activity. Mr. Bernauer supervised the use of those gas chromatographs containing Ni-63 at the Environmental Research Center (ERC).
 - Please name the Radiation Safety Officer as the supervisor of these instruments.
 - Also, please note that the "Environmental Research Center" (ERC) is the present name for the facility called "National Fertilizer and Environmental Research Center" in the license and previous correspondence.
4. Please add Activity N, "ANALYSIS OF CONTAMINATED SAMPLES," to this license.
 - This activity will involve the analysis of radiologically contaminated samples at TVA's ERC in Muscle Shoals, Alabama. The samples will contain small quantities of mixed fission/activation product and will be received from licensed facilities such as nuclear power plants. The samples will be analyzed for chemical and physical characteristics.
 - License Item 6 By-Product Material: Mixed fission/activation products.

- License Item 7 Chemical/Physical Form: Any.
- License Item 8 Maximum Quantity Possessed: 1 millicurie.
- License Item 9 Authorized Use: Physical and chemical characterization of the nonradioactive component of a variety of solid and liquid sample types using laboratory instruments.
- License Item 10 Location of Use: TVA's ERC in Muscle Shoals, Alabama, and at temporary job sites throughout the United States.
- License Item 12: Authorized Users
This licensed material will be used by or under the supervision of Dr. William J. Rogers or Dr. C. Henry Copeland. Their resumes and descriptions of their training are attached.

Resume
William J. Rogers

Education and Training:

1975, B.S. in Chemistry, Angelo State University, San Angelo, Texas.

1979, Ph.D. in Physical Chemistry, University of Tennessee, Knoxville, Tennessee.

Attended numerous short training sessions on radiological safety at Oak Ridge National Laboratory (ORNL) and at Tennessee Valley Authority's Western Area Radiological Laboratory (WARL) in preparation for work with radioactive materials.

On June 17, 1996, received the training described below. The training was provided by Jesse H. Coleman.

Experience Working with Radioactive Materials:

1977 to 1979--Two years' experience at ORNL, Oak Ridge, Tennessee, working with radioactive tracers.

1979 to 1990--Eleven years' experience at Tennessee Valley Authority's WARL in Muscle Shoals, Alabama, working with radioactive materials. This work included using radioactive tracers for determining distribution coefficient of soil and clay materials, production of low-level standard materials, production of interlaboratory cross-checks, and development and testing of radioanalytical procedures.

Resume
C. Henry Copeland

Education and Training:

1963, B. S. in Chemistry, Physics, and Math, University of Alabama, Tuscaloosa, Alabama.

1977, Ph.D. in Mathematics, University of Alabama, Tuscaloosa, Alabama.

Studies and research at the University of Alabama included course work in nuclear and radiation physics and a course in nuclear chemistry.

1988, M.S. in Health Physics, Georgia Institute of Technology, Atlanta, Georgia. This consisted of 16 graduate level courses in radiation protection and related subjects.

Attended short training sessions on radiological safety at Tennessee Valley Authority's (TVA) Western Area Radiological Laboratory (WARL) in preparation for work with radioactive materials described below.

On June 17, 1996, received the training described below. The training was provided by Jesse H. Coleman.

Experience Working with Radioactive Materials:

I. University of Alabama, Student and Staff: 1959 to 1979.

- Worked with radiological materials at the University of Alabama.
- One course in nuclear chemistry that required the handling of radioactive sources of various types. Also conducted research on the nuclear physics of gamma-gamma correlation using Co-60 and other sources and also alpha-gamma correlation using alpha emitters.

II. Work with Radiological Materials at TVA:

A. Radiological Hygiene Branch, 1979 to 1981:

- A.1. Developed a TLD calibration system using sealed sources.

B. WARL, 1981 to 1990:

- B.1. Set up a c-zone and contained contamination from a leaking sealed source.
- B.2. Developed a tritium monitoring system for use at Sequoyah Nuclear Plant. The project included methods development, selection of equipment and materials, fabrication of samplers, and analysis.
- B.3. Designed and installed high-level calibration facility at TVA's WARL. The high-level source is a 1450 Ci sealed source of Cs-137.
- B.4. Responsible for development of quality assurance program for TVA's radiological monitoring program.

RADIATION SAFETY TRAINING: BY-PRODUCT LICENSE 01-06113-03
ACTIVITY N "ANALYSIS OF CONTAMINATED SAMPLES"

- I. Introduction
- II. Basic Principles
 - A. Atomic structure, fundamental particles, and isotopes.
 - B. Alpha, beta, and gamma radiations and their properties.
 - C. Quantity of radioactivity, the Curie and Bq., radiological decay and half-life.
 - D. Interaction of radiation with matter.
 - E. Dose and dose rate - external and internal sources of dose.
 - F. Sources of natural and man-made radiation.
- III. Radiation Measurements and Monitoring Techniques
 - A. Dose: roentgen, rem, rad, and SI units.
 - B. Contamination: cpm and dpm per 100 sq. cm.
 - C. Monitoring instruments and their use: surveying for contamination.
- IV. Radiation Protection Standards and Control Methods
 - A. 10 CFR 19, 20, and 21.
 - B. TVA's control system.
 - C. Permissible dose limits for internal and external dose.
 - D. Principles for limiting dose and contamination.
 - Preventing contamination and its spread.
 - Time, distance, and shielding.
 - Emphasis on good laboratory practices and good housekeeping.
 - E. Barricades, signs, etc.
 - Restricted and unrestricted areas.
 - Postings for contaminated areas, radioactive materials, etc.
 - Labeling containers of radioactive materials.
- V. Biological Effects of Radiation
 - A. Types of effects (acute effects, cancer, and birth defects).
 - B. Risk factors and comparison with other risks.
 - C. Prenatal indoctrination (Regulatory Guide 8.13).
- VI. Practical Considerations and Work Procedures
 - A. No smoking, eating, or drinking in restricted areas.
 - B. Clothing and gloves to be worn in restricted areas.
 - C. Disposal of waste and used protective clothing.
 - D. Monitoring procedures when exiting a restricted area.
 - How to frisk for contamination.
 - Decontamination and reporting contamination.
 - E. How to work with contaminated samples without spreading contamination.
 - Changes in work procedures when using radioactive materials.
 - F. Storage and disposal of radioactive waste.
- VII. Radioactive Material Shipments
 - A. What to do when a shipment arrives.
 - B. How to ship radioactive material away from the laboratory.

TRAINING FOR INDIVIDUALS WORKING WITH RADIOACTIVE MATERIALS ACTIVITY N "ANALYSIS OF CONTAMINATED SAMPLES"

All individuals who will work with radioactivity contaminated samples will receive the training described above. The training will be provided by Radiation Safety. Trainers with equivalent training and experience may be substituted if necessary.

FACILITIES AND EQUIPMENT

TVA's Environmental Research Center contains numerous laboratories in which these contaminated items may be analyzed. The particular laboratory in which the work will be conducted will be decided by the type of analysis required. These are the same laboratories described in the application for this license, dated September 30, 1993, Item 9, Activity C: "C-14 Laboratory Studies".

The laboratories that will be used contain a variety of standard equipment used for scientific, chemical, and engineering analyses. The techniques and instruments used will include but not be limited to the following.

- High performance liquid chromatography
- Ion chromatography
- Inductively coupled plasma emission spectroscopy
- Atomic absorption spectroscopy
- Infrared spectroscopy
- Ultraviolet spectroscopy
- Optical microscopy
- Electron microscopy
- Polarized light microscopy
- X-ray diffraction
- Gas chromatography
- Gas chromatography - mass spectroscopy
- Wet chemistry characterization methods

The use of sinks in rooms where radiological work is being conducted will be restricted to prevent the unmonitored release of radioactive materials.

Each laboratory where radiological work will be conducted will be equipped with a frisker located near the exit for use by trained workers to detect contamination.

RADIATION SAFETY PROGRAM

The basic radiation safety program remains essentially as it was described under Item 10 of the application for this license dated September 30, 1993. That is, the discussion on radiation safety instruments and their calibration and use remains unchanged. The description on emergency response also remains unchanged except that Ronald B. Maxwell has retired and his name has been removed from the emergency contact list.

Because of the small quantity of radioactive material used in this activity, the hazard to a worker from direct radiation, both beta and gamma, is extremely small. Dosimeters (TLDs) will therefore not be required. We justify this decision with the following considerations: Suppose that the entire quantity (1 millicurie) authorized for this activity consisted entirely of Co-60. This is an extremely conservative but nearly impossible occurrence for mixed fission-activation products from a reactor. The gamma dose rate for this material at 1 meter is approximately 1.3 mrem/hr. If a worker was continuously exposed to that dose rate for an entire 40 hour work week, then he would receive a dose of slightly over 50 mrem. This is 1 percent of the allowable limit of 5,000 mrem per year for a radiation worker. Dosimetry is required when an adult worker is likely to exceed 10 percent of this allowable limit. We believe that this condition cannot be reached for this licensed activity.

Protective clothing appropriate for the radiological hazard will be used. For most jobs, rubber gloves and lab coats will be sufficient. However, additional precautions may be required at the discretion of Radiation Safety personnel.

Laboratory bench tops, floors, and instruments will be covered to the extent required to contain contamination. These precautions will vary from job to job and will be determined by such factors as the physical form of the radioactive material (solid, liquid, oily, etc.); the quantity of material being analyzed; the type of analysis being performed; and the length of time that the analysis is expected to require.

Work areas will be posted in accordance with NRC regulations, and access to the work areas containing radioactive material will be limited to trained individuals.

Incoming shipments of radioactive materials will be surveyed as required by NRC regulations. Incoming packages will be opened only in areas that are properly prepared to contain radiological contamination.

Before work begins on a contaminated sample, Radiation Safety personnel will survey the sample to determine dose rates, potential for contamination, and to determine necessary precautions.

All personnel exiting a contaminated area will be required to survey themselves for radioactive contamination. A GM-frisker will be provided near the exit for this purpose.

Because of the small quantity of radioactive material used in these analyses and because of the precautions taken, it is extremely unlikely that a worker could ingest or inhale a quantity of radioactive material sufficient to produce a committed effective dose equivalent exceeding or approaching the occupational dose limits specified in 10 CFR Subpart C. Therefore, routine bioassay will not be used.

None of the laboratory hoods that are intended to be used for these analyses are equipped with HEPA filters. Precautions will be used to prevent radioactive material from becoming airborne. Only the smallest quantity of material required for an analysis will be used. Appropriate precautions will be taken to prevent material from becoming airborne. Because of these precautions and because of the small quantities of radioactive material used in these analyses, HEPA filters are not required for laboratory hoods. Sampling for airborne radioactivity will be conducted at the discretion of the Radiation Safety staff.

The use of liquids will be reduced to the extent possible to prevent their accumulation and to reduce the necessity of their disposal.

Properly marked containers will be provided to collect radiologically contaminated solids such as used gloves and supplies.

All instruments and devices used in these analyses will be surveyed by Radiation Safety prior to release for nonradiological use.

Work and storage areas will be posted in accordance with applicable regulations.

Bench tops, floors, instruments, and similar items will be surveyed for contamination by Radiation Safety at appropriate intervals during and at the end of work in a particular laboratory. The contamination surveys will consist of a survey for direct radiation (beta and gamma) using a pancake-type GM detector and smears for removable contamination. Contamination survey instruments and smear techniques are discussed in the license application dated September 30, 1993.

We plan to have no permanent c-zones or radioactive material areas. Temporary zones of the appropriate type will be set up when an analysis is needed. At the end of the analysis, the zone will be surveyed, decontaminated if needed, and returned to unrestricted use.

We plan that these analyses will not occur continuously. There should be periods when no radiological work is occurring. We plan to ship all radioactive materials from each analysis of contaminated samples off site as soon as appropriate and not have any long-term storage of radioactive materials on site.

Records will be maintained to document that possession limits of radioactive materials are met.

Only trained workers will be allowed into restricted areas. We plan that no minors (under age 18) will participate in this work with radiological samples.

WASTE MANAGEMENT

It is planned that radioactive materials resulting from this activity will be returned to the licensee from which it came. However, it may be necessary to dispose of some radioactive waste by sending it to a licensed waste broker for disposal.

Potentially contaminated solid wastes generated during the analyses of samples may be surveyed by Radiation Safety for contamination. A GM-frisker will be used in a low-background area for these surveys. Items that do not read above background may be disposed of as nonradioactive material.

If necessary, small quantities of radioactive material may be released to the sanitary sewer. If this becomes necessary, the quantity and volume will be known and such releases will be in accordance with 10 CFR 20.2003.