



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

October 1, 2021

Mr. Robert Horton, Reactor Administrator  
U.S. Geological Survey  
Denver Federal Center  
PO Box 25046, MS 911  
Denver, CO 80225-0046

SUBJECT: U.S. GEOLOGICAL SURVEY – U.S. NUCLEAR REGULATORY COMMISSION  
SAFETY INSPECTION REPORT NO. 05000274/2021202

Dear Mr. Horton:

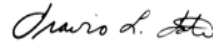
From August 16 - 19, 2021, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the U.S. Geological Survey TRIGA Research Reactor facility. The enclosed report documents the inspection results, which were discussed on August 19, 2021, with you and members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspector reviewed selected procedures and records, observed various activities, and interviewed personnel. Based on the results of this inspection, no findings of significance were identified. No response to this letter is required.

In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390, "Public inspections, exemptions, requests for withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of the NRC's document system (Agencywide Documents Access and Management System (ADAMS)). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

If you have any questions concerning this inspection, please contact Kevin Roche at 301-415-1554, or by electronic mail at [Kevin.Roche@nrc.gov](mailto:Kevin.Roche@nrc.gov).

Sincerely,

A handwritten signature in dark ink, appearing to read "Travis L. Tate", with a stylized flourish at the end.

Signed by Tate, Travis  
on 10/01/21

Travis L Tate, Chief  
Non-Power Production and Utilization  
Facility Oversight Branch  
Division of Advanced Reactors and Non-Power  
Production and Utilization Facilities  
Office of Nuclear Reactor Regulation

Docket No. 50-274  
License No. R-113

Enclosure:  
As stated

cc: See next page

U.S. Geological Survey

Docket No. 50-274

cc:

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Jonathan Wallick, Reactor Supervisor  
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Test, Research and Training  
Reactor Newsletter  
Attention: Ms. Amber Johnson  
Dept of Materials Science and Engineering  
University of Maryland  
4418 Stadium Drive  
College Park, MD 20742-2115

SUBJECT: U.S. GEOLOGICAL SURVEY – U.S. NUCLEAR REGULATORY COMMISSION  
SAFETY INSPECTION REPORT NO. 05000274/2021202  
DATED: OCTOBER 01, 2021

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<b>DATE</b>	09/17/2021	09/21/2021	10/01/2021

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**U.S. NUCLEAR REGULATORY COMMISSION**  
**OFFICE OF NUCLEAR REACTOR REGULATION**

Docket No.: 50-274

License No.: R-113

Report No.: 05000274/2021202

Licensee: U.S. Geological Survey

Facility: U.S. Geological Survey TRIGA Research Reactor

Location: Building 15, Denver Federal Center  
Denver, Colorado

Dates: August 16 - 19, 2021

Inspector: Kevin Roche

Approved by: Travis L Tate, Chief  
Non-Power Production and Utilization  
Facility Oversight Branch  
Division of Advanced Reactors and Non-Power  
Production and Utilization Facilities  
Office of Nuclear Reactor Regulation

Enclosure

## EXECUTIVE SUMMARY

U.S. Geological Survey  
U.S. Geological Survey TRIGA Research Reactor  
Inspection Report No. 05000274/2021202

The primary focus of this routine, announced inspection was the on-site review of selected aspects of the U.S. Geological Survey (USGS, the licensee) Class II research reactor facility safety program including: (1) procedures; (2) experiments; (3) health physics; (4) design changes; (5) committees, audits and reviews; and (6) transportation activities. The U.S. Nuclear Regulatory Commission (NRC) staff determined that the licensee's program was acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

### Procedures

- The inspector found that procedural review, revision, control, and implementation satisfied the technical specification (TS) requirements.

### Experiments

- The inspector found that experiments and irradiations were performed in accordance with TSs, the applicable experiment irradiation authorizations, and associated licensee procedures.

### Health Physics

- The inspector found that surveys, postings, and personnel dosimetry met regulatory requirements.
- The inspector found that radiation monitoring equipment was maintained and calibrated as required by TSs.
- The inspector found that calculations of effluents released from the facility satisfied license and regulatory requirements and releases were within the specified regulatory limits.

### Design Changes

- The inspector found that changes to the facility were evaluated using the criteria specified in Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59, "Changes, tests and experiments," and were reviewed and approved by the Reactor Operations Committee (ROC).

#### Committees, Audits and Reviews

- The inspector found that review, audit, and oversight functions required by the TSs were acceptably completed by the ROC.

#### Transportation Activities

- The inspector found that radioactive material was shipped in accordance with the applicable regulations.

## REPORT DETAILS

### Summary of Facility Status

The licensee's 1 megawatt Training, Research, Isotopes, General Atomics (TRIGA) research reactor was operated in support of various types of irradiation projects. During the inspection, the reactor was started up, operated, and shut down as required to support these ongoing activities.

#### 1. Procedures

##### a. Inspection Scope (Inspection Procedure (IP) 69001, Section 02.03)

The inspector reviewed the following documents to verify compliance with the licensee's TS requirements for procedures:

- procedural implementation by the reactor staff
- records of changes and temporary changes to procedures
- Reactor Operations Manual (ROM) Sections No. 4, "Administrative Procedures," No. 5, "Operating Procedures," and No. 8, "Radiation Protection Program"
- signed cover sheets for the following procedures:
  - Geologic Survey TRIGA Reactor (GSTR) Procedure #18, "Instructions for Packaging Radioactive Materials"
  - GSTR Procedure #19, "Procedure for Test Equipment Calibration"
  - GSTR Procedure #20, "Procedure for Radiation Instrument Calibration"
  - GSTR Procedure #21, "Procedure for Measuring Control Rod Drop Time"
  - GSTR Procedure #22, "Procedure for Analysis of Stack Gas Radionuclides"
- ROC meeting minutes for meetings held from April 2020 to the present

##### b. Observations and Findings

The inspector reviewed the facility procedures and the processes to write, review, approve, and change procedures. The inspector noted that facility procedures were developed as required by TS 6.4. The inspector confirmed that procedures were written, reviewed, approved, and changed in accordance with TS 6.2.3.1 and the ROM. During the inspection, the inspector observed licensee staff following procedures to complete tasks. Additionally, the inspector found that the procedures used were effective and able to be implemented for the intended purposes.

##### c. Conclusion

The inspector determined that procedural review, revision, control, and implementation satisfied TS requirements.



## 2. Experiments

### a. Inspection Scope (IP 69001, Section 02.06)

The inspector reviewed the following to verify compliance with TS 3.8 and 6.4:

- Reactor Operations Logbooks Nos. 180 – 181
- experiment program requirements contained in ROM Sections 4.5 through 4.8
- GSTR experiment authorization forms including Parts I, II, and III for Experiment Nos. C-001, C-017, C-028, C-040, C-049, L-040, L-126, O-018, and P-001
- selected GSTR radioisotope request and receipt forms which were completed during December 2019 through the present
- ROC meeting minutes for meetings held from April 2018 to April 2019
- USGS TRIGA Reactor Corrected Annual Report for the period from January 1, 2019, through December 31, 2019, dated April 21, 2020
- USGS TRIGA Reactor Annual Report for the period from January 1, 2020, through December 31, 2020, dated March 29, 2021

### b. Observations and Findings

The inspector found that the various experiments conducted at the facility were reviewed and approved. The inspector also noted that no new experiments were proposed in the past several years.

Through a review of console logs and various irradiation request forms, the inspector noted that irradiations were conducted under the cognizance of the Reactor Supervisor. The inspector verified that irradiations were documented in the console logs. The inspector also verified that the resulting radioactive material was transferred to an authorized user, disposed of as stipulated by procedure, or held for decay.

### c. Conclusion

The inspector concluded that experiments were reviewed and performed in accordance with the TS requirements and the licensee's written procedures.

## 3. Health Physics

### a. Inspection Scope (IP 69001, Section 02.07)

The inspector reviewed the following documents to verify compliance with 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigations," 10 CFR Part 20, "Standards for Protection against Radiation," and TS requirements for health physics:

- radiological signs and posting in various areas of the facility
- training records for GSTR staff and various support personnel
- HP Quarterly Reports from 2019 to the present

- USGS TRIGA Reactor Quarterly Reports from 2019 to the present
- USGS TRIGA Reactor Monthly Checklists for the past 2 years
- routine periodic survey and monitoring records for the past 2 years documented on radiological survey maps
- maintenance and calibration records of radiation monitoring equipment for the past 2 years documented in the instrument calibration log
- GSTR Radiation Protection Program as outlined in ROM, Chapter 8, "Radiation Protection Program," latest revision dated October 2018, including:
  - Section 8.1, "Radiation Protection Policy;" Section 8.2, "Health Physics Training;" Section 8.3, "Radioactive Material Control;" Section 8.4, "Radiation Monitoring;" Section 8.5, "Instrumentation;" Section 8.6, "Records;" Section 8.7, "Emergency Response and Exposure Guidelines;" Section 8.8, "Declared Pregnant Woman Guidelines;" and, Section 8.9, "Planned Special Exposures"
- Various ROM GSTR Procedures including:
  - Procedure No. 15, "Pocket Dosimeter Drift Check Procedure"
  - Procedure No. 16, "Pocket Dosimeter Calibration Procedure"
  - Procedure No. 20, "Procedure for Radiation Instrument Calibrations"
  - Procedure No. 22, "Procedure for Analysis of Stack Gas Radionuclides"

b. Observations and Findings

(1) Surveys

The inspector reviewed selected radiation and contamination surveys from 2019 to the present. The inspector found surveys were completed as required by procedures and in accordance with the requirements in Subpart F, "Surveys and Monitoring," to 10 CFR Part 20.

During the inspection, the inspector confirmed the radiation survey readings were consistent with expected radiation levels.

(2) Postings and Notices

The inspector toured the facility and observed that signage, postings, and labels were used in accordance with requirements in Subpart J, "Precautionary Procedures," to 10 CFR Part 20. The inspector noted that the radioactive material storage areas were properly posted. The inspector found no unmarked radioactive material in the facility. The inspector observed that copies of notices to workers were posted in the facility, including a copy of the most recent revision of NRC Form 3, "Notice to Employees," as required by 10 CFR 19.11, "Posting of notices to workers."

(3) Dosimetry

The inspector determined that the licensee monitored individuals for radiation exposure in accordance with the requirements in 10 CFR 20.1502, "Conditions requiring individual monitoring of external

and internal occupational dose.” The inspector examined the dosimetry records for the past 2 years and confirmed that the highest occupational doses were within Subpart C, “Occupational Dose Limits,” to 10 CFR Part 20 limits and licensee action levels.

(4) Radiation Monitoring Equipment

The inspector reviewed the records of selected meters, detectors, and air monitoring equipment in use at the facility. The inspector found that annual calibration and quarterly source check frequency of the portable and fixed meters and monitors were consistent with manufacturer’s recommendations. The inspector also found that appropriate calibration records were maintained. The inspector found that portable survey meters were maintained as required by TS 4.7, and Subpart F to 10 CFR Part 20.

The inspector observed storage and use of portable survey instrumentation at the facility. The inspector found that survey instrumentation capable of measuring exposure and dose rates were available and operable during times when the reactor was operating as required by TS 3.7.1.

(5) Radiation Protection Training

The inspector reviewed documentation of the initial and annual radiation protection training given to staff and facility users. The inspector verified that training was provided to new users as well as staff members. The inspector found the content of the training program satisfied the requirements in 10 CFR 19.12, “Instruction to workers.”

(6) Radiation Safety Program

The inspector found that the licensee’s radiation protection program was acceptably established in the ROM. The inspector found that the health physicist reviewed the radiation safety program quarterly in accordance with licensee procedures. The inspector confirmed that no deficiencies related to the radiation safety program at the GSTR were identified during reviews of the program.

(7) As Low As Reasonably Achievable Policy

The inspector found that a policy for maintaining radioactive exposure to personnel as low as reasonably achievable (ALARA) was outlined and established in the ROM. The inspector confirmed that the policy discussed and set expectations for radiation safety culture and provided guidance for keeping doses ALARA, including local action levels for personnel radiation exposure doses, consistent with the requirements in 10 CFR 20.1101, “Radiation protection programs.”

(8) Environmental Monitoring and Effluents

The inspector reviewed the calibration records of the area radiation monitors and the gaseous effluent (or stack) monitor. The inspector found that these systems were calibrated annually in accordance with the requirements in TS 4.7. The inspector also reviewed selected records from the past 2 years of the daily channel test for these systems. During the inspection, the inspector observed these systems operating while the reactor was in operation, as required by TS 3.7.

The inspector reviewed the records documenting solid, liquid, and airborne radioactive material releases to the environment. The inspector noted that no releases of solid radioactive material to the environment occurred. The inspector found that no liquid radioactive material releases from operation of the GSTR occurred during the period reviewed. The inspector determined that gaseous radioactive material release activity continued to be calculated and the results were documented. The inspector found that releases were determined to be within the concentrations specified in Appendix B to 10 CFR Part 20, "Annual Limits on intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage," and TS limits. The inspector found the highest calculated dose that could be received by a member of the public because of gaseous emissions from reactor operations was well below the requirements of 10 CFR 20.1101(d).

The inspector verified that environmental gamma radiation monitoring was conducted using thermoluminescent dosimeters in accordance with the applicable procedures. The inspector found the data indicated that there were no radiation doses in uncontrolled areas from operation of the reactor that would result in a member of the public exceeding the limits in Subpart D, "Radiation Dose Limits for Individual Members of the Public," to 10 CFR Part 20.

c. Conclusion

The inspector determined that the radiation protection program implemented by the licensee satisfied regulatory requirements.

**4. Design Changes**

a. Inspection Scope (IP 69001, Section 02.08)

The inspector reviewed the following documents to verify compliance with 10 CFR 50.59 and TS requirements for design changes:

- facility design change (10 CFR 50.59) records for the past 2 years
- ROC meeting minutes for meetings held from December 2019 to present
- ROM, Section 3, "Nuclear Center Organization," and Section 4, "Administrative Procedures"

- USGS TRIGA Reactor Corrected Annual Report for the period from January 1, 2019, through December 31, 2019, dated April 21, 2020
- USGS TRIGA Reactor Annual Report for the period from January 1, 2020, through December 31, 2020, dated March 29, 2021

b. Observations and Findings

The inspector reviewed the associated 10 CFR 50.59 screening, and the corresponding design change packages concerning the latest facility changes since the last inspection in this area. The inspector determined that the facility design change evaluations contained adequate supporting documentation and information required by procedure. Additionally, the inspector found that the ROC reviewed proposed changes in accordance with the requirement in TS 6.2.3.

c. Conclusion

The inspector determined that changes to the facility were evaluated using the 10 CFR 50.59 criteria and were reviewed and approved by the ROC.

## 5. **Committees, Audits and Review**

a. Inspection Scope (IP 69001, Section 02.09)

The inspector reviewed the following documents to verify compliance with the TS requirements for review and audit:

- ROC operational audits for the last 2 years
- safety review records and audit reports for the past 2 years
- ROC meeting minutes for meetings held from October 2018 to the present
- ROM, Section 3, "Nuclear Center Organization," and Section 4, "Administrative Procedures"

b. Observations and Findings

The inspector found that the composition of the ROC and the meeting frequency satisfied the requirements of TS 6.2 and TS 6.2.2. The inspector verified minutes of these meetings demonstrated that the ROC provided the review and conducted the audits required by the TS 6.2.3 and TS 6.2.4. The inspector found issues brought up by the ROC were resolved and were noted in ROC meeting minutes. The inspector reviewed ROC meeting minutes and found that the ROC had the correct number of members in accordance with TS.

c. Conclusion

The inspector found that review, audit, and oversight functions required by the TSs were completed by the ROC.

## 6. Transportation Activities

### a. Inspection Scope (IP 86740)

The inspector reviewed the following documents to verify compliance with the regulations in 10 CFR Part 71, "Packaging and Transportation of Radioactive Material," 49 CFR, "Transportation":

- training records of staff members responsible for shipping and receiving licensed radioactive material
- ROM GSTR Procedure No. 23, "Procedure for Receipt of Radioactive Material Shipments," dated October 2012
- letter from the licensee to the NRC dated August 9, 2018, "Request for Approval for Use of Alternative A2 Value for Isotope Br-80m under Appendix A to 10 CFR 71"
- letter from the NRC dated July 20, 2020, "Approval of Alternate A2 Value"
- letter from the licensee to the Department of Transportation (DOT) dated August 9, 2018, "Request for Approval for Use of Alternative A2 Value for Isotope Br-80m under 49 CFR § 173.433"
- letter from the DOT to the licensee dated October 3, 2018, approving the licensee's request to use an alternate A2 value for Bromine-80m

### b. Observations and Findings

The inspector found that the licensee shipped various types of radioactive material since the last inspection in this area. The inspector verified records indicated that the radioisotope types and quantities were calculated, and dose rates measured as required. The inspector noted that staff members received the required training and were certified for shipping radioactive material. The inspector observed packaging of a limited quantity shipment and did not note any deficiencies. All radioactive material shipment records reviewed by the inspector were completed in accordance with DOT and NRC regulatory requirements.

As a result of a violation identified in report 50-274/2019-202, the licensee took various corrective actions. On June 29, 2018, the licensee submitted a letter to the NRC documenting the violations. Later, on August 9, 2018, the licensee submitted letters to the NRC and the DOT requesting approval to use an alternative A2 value for the isotope Br-80m. By letter dated October 3, 2018, the DOT approved the licensee's request for an alternate A2 value for Br-80m which would resolve the problem. However, the NRC had not yet granted approval for the use of an alternate A2 value for shipping Br-80m as required by 10 CFR Part 71. Because the licensee's request for approval to use an alternative A2 value to ship radioactive tracer material (Br-80m) had not received NRC approval, this issue was identified as an Inspector Follow-up Item (IFI 50-274/2019-202). The NRC granted approval for use of the alternate A2 value for shipping Br-80m until November 1, 2023, by a letter dated July 20, 2020. IFI 50-274/2019-202 is now closed.

c. Conclusion

The inspector determined that radioactive material was shipped in accordance with the applicable regulations and licensee procedures.

**7. Exit Interview**

The inspection scope and results were summarized on August 19, 2021, with members of licensee management and staff. The inspector described the areas inspected and discussed the inspection results.

## **PARTIAL LIST OF PERSONS CONTACTED**

### **Licensee Personnel**

C. Farwell	Senior Reactor Operator
R. Horton	Reactor Administrator
C. Manning	Reactor Health Physicist and Senior Reactor Operator
J. Wallick	Reactor Supervisor

## **INSPECTION PROCEDURES USED**

IP 69001	Class II Non-Power Reactors
IP 86740	Transportation

## **ITEMS OPENED, CLOSED, AND DISCUSSED**

### **Opened**

None

### **Closed**

50-274/2019-202-01	IFI	Follow-up on the licensee's request for approval to use an alternative A2 value to ship radioactive tracer material (Br 80m) in accordance with 49 CFR 173.431 and 173.433 requirements.
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### **Discussed**

50-274/2018-202-01	URI	Review the adequacy of the licensee's 10 CFR 50.59 review concerning movement of the lightly used fuel acquired from DOE and placing some of the elements into the core.
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