United States Department of the Interior
GEOLOGICAL SURVEY
BOX 25046 M.S. 424
DENVER FEDERAL CENTER
DENVER, COLORADO 80225

IN REPLY REFER TO

January 18, 1990

Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

Gentlemen:

The enclosed annual report of the U.S. Geological Survey TRIGA reactor facility is submitted in accordance with license conditions.

Sincerely,

Timothy M. DeBey
Reactor Supervisor

Enclosure

Copy to:
Document Control Desk (2)

IE47
1/1

U.S. GEOLOGICAL SURVEY TRIGA REACTOR

ANNUAL REPORT

JANUARY 1, 1989 - DECEMBER 31, 1989

NRC LICENSE NO. R-113 - DOCKET NO. 50-274

I. Administrative Changes

Tim DeBey assumed the position of Reactor Supervisor on January 1, 1989, relieving Paul Helfer, who was Acting Reactor Supervisor from June 1, 1988, through December 31, 1988.

II. Operating Experience

The Geological Survey TRIGA Reactor (GSTR) was in normal operations for the year 1989. A new irradiation facility was added external to the core and preinstallation checks were continued on the new control console.

A total of 271 irradiation requests were processed during the year, with the average request representing 78 samples and 8.5 full-power hours of reactor operation. A synopsis of irradiations performed during the year 1989 is given below, listed by the organization submitting the samples to the reactor staff:

Organization	Number of Samples
Geologic Division - BGC	18,728
Geologic Division - BIG	1,219
Geologic Division - CMR	1,037
Geologic Division - WMR	30
Geologic Division - BSP	20
Non-USGS users	96
Total	21,130

A. Thermal power calibrations at about 800 kW were performed in June and December, with only very minor adjustments required.

B. Three new Class I experiments were approved and one Class I experiment was amended during this period. One new Class II experiment was also approved. This experiment involved the irradiation of a cylinder of argon gas pressurized to 50 psig for the production of a radioactive tracer material.

C. During the report period, 183 daily checklists and 12 monthly checklists were completed in compliance with technical specifications requirements for surveillance of the reactor facility.

D. Tours were provided to individuals and groups in 1989 for a total visitor count of approximately 250.

III. Tabulation of Energy Generated

Month	Megawatt Hours	Time Reactor Was Critical	Number of Pulses
January 1989	89.485	94 hours 1 minute	0
February 1989	90.507	93 hours 2 minutes	0
March 1989	130.168	136 hours 6 minutes	0
April 1989	118.349	122 hours 32 minutes	0
May 1989	100.011	103 hours 16 minutes	0
June 1989	95.453	104 hours 20 minutes	0
July 1989	96.100	97 hours 52 minutes	0
August 1989	112.546	115 hours 6 minutes	0
September 1989	87.500	88 hours 38 minutes	0
October 1989	90.549	92 hours 1 minute	0
November 1989	88.980	92 hours 21 minutes	0
December 1989	86.420	88 hours 46 minutes	0
Totals	1186.068	1228 hours 1 minute	0

IV. Unscheduled Shutdowns

Serial No.	Date	Cause
411	1/5/89	Period scram caused by AC power dip
412	1/11/89	Period scram caused by loose connector on log channel
413	1/12/89	Linear scram caused by AC power dip
414	1/12/89	Period scram caused by dirty contacts on bistable card
415	1/25/89	Manual scram due to loss of DN system blower (AC loss)
416	2/6/89	Linear scram due to intermittent ground on cables
417	3/2/89	Manual scram due to DN system failure, rabbit stuck
418	3/21/89	Linear scram due to noise from range switching
419	3/29/89	Period scram due to AC power dip
420	4/3/89	Linear scram due to physical shock to control console
421	4/5/89	Linear scram due to momentary AC power outage
422	4/5/89	Period scram due to AC power line noise
423	4/14/89	Linear scram due to noise from pool alarm reset
424	4/17/89	Linear scram due to momentary AC power outage
425	4/20/89	Linear scram due to AC power line noise
426	5/2/89	Linear scram due to physical shock to control console
427	6/1/89	Linear scram due to physical shock to control console
428	6/6/89	Linear scram due to noise from pool alarm reset
429	6/7/89	Linear scram due to noise from range switching
430	6/14/89	Percent power scram due to physical shock to console
431	6/21/89	Linear scram due to AC noise from Transient Rod drive
432	8/4/89	Linear scram due to AC noise from Transient Rod drive
433	8/10/89	Linear scram due to AC noise from Transient Rod drive
434	9/19/89	Linear scram due to noise from range switching
435	9/27/89	Linear scram due to momentary AC power outage
436	12/14/89	Percent power scram due to cables being stepped on
437	12/19/89	Period scram due to signal noise on log channel

V. Major Maintenance Operations

Maintenance items in CY'89 are relatively minor compared to the reactor tank replacement of CY'88. In March, the temporary gamma and neutron shielding at the top of the reactor tank was removed and replaced with permanent shielding that provided additional radiation attenuation. In April, the cooling tower nozzles were removed, inspected, cleaned, and reinstalled. Rust particles were found to be clogging a number of the nozzles. After the maintenance, a significant decrease in cooling tower header pressure was noted. Overall performance of the cooling tower continues to be satisfactory. A DOP leak test of the reactor room exhaust plenum was satisfactorily performed in August, and a routine control rod inspection was performed in December. Ion exchange resin was replaced twice during the year, in March and September.

VI. Summary of 10 CFR 50.59 changes

There were no 50.59 changes at the facility during this report period. The pending installation of a new control console will not be performed as a 50.59 change, but will be installed after receiving the appropriate approval and technical specifications changes from the Nuclear Regulatory Commission. The current schedule calls for the console to be installed in the spring of 1990.

VII. Radioactivity Releases

A. Listed below are the total amounts of radioactive gaseous effluents released to the environs beyond the effective control of the reactor facility.

Month	Argon-41 (Curies)	License (R-113) Allowable (Curies)	Tritium (HTO) (uCuries)	10 CFR 20 Allowable (Curies)
January 1989	0.73	5.8	28	0.25
February 1989	1.19	5.8	11.4	0.25
March 1989	0.97	5.8	55.6	0.25
April 1989	1.10	5.8	58.1	0.25
May 1989	0.74	5.8	87.5	0.25
June 1989	0.47	5.8	54.1	0.25
July 1989	0.75	5.8	55.7	0.25
August 1989	0.84	5.8	11.0	0.25
September 1989	0.61	5.8	13.8	0.25
October 1989	0.71	5.8	12.8	0.25
November 1989	0.70	5.8	10.6	0.25
December 1989	0.65	5.8	11.7	0.25
Total	9.46	70.0	410.3 uCi	3.00
% of allowable	13.5%		0.014%	

Note #1: The argon activities reported are integrated values obtained from the facility's gaseous stack monitor. Calculated values have been substituted for measured values in the few instances when the monitoring system was down for maintenance or repair.

Note #2: The tritium concentrations are estimates based on the amount of water lost by evaporation from the reactor multiplied by the concentration of tritium as HTO. Tritium sample analyses are being performed by Colorado State University.

B. About 707 liters of contaminated reactor water containing a total of 22.4 uCi of ^{60}Co were released into the Federal Center sewage system over a twelve month time period. This water was diluted by 3.4×10^6 gallons of sewage water.

C. Four 55-gal. drums of low level solid waste and solidified resin were shipped for burial in Nevada in 1989.

The total amount of radioactive waste released from the reactor facility during 1989 is estimated to be approximately 27.5 mCi.

Note: The principal radioactive waste generated at the reactor facility is the demineralizer resin - used resin with small quantities of rinse water is solidified with Portland cement prior to release in 55-gallon drums.

VIII. Radiation Monitoring

A. Our program to monitor and control radiation exposures included the four major elements below during the operating year 1989.

1. Eighteen area monitors (17 gammas, 1 neutron) located throughout the Nuclear Science Building. To provide a background signal, a small check source is attached to the scintillation detector. High alarm set points range from 2 mR/hr to 50 mR/hr. High level alarms have been infrequent and are documented in appropriate Log Books.

2. One Continuous Air Monitor (CAM) sampling the air in the reactor bay. An equilibrium concentration of 3.0×10^{-8} uCi/ml present for two minutes will result in an increase of 400 cpm above background. There are two alarm set points. A low-level alarm is set at 3,000 cpm, and the high level alarm is set at 10,000 cpm.

Reactor bay air is sampled during all reactor operations. The fixed particulate air filter is changed and counted daily on a Gamma Products G4020 Low Level counting system. The charcoal filter, fitted behind the air filter, is changed and counted weekly. In all instances, final sample calculations show less than MPC (10 CFR Part 20, Appendix B, Table 11) concentrations for all isotopes in question in the reactor bay.

3. Contamination wipe surveys and radiation surveys with portable survey instruments are performed at least once a month. All portable instruments are calibrated with a certified 3-Curie Cs-137 source and wipes are counted on a Gamma Products G4020 Low Level counting system.

Monthly wipe tests in the Reactor Bay indicated two areas of contamination in 1989. The first was located on a sample storage cave and the second on the floor near the cave. The recorded activities were 22 and 51 pCi/100 cm^2 beta, respectively. Neither area was greater than two square feet. The roof hatch over the reactor bay has been roped off and posted as a radiation area due to radiation streaming from the annulus when operating at high power. Radiation levels within the roped boundaries measure up to 3 mr/h and average about 2.5 mr/h when the reactor is operating at 1 MW.

4. Personnel, X and gamma, beta and neutron film badges are assigned to all permanent occupants of the Nuclear Science Building. $CaSO_4$:Dy dosimeters have been used at four outdoor environmental stations. Reactor facility visitors are issued L-49 self-reading dosimeters.

Personnel monitoring results are categorized below:

	Rem-1989		
	Gamma	Beta	Neutron
Reactor Staff			
Whole Body Cumulative Dose for Calendar Year (thru 11-19-89)			
Highest	0.080	0.080	0.000
Hands Cumulative Shallow Dose for Calendar Year			
Highest	0.000	0.490	0.000
Reactor Experimenters			
Whole Body Cumulative Dose for Calendar Year			
Highest	0.080	0.080	0.000
Hands Cumulative Dose for Calendar Year			
Highest	0.060	0.180	0.000

Reactor Visitors

All readings were less than 14 mrem.

Environmental Stations

	Rem 1989
Exhaust Stack	0.1564
West	0.0103
Southwest	0.0000
Southeast	0.0000

IX. Environmental Monitoring

Pursuant to reactor procedures, soil and water samples are collected every second year. No environmental samples were collected in 1989.