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License R-74
Docket 50-156

August 10, 2009

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Dear Sir:

Enclosed is a copy of the 2008-2009 Annual Report for the University of Wisconsin Nuclear Reactor Laboratory as required by our Technical Specifications.

Sincerely,

Robert J. Agasie
Reactor Director

Enc. (Annual Report)

cc: Region III Administrator
Compliance Inspector, Craig Bassett
Facility Project Manager, William Schuster
Reactor Safety Committee, RSC 1029

A020
NRR

THE UNIVERSITY OF WISCONSIN
NUCLEAR REACTOR LABORATORY

FISCAL YEAR 2008-2009 ANNUAL OPERATING REPORT

Prepared to meet reporting requirements of:
U. S. Department of Energy
SPECIAL MASTER TASK RESEARCH SUBCONTRACT NO. C96-175937
and
U. S. Nuclear Regulatory Commission
(Docket 50-156, License R-74)

Prepared by:

Robert J. Agasie
Department of Engineering Physics

EXECUTIVE SUMMARY OF REACTOR UTILIZATION

Instruction: Teaching usage of the reactor during the year included:

- 90 Nuclear Engineering students in laboratory and lecture courses.
- 57 students and staff from other UW-Madison departments and programs.
- 105 professionals in continuing education and professional development programs.
- 702 students and instructors from 6 non-college level educational organizations as part of the UW Nuclear Reactor Outreach Program.

Research: Neutron irradiations during the year included:

- 1065 samples irradiated for departments at UW-Madison.
- 18 samples were irradiated for other educational and research institution research programs.
- 4.5 hours of neutron beam time were devoted to neutron radiographic analysis.

Industrial Use:

- Irradiation of 5 samples were performed for isotope production services.

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A. SUMMARY OF OPERATIONS

1. INSTRUCTIONAL USE

Nuclear Engineering(NE) 231, "Survey of Nuclear Engineering" was offered in the spring semester with an enrollment of 25 students. The course is designed for freshmen students interested in nuclear engineering and consists of three lecture modules surveying fission, fusion and radiation science technologies. The fission module concludes with a reactor tour.

NE 427 was offered in the fall and spring semesters with a total enrollment of 38 students. Several NE 427 experiments use materials that are activated in the reactor. One experiment entitled "Radiation Survey" requires that students make measurements of radiation levels in and around the reactor laboratory.

NE 428 was offered in the fall, spring and summer semesters with a total enrollment of 27 students. Three experiments in NE 428 require exclusive use of the reactor. These experiments ("Critical Experiment", "Control Element Calibration", and "Pulsing") required a total of 27 hours of exclusive reactor use. Other NE 428 laboratory sessions use material that has been irradiated in the reactor ("Fast Neutron Flux Measurements by Threshold Foil Techniques" and "Resonance Absorption").

Individual class sections for Nuclear Engineering 408, "Ionizing Radiation", Anthropology 311, "Archaeological Chemistry", and Physics 115, "Energy", where held at the Reactor Laboratory, with 36 students participating.

The Reactor Laboratory's continued commitment to its educational outreach program attracts large numbers of community organizations who visit the reactor. A listing of individual schools and educational programs who have visited is provided below in section A.2 of this report.

2. OUTREACH AND COMMUNITY SERVICE

Participating Institution	Number of Participants

Abundant Life Christian High School 23

Reactor tour with a discussion on applications of nuclear energy and uses of the UW nuclear reactor.

American Nuclear Society 1

Reactor tour for Tom Sanders, president elect of the American Nuclear Society, with a discussion on the capabilities and uses of the UW nuclear reactor.

Argonne National Laboratory 1

Reactor tour with a discussion on the capabilities of the UW nuclear reactor and future collaborations.

Atomic Energy of Canada
Chalk River 2

Reactor tour with a discussion on the capabilities of the UW nuclear reactor and future collaborations.

Beloit College 0

Analyzed swipe tests to leak check radioactive sources and performed detector calibrations.

Boy Scouts of America 483

Reactor tour with a discussion on applications of nuclear energy and uses of the UW nuclear reactor. Program included hands on demonstrations of radiation detection and shielding. Program co-sponsored by the UW student branch of the American Nuclear Society in support of the Scouts Atomic Energy Merit Badge program.

Camp Badger 60

Reactor tour with a discussion on applications of nuclear energy and uses of the UW nuclear reactor. A program designed to allow middle school students to explore math, science and engineering.

Participating Institution	Number of Participants

Capital Science & Engineering Fair 12

Reactor tour with a discussion on applications of nuclear energy and uses of the UW nuclear reactor. Part of the Capital Science & Engineering Fair which was established to provide high school students from South Central Wisconsin a unique opportunity to perform science and engineering and learn from University faculty and staff.

Dominion 2

Reactor tour with a discussion on the capabilities of the UW nuclear reactor and future collaborations.

Exelon Nuclear
Quad Cities Nuclear Generating Station 18

Week long reactor physics seminar provided to initial license trainees. Details of the training program can be found in section A.4 of this report.

Girl Scouts of the USA 114

Reactor tour with a discussion on applications of nuclear energy and uses of the UW nuclear reactor. Program included hands on demonstrations of radiation detection and shielding. Program co-sponsored by the UW student branch of the American Nuclear Society in support of the Girl Scouts Atomic Merit Badge.

Madison Fire Department 59

Radiation safety training program for the Madison Fire Department's Hazardous Incident Response Team. Details of the training program can be found in section A.4 of this report.

Oak Ridge National Laboratory 3

Reactor tour with a discussion on the capabilities of the UW nuclear reactor and future collaborations.

Ohio State University 1

Reactor tour with a discussion on the capabilities of the UW nuclear reactor and future collaborations.

Sandia National Laboratory 2

Reactor tour with a discussion on the capabilities of the UW nuclear reactor and future collaborations.

Participating Institution	Number of Participants

Wausau East High School 10
Reactor tour with a discussion on applications of nuclear energy and uses of the UW nuclear reactor.

University of Tokyo 15
Reactor tour with a discussion on the capabilities of the UW nuclear reactor and future collaborations.

UW Engineering Physics Society 5
Reactor tour with a discussion on applications of nuclear energy and uses of the UW nuclear reactor.

UW Engineering Physics Department
Graduate Student Recruitment Program 13
Reactor tour with a discussion on the capabilities and uses of the UW nuclear reactor in support of graduate research recruitment program.

UW Institutes of Discovery 3
Reactor tour with a discussion on the capabilities of the UW nuclear reactor and future collaborations.

Wisconsin Engineer Magazine 2
Reactor tour with a discussion on applications of nuclear energy and uses of the UW nuclear reactor. Part of an article on nuclear energy.

State of Wisconsin
House of Representatives 1
Reactor tour with a discussion on applications of nuclear energy and uses of the UW nuclear reactor.

USER SUMMARY:

Institutions: 22

Participants: 830

3. SAMPLE IRRADIATIONS AND NEUTRON ACTIVATION ANALYSIS SERVICES

There were 1088 individual samples irradiated during the year. Of these samples, 374 were irradiated for 15 minutes or less. Samples accumulated 243.1 irradiation space hours and 1426.4 sample hours. Many samples were irradiated and then counted at the Reactor Laboratory as part of our neutron activation analysis program. In the listing below the notation (NAA) indicates that the samples were processed by our neutron activation analysis program.

Engineering Physics Department, UW-Madison
UW Nuclear Reactor Laboratory
175 samples, 548.7 sample hours
Production of calibration sources for required reactor measurements and development of methods for instrumental neutron activation analysis.

Engineering Physics Department, UW-Madison (NAA)
Graduate Research Project
156 samples, 312.0 sample hours
Neutron activation analysis was used to determine elemental impurity of molten FLiNaK salt. The measured concentrations in the salts were used to calibrate an in situ probe developed to measure corrosion products in the heat transfer media of the Very High Temperature Reactor (VHTR).

Engineering Physics Department, UW-Madison
Undergraduate Research Project
240 samples, 111.6 sample hours
Irradiation of foil sources for neutron flux measurements of UWNR experimental facilities as part of an NE 699, independent study, for an undergraduate research project.

Engineering Physics Department, UW-Madison
Instrumentation Laboratory
135 samples, 123.1 sample hours
Irradiation of foil sources for radiation detector experiments, including absolute counting for neutron flux measurements and activation of samples for neutron activation analysis experiment.

Engineering Physics Department, UW-Madison
NE 428
23 samples, 27.8 sample hours
Irradiation of foils for resonance absorption measurements and fast neutron flux measurements.

Department of Anthropology, UW-Madison (NAA)
293 samples, 244.0 sample hours
Professor R. Law used NAA to characterize fragments of steatite manufacturing debris excavated from the archaeological site of Harappa, Pakistan.

Department of Pharmacy, UW-Madison (NAA)
3 samples, 6.0 sample hours
UW Pharmacy faculty W. Heideman and R. Peterson and research assistant Ofek Bar-Ilan used NAA to measure stable gold and silver tagged nanoparticles for toxicity in zebra fish embryos.

University of Wisconsin- Milwaukee (NAA)
Center for Byproduct Utilization
40 samples, 34.9 sample hours
Professor T. Naik used NAA to measure levels of various elements in concretes prepared using various byproduct materials, such as paper mill sludge, fly ash, and bottom ash.

Madison Fire Department
18 samples, 15.9 sample hours
Irradiation of samples used in training program for the Madison Fire Department Hazardous Incident Team. Program focused on measurements of activity, energy, and distance dependence on various isotopes.

NorthStar Nuclear
5 samples, 2.5 sample hours
Feasibility study of irradiating calcium hydroxyapatite (Ca_{10}-$(PO_4)_6(OH)_2$, CaHAP) for P^{32} production.

Oak Ridge National Laboratory
Fuels, Engines and Emissions Research Group
4.5 hours beam time
Neutron radiography beam time to determine the feasibility to study diesel spray systems including, quantifying soot accumulation in EGR coolers and diesel particulate filters.

4. OTHER MAJOR EDUCATIONAL, RESEARCH, & OPERATIONAL ACTIVITIES

In the fall of 2007 the Reactor Laboratory was notified that funding from the Department of Energy was available to pursue the conversion of the reactor from high enriched uranium (HEU) to low enriched uranium (LEU) in accordance with 10 CFR 50.64 (b)(2)(ii). Reactor Laboratory staff, along with support from University of Wisconsin, Department of Engineering Physics faculty members Michael L. Corradini, and Paul P.H. Wilson, research assistants Mike Priaulx, Brian Vitiello, and Phiphat (Nor) Phruksarojanakun, and partners from the National Nuclear Security Administration's (NNSA) Reduced Enrichment for Research and Test Reactors (RERTR) Program, successfully prepared and submitted to the U.S. Nuclear Regulatory Commission the safety analysis report for the conversion on August 25, 2008.

Concurrent with the preparation and submission of the safety analysis report, Reactor Laboratory staff successfully disassembled 30 TRIGA standard 8.5 w/o, 20% enriched LEU fuel clusters in preparation for conducting a spent fuel shipment on May 28, 2009.

Subsequently, on June 11, 2009, the University of Wisconsin Nuclear Reactor was ordered by the U.S. Nuclear Regulatory Commission to modify facility license R-74 to convert from high to low enriched uranium fuel.

In August 2008 the Reactor Laboratory partnered with Exelon Nuclear's Quad Cities Nuclear Generating Station to provide a week long seminar investigating reactor behavior for the station's Initial Licensed Training (ILT) class. Eighteen professionals who aspire to become nuclear reactor operators participated. The program was a hands-on, laboratory based seminar where the participants investigated sub critical, super critical and prompt critical reactor behavior. Participants measured rod worth using the rod bump rising period method and the rod drop method. They then applied this measurement to power versus temperature data to derive the prompt negative fuel temperature coefficient of reactivity and finally witnessed the effects of the prompt negative fuel temperature coefficient of reactivity during reactor pulse operations.

During the fall of 2008 the Reactor Laboratory developed and implemented a training program for the Madison Fire Department (MFD). Both the Hazardous Incident Response Teams and the crews of MFD's Station 4, the first responders

for an event at the Reactor Laboratory, attended. The program was a hands-on laboratory experience where MFD participants used their own equipment to increase familiarity. The program covered topics including: use of radiological detection equipment, the nature of alpha, beta and gamma radiation, investigation of activity versus dose, demonstration of the $1/r^2$ nature of radiation point sources, how to conduct a contamination survey, and general awareness of the hazard communicated by regulatory signs and placards.

5. CHANGES IN PERSONNEL, FACILITY AND PROCEDURES

Any changes reportable under 10 CFR 50.59 are indicated in section E of this report.

Other changes to the facility included the implementation of a Low System Temperature annucicator. This new annuciator was added to the existing System Temperature High annuciator and the new, combined annuciator, is called System Temperature High/Low. It is known that thermal cycling of the aluminum pool liner can initiate minor cracks that can release pool water to the environment. While high pool water temperatures can lead to excessive thermal expansion, similarly, low pool water temperatures can result in excessive thermal contraction. The new combined annunciator will warn of potentially large thermal cycles.

Personnel changes during the year were as follows:

The following reactor operators were removed from licensed status upon resigning their positions with the university:

Daniel C. Ludwig	OP-70524	effective 08/04/08
Robert M. Scherrer	OP-70602	effective 01/07/09
Aaron M. Lee	OP-70523	effective 05/08/09

Ross E. Swaney was appointed to the Reactor Safety Committee upon the departure of Cynthia Stiles from the University of Wisconsin-Madison, effective November 7, 2008.

Dr. Biddy (Carolyn A.) Martin was named Chancellor of the University of Wisconsin at Madison following the retirement of Dr. John D. Wiley from the position of Chancellor, effective September 2, 2008.

6. RESULTS OF SURVEILLANCE TESTS AND INSPECTIONS

The program of inspection and testing of reactor components continues, satisfactorily meeting procedural acceptance criteria. Inspection of underwater components during the annual maintenance showed no deterioration or wear with the exception of the regulating blade.

The regulating blade has experienced some degradation. The four bottom most rivets(out of 11 total), which connect the aluminum support rod to the stainless blade, have failed at the buck tail end. The factory end of the rivets are still intact. The stainless blade remains firmly attached to the support rod. There appears to be no binding of the support rod inside the control blade shroud as indicated by normal rod drive stroke times. The regulating blade is not part of the reactor protection system and does not have SCRAM capabilities. Replacement options are being pursued.

The pool leak surveillance program continues to monitor the pool evaporation rate, the pool make-up volume, and pool water radioactivity. The pool leak surveillance program indicated that approximately 2449 gallons of water effluent has been released to the environment as detailed in table 4 below.

B. OPERATING STATISTICS AND FUEL EXPOSURE

Operating Period	Critical Hours	MW-Hrs	Runs	Pulses
Fiscal Year 2008-2009	374.57	298.69	91	30
Cumulative FLIP Core	18,486.48	15,231.51	5,476	1,192
Cumulative TRIGA	25,751.47	20,219.69	7,466	2,503

Core I23-R10 was operated throughout the year. The excess reactivity of this core was determined to be 4.393%ρ.

C. EMERGENCY SHUTDOWNS AND INADVERTENT SCRAMS

There were three automatic SCRAMS or manual emergency shutdowns during the year. Each is described below in chronological sequence.

August 4, 2008; Manual SCRAM by reactor operator. An operator was dispatched to de-energize the whale pump by opening the whale pump disconnect. The disconnect is located next to the diffuser pump disconnect. The operator mistakenly opened the diffuser pump disconnect. As a result, radiation levels increased at the pool top due to increased N-16 activity. The control room reactor operator received the "area radiation high" annuciator and noted the bridge area radiation monitor was reading above the alarm set point. The reactor operator initiated a manual SCRAM of the reactor in accordance with procedure.

September 22, 2008; SCRAM from alternating current monitor. During a full power run, the Mechanical Engineering Building experienced a temporary loss of AC power. While the control console is powered though an uninterruptible power supply (UPS), the alternating current monitor prevents the reactor from operating unless normal AC power is available for auxiliary system loads.

January 23, 2009; SCRAM from pool level monitor. During the annual UWNR 170 "Power Level Calibration Procedure" the pool water heated up to 109°F. This caused sufficient thermal expansion of the bulk pool water such that the pool level increased to the high pool level SCRAM set point.

D. MAINTENANCE

The Preventive Maintenance Program continues to maintain equipment and systems in good condition. Routine demineralizer regeneration occurred on September 22, 2008, January 22, 2009 and May 4, 2009.

Corrective maintenance performed as a follow up action necessary for reactor restart following an automatic SCRAM is covered in section C of this report. Additional corrective maintenance was performed on the following reactor systems:

During an approach to critical demonstration on August 21, 2008, picoammeter #2 indication became full downscale. This behavior is consistent with a loss of +HV to the compensated ion chamber (CIC) #2 which is connected to picoammeter #2. The detector was removed and the signal HN jack was found to be loose. All 3 HN connectors were removed and retightened.

In October 2009, the main panel period meter was noted to be reading +30 seconds, during shutdown. The vertical meter on the unit chassis and the main recorder indication were both reading normally. The unit's built-in period check showed that the period was also still responding normally but that the main panel meter was offset. Turning the unit off revealed that the mechanical zero of the main panel meter was misadjusted. The mechanical zero was readjusted.

On May 14, 2009 the Waste Holdup Tank Level annunciator was found to be in alarm without an actual high level condition. After removing the reed switch from the circuit, the system no longer indicated a "HIGH" condition. When the reed switch was tested, it responded appropriately. It was then noticed that the connecting wire seemed to have worn and cracked insulation. It was determined that the wires were shorting and causing the false annunciator. Shrink tubing was applied over the splices.

E. CHANGES IN THE FACILITY OR PROCEDURES REPORTABLE UNDER 10 CFR 50.59

There were no changes in the facility or procedures reportable pursuant to 10 CFR 50.59 completed during the year.

F. RADIOACTIVE WASTE DISPOSAL

1. SOLID WASTE

All solid waste was transferred to the University Broad Scope license for ultimate disposal in accordance with radioactive materials license number WI 25-1323-01. The amount and activity are detailed in Table 1.

2. LIQUID WASTE RELEASED TO THE SANITARY SEWER

Liquid waste discharges from the facility during the year are detailed in Table 2.

3. PARTICULATE AND GASEOUS ACTIVITY RELEASED TO THE ATMOSPHERE

Table 3 presents information on stack discharges during the year.

4. LIQUID ACTIVITY RELEASED TO THE ENVIRONMENT

Table 4 presents information on the pool leak effluent described in section A.6 of this report to the environment during the year.

G. SUMMARY OF RADIATION EXPOSURE OF PERSONNEL (01/01/08 - 12/31/08)

The personnel radiation monitoring program at the University of Wisconsin for the past calendar year used Global Dosimetry brand TLD monitors for whole body exposure while extremity dose was monitored using TLD ring badges processed by Landauer Inc. No personnel received any significant radiation exposure for the above period. The highest annual doses recorded were 26 mrem to the whole body and 117 mrem to the extremities.

The highest dose received by a member of the public visiting the reactor lab was 0.1 mrem, as measured by Siemens brand Electronic Personal Dosimeters.

Monthly radiation surveys continue to demonstrate acceptable radiation dose rates within the reactor laboratory and no contamination.

H. RESULTS OF ENVIRONMENTAL SURVEYS (01/15/08 - 01/14/09)

The environmental monitoring program at the University uses Landauer Luxel brand area monitors located in areas surrounding the reactor laboratory. Table 5 indicates the dose a person would have received if continuously present in the indicated area for the entire 2008 calendar year.

I. PUBLICATIONS

The following are theses, publications and presentations based in part on reactor use:

Austin, K., (2008). Calculating the Dose from an Unshielded TRIGA Reactor Core as Part of the LOCA Accident Analysis. Test, Research, and Training Reactors Annual Conference, Cape Cod, MA.

Blanchard, M., (2009). Radiological Monitoring and Response. Wisconsin HAZMAT Emergency Responders Conference, Wisconsin Dells, WI.

Vitiello, B. J., (2008). Thermal Hydraulic and Safety Analysis of the University of Wisconsin Nuclear Reactor. University of Wisconsin Thesis (M.S.), Madison, WI.

TABLE 1 SOLID WASTE

Date:	08/05/08	02/11/09	02/19/09	06/25/09	TOTAL VOLUME
Volume:	1.9 ft^3	4 ft^3	21 ft^3	8 ft^3	34.9 ft^3
Constituents:	NAA Samples	1968 - 1973 PAD Experiment Waste	1968 - 1973 PAD Experiment Waste	Spent Resins	
Isotope	Activity (μCi)	Activity (μCi)	Activity (μCi)	Activity (μCi)	Total Activity by Isotope (μCi)
Co-58	3.986	-	-	-	3.986
Co-60	178.6	-	-	7.000	185.6
Cr-51	4.255	-		-	4.255
Cs-134	4.672	-	-	-	4.672
Cs-137	-	0.010	0.0004	-	0.010
Eu-152	20.72	-	-	-	20.72
Mn-54	-	-	-	7.000	7.000
Tm-170	89.67	-	-	-	89.67
U-235	-	0.050	0.0032	-	0.053
Zn-65	3.733	-	-	28.00	31.73
Total Activity per Transfer (μCi):	305.6	0.060	0.0036	42.00	**TOTAL ACTIVITY** 347.7 μCi

TABLE 2 LIQUID RADIOACTIVE WASTE DISCHARGED TO SEWER

Release Date:	09/18/2008	01/26/2009
Gallons Released:	1250	1500
Total μCi:	33.73	185.7
Sum of Fraction of MPC w/o dilution:	0.1615	0.4947
Sum of Fraction of MPC w/ daily dilution:	0.0080	0.0294

Isotope	MPC (μCi/ml)	Released	Released	
Co-58	2.00E-4	8.72	26.9	μCi
		1.84E-06	4.73E-06	μCi/ml
		0.009	0.024	Fraction of MPC
Co-60	3.00E-05	21.2	18.7	μCi
		4.49E-06	3.30E-06	μCi/ml
		0.150	0.110	Fraction of MPC
Cr-51	5.00E-3	-	12.3	μCi
		-	2.17E-06	μCi/ml
		-	0.0004	Fraction of MPC
Mn-54	3.00E-04	3.78	30.5	μCi
		7.99E-07	5.38E-06	μCi/ml
		0.003	0.018	Fraction of MPC
Zn-65	5.00E-05	-	97.3	μCi
		-	1.71E-05	μCi/ml
		-	0.343	Fraction of MPC

Total volume of water released to the sanitary sewer (gallons)	=	2750
Total quantity of radioactive material released to the sanitary sewer (μCi)	=	219.4
Average daily sewage flow for dilution (gallons)	=	2.37E+4
Maximum fraction of MONTHLY release limit with DAILY dilution	=	0.029
Maximum fraction of MONTHLY release limit with MONTHLY dilution	=	0.002

TABLE 3 EFFLUENT FROM STACK

1. Particulate Activity

There was no discharge of particulate activity above background levels.

2. Gaseous Activity - All Argon-41

Month	Activity Discharged (Curies)	Maximum Concentration (μCi/ml x 1E-6)	Average Concentration (μCi/ml x 1E-6)
July 2008	0.253	1.280	0.267
August	0.353	0.683	0.318
September	0.353	0.980	0.284
October	0.181	0.626	0.223
November	0.200	0.896	0.180
December	0.082	0.749	0.174
January 2009	0.011	0.305	0.126
February	0.170	1.030	0.218
March	0.131	0.749	0.173
April	0.148	1.070	0.185
May	0.000	0.000	0.000
June	0.036	1.070	0.343
	Total	Maximum	Average
	1.918	1.280	0.208

Using Gifford's model, as described in the appendix to the "Safety Analysis Report for the University of Wisconsin Nuclear Reactor", a concentration of 8E-6 μCi/ml at the stack discharge would result in a maximum air concentration of 1E-8 μCi/ml at any point downwind.

TABLE 4 EFFLUENT FROM POOL

Liquid Release to the Environment - All Activity H-3

Month	Water Released (Gallons)	Average Concentration (μCi/ml)	Activity Released (mCi)	Fraction of MPC
July 2008	197	1.00E-4	0.075	0.100
August	1010	8.65E-5	0.331	0.086
September	911	9.46E-5	0.326	0.095
October	331	9.19E-5	0.115	0.092
November	0	9.19E-5	0.000	-
December	0	8.38E-5	0.000	-
January 2009	0	8.51E-5	0.000	-
February	0	8.46E-5	0.000	-
March	0	8.46E-5	0.000	-
April	0	1.27E-4	0.000	-
May	0	1.22E-4	0.000	-
June	0	1.41E-4	0.000	-
	Total	Average	Total	Average
	2449	9.13E-5	0.847	0.091

TABLE 5 ANNUAL ENVIRONMENTAL MONITORING DOSE DATA
(01/15/08 - 01/14/09)

Location	Annual Dose (mrem)
Dose Inside Reactor Laboratory Stack	16.0
Highest Dose in Occupied* Non-restricted Area (room 3120, class room)	46.0
Average Dose in all Non-restricted Areas (26 Monitor Points)	21.9

*Occupied areas include classrooms, offices, and lobbies/meeting areas where an individual might reasonably spend in excess of 2 hours per day.