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*Annual Radiological Environmental Monitoring  
Program Report for the Fort St. Vrain Independent  
Spent Fuel Storage Installation*

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**Annual Radiological Environmental Monitoring  
Program Report for the Fort St. Vrain  
Independent Spent Fuel Storage Installation**

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## **ABSTRACT**

This report presents the results of the 2000 Radiological Environmental Monitoring Program conducted in accordance with 10 CFR 72.44 for the Fort St. Vrain Independent Spent Fuel Storage Installation. A description of the facility and the monitoring program is provided. The results of monitoring the two predominant radiation exposure pathways, potential airborne radioactivity releases and direct radiation exposure, indicate the facility operation has not contributed to any increase in the estimated maximum potential dose commitment to the general public.



## **SUMMARY**

The purpose of this report is to present the results of the Radiological Environmental Monitoring Program (REMP) conducted during 2000 for the Fort St. Vrain (FSV) Independent Spent Fuel Storage Installation (ISFSI). The results of the airborne radioactivity sampling did not indicate releases of airborne particulate radioactivity from the ISFSI. The results of the thermoluminescent dosimetry network did not indicate an increase in radiation levels above post-loading ambient background attributed to the facility operation. The monitoring program results support the conclusion reached in the Safety Analysis Report that operation of the facility will not result in a significant dose commitment greater than 0.15 mrem/y to the nearest resident.



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# **Annual Radiological Environmental Monitoring Program Report for the Fort St. Vrain Independent Spent Fuel Storage Installation**

## **INTRODUCTION**

The Fort St. Vrain (FSV) Independent Spent Fuel Storage Installation (ISFSI) is a spent fuel dry storage facility located in Platteville, Colorado. The FSV ISFSI is operated by Bechtel BWXT Idaho, LLC for the Department of Energy (DOE). The FSV ISFSI is licensed (SNM-2504) by the Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 72 for authorization to store spent nuclear fuel from the Fort St. Vrain Nuclear Station.<sup>1</sup> Spent fuel from the FSV reactor was transferred to the FSV ISFSI between December 26, 1991 and June 10, 1992. The FSV ISFSI license was transferred from the Public Service Company of Colorado (PSCo) to the U.S. Department of Energy, Idaho Operations Office (DOE-ID) on June 4, 1999.

A Radiological Environmental Monitoring Program (REMP) has been implemented for the FSV ISFSI in accordance with 10 CFR 72.44. This report presents the REMP results for 2000.

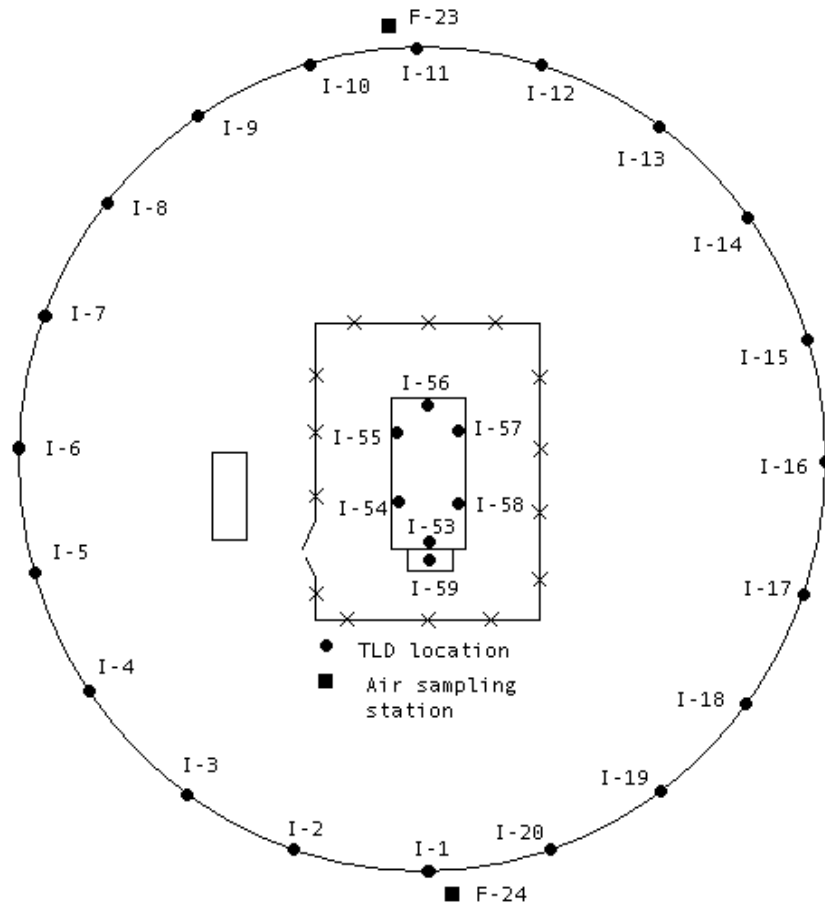
## **PROGRAM DESCRIPTION**

At the time of the license transfer in 1999, the M&O contractor at the Idaho National Engineering and Environmental Laboratory retained the subcontracted services of Rogers & Associates Engineering (RAE) to implement the REMP. The results of the REMP airborne radioactivity monitoring conducted during the first three months of 2000 was reported by RAE.<sup>2</sup> The report is included as Appendix A. An amendment to the FSV ISFSI license on March 24, 2000 allowed the ISFSI to discontinue airborne radioactivity monitoring at the 100 meter perimeter boundary of the facility.<sup>3</sup> Direct radiation monitoring during 2000 was performed exclusively by the INEEL.

The REMP is designed to monitor the two predominant radiation exposure pathways inherent with the facility design: potential airborne radioactivity releases and direct radiation. During the first three months of 2000, the airborne radioactivity release pathway was monitored using airborne radioactivity sampling. The direct radiation exposure pathway is monitored using thermoluminescent dosimetry (TLD) located along the 100 meter perimeter fence of the FSV ISFSI. Monitoring locations are identified in Figure 1.

Two continuous air sampling stations were located at the north and south end of the 100 meter perimeter fence. A third control air sampling station was located at the Denver Technology Center in Denver, Colorado. Air samples were collected weekly and analyzed for gross beta, Cs-134, and Cs-137 particulate radioactivity. Molesieve samples are also collected periodically within the ISFSI chimney and charge face and are subsequently analyzed for tritium radioactivity, but this is not considered part of the REMP.

Twenty thermoluminescent dosimeters (TLD's) are located around the 100 meter perimeter fence to monitor direct radiation from the FSV ISFSI. One third of the TLD's are changed out and processed each month. An additional seven TLD's are located inside the FSV ISFSI above the charge face and in the alarm station, but are not considered part of the REMP.



**Figure 1.** FSV ISFSI Monitoring Locations

## RESULTS

Air sampling results for the FSV ISFSI are presented in Table 1. The quarterly mean gross beta radioactivity concentration of  $24 \pm 15$  fCi/m<sup>3</sup> is not significantly different than the control mean of  $19 \pm 10$  fCi/m<sup>3</sup>, the preoperational (1991) mean of  $23 \pm 2$  fCi/m<sup>3</sup>, and the five-year historical operation mean of  $25 \pm 17$  fCi/m<sup>3</sup> last reported by Colorado State University (CSU).<sup>4</sup>

RAE reported that gamma spectroscopy results of the weekly air samples collected during the first quarter of 2000 did not indicate the presence of Cs-134 or Cs-137. The mean Minimum Detectable Limit (MDL) for the analyses was 6 fCi/m<sup>3</sup>, hence less than the required LLD of 10 fCi/m<sup>3</sup>.

Airborne tritium monitoring results of samples collected from the vault chimneys and charge face are presented in Table 2. There was no detected tritium.

TLD results for the FSV ISFSI are presented in Table 3 in units of mrem/d. Dosimetry processing services were provided by the INEEL. The mean daily exposure rate of  $0.42 \pm 0.02$  mrem/d measured at the ISFSI perimeter fence is not significantly different than the five-year historical operation

mean of 0.39 +/- 0.05 mrem/d last reported by CSU.<sup>4</sup> The mean exposure rate of 0.41 +/- 0.04 mrem/d measured inside the charge face and alarm station is not significantly different than the four-year historical operation mean of 0.40 +/- 0.06 mrem/d for the charge face last reported by CSU.<sup>4</sup> Previous annual REMP reports (preceding 1999) have indicated that the historical operation mean exposure rates were not significantly above preoperational and background levels for eastern Colorado.

**Table 1.** FSV ISFSI Air Sample Gross Beta Results (fCi/m<sup>3</sup>).

Sample Date	Control Station	North Station	South Station
January 4	13	19	18
January 10	14	22	19
January 18	17	30	36
January 24	19	29	29
January 31	31	42	38
February 7	18	22	25
February 14	23	26	24
February 21	24	32	29
February 28	15	23	23
March 6	23	23	26
March 13	16	16	17
March 20	14	14	18
March 27	16	22	24
April 3	18	16	15
Mean (1.96 sigma)	19 (10)	24 (15)	24 (14)

**Table 2.** FSV ISFSI Airborne Tritium Monitoring Results (uCi/cc).

Location	May/June 2000	August 2000	December 2000
North Charge Face	<8.66E-13	<9.40E-13	<8.44E-13
South Charge Face	<8.30E-13	<8.59E-13	<7.41E-13
East Charge Face	<1.11E-12	<1.35E-12	<7.51E-13
West Charge Face	<1.44E-12	<1.49E-12	<7.65E-13
Chimney A	<9.44E-13	-	-
Chimney B	<1.40E-12	-	-
Chimney C	<1.68E-12	-	-
Chimney D	<8.96E-13	-	-
Chimney E	<1.39E-12	-	-
Chimney F	<1.01E-12	-	-

**Table 3.** FSV ISFSI Exposure Rates (mrem/d).

Location	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Mean
I-1	0.42	-	-	0.46	-	-	0.41	-	-	0.43	-	-	0.43
I-2	-	0.36	-	-	0.40	-	-	0.45	-	-	0.38	-	0.40
I-3	-	-	0.42	-	-	0.44	-	-	0.44	-	-	0.43	0.43
I-4	0.42	-	-	0.41	-	-	0.42	-	-	0.45	-	-	0.42
I-5	-	0.37	-	-	0.40	-	-	0.43	-	-	0.39	-	0.40
I-6	-	-	0.41	-	-	0.38	-	-	0.45	-	-	0.47	0.43
I-7	0.46	-	-	0.40	-	-	0.41	-	-	0.41	-	-	0.40
I-8	-	0.42	-	-	0.41	-	-	0.44	-	-	0.38	-	0.41
I-9	-	-	0.48	-	-	0.41	-	-	0.43	-	-	0.43	0.44
I-10	0.43	-	-	0.41	-	-	0.40	-	-	0.43	-	-	0.42
I-11	-	0.36	-	-	0.41	-	-	0.46	-	-	0.38	-	0.40
I-12	-	-	0.40	-	-	0.43	-	-	0.48	-	-	0.45	0.44
I-13	0.41	-	-	0.42	-	-	0.39	-	-	0.43	-	-	0.41
I-14	-	0.35	-	-	0.41	-	-	0.41	-	-	0.38	-	0.39
I-15	-	-	0.40	-	-	0.37	-	-	0.44	-	-	0.45	0.42
I-16	0.41	-	-	0.47	-	-	0.42	-	-	0.46	-	-	0.44
I-17	-	0.35	-	-	0.40	-	-	0.44	-	-	0.38	-	0.39
I-18	-	-	0.38	-	-	0.38	-	-	0.45	-	-	0.43	0.41
I-19	0.39	-	-	0.42	-	-	0.43	-	-	0.43	-	-	0.42
I-20	-	0.37	-	-	0.41	-	-	0.43	-	-	0.38	-	0.40
Mean	0.42	0.37	0.42	0.43	0.41	0.40	0.41	0.44	0.45	0.43	0.38	0.44	0.42
I-53	-	0.47	-	-	0.53	-	-	0.51	-	-	0.44	-	0.49
I-54	-	-	0.38	-	-	0.37	-	-	0.40	-	-	0.38	0.38
I-55	0.39	-	-	0.40	-	-	0.38	-	-	0.39	-	-	0.39
I-56	-	0.29	-	-	0.45	-	-	0.46	-	-	0.44	-	0.41
I-57	-	-	0.39	-	-	0.39	-	-	0.42	-	-	0.41	0.40
I-58	0.40	-	-	0.41	-	-	0.39	-	-	0.40	-	-	0.40
I-59	0.39	-	-	0.40	-	-	0.39	-	-	0.40	-	-	0.40
Mean	0.39	0.38	0.38	0.40	0.49	0.38	0.39	0.48	0.41	0.40	0.44	0.40	0.41

## DISCUSSION

The FSV ISFSI REMP was successfully implemented during 2000. There was no loss of radiological monitoring data. There were no sampling location changes, but the air particulate sampling program was terminated after March 2000. There were no deviations from the established sampling schedule.

The airborne radioactivity sampling results indicate there was no measurable release of radioactive material from the FSV ISFSI during the first quarter of 2000. Radioanalytical results were not

significantly different from pre-operational results as well as the five-year historical operation mean last reported by CSU.<sup>4</sup>

The radiation dosimetry results indicate there has been no measurable increase in ambient background radiation levels outside the FSV ISFSI perimeter fence attributed to storage of the FSV fuel.

The calibration and quality control of instrumentation used for gross beta and gamma spectroscopy analysis was assessed during a quality assurance audit of RAE in August 1999. Barringer Laboratories, Inc. (BLI) of Golden, Colorado, the subcontracted radioanalytical laboratory used by RAE for sample analysis, also routinely analyzed blank, duplicate, and controlled spiked samples as part of their quality control program. The results of their quality control program are reported in monthly data validation reports. BLI also participated in the intercomparison program conducted by the DOE Environmental Measurements Laboratory (EML).<sup>5</sup> The selected intercomparison results are summarized in Table 4. The INEEL dosimetry processor also participated in the twelfth environmental dosimetry intercomparison program conducted by the EML, but EML has not yet published the results.

**Table 4.** Gross Alpha/Beta and Gamma Spectroscopy Intercomparison Results for June 2000 (Bq/filter)

Radionuclide	BLI Value (Error)	EML Value (Error)	BLI/EML	Evaluation
Co-57	5.324 (0.572)	5.310 (0.220)	1.003	Acceptable
Co-60	5.354 (0.569)	5.320 (0.260)	1.006	Acceptable
Cs-137	6.618 (0.700)	6.100 (0.300)	1.085	Acceptable
Mn-54	30.300 (3.180)	27.200 (0.800)	1.114	Acceptable
Gross Alpha	2.920 (0.070)	3.020 (0.300)	0.967	Acceptable
Gross Beta	2.250 (0.070)	2.420 (0.200)	0.930	Acceptable

It can be concluded from the results of the FSV ISFSI REMP that airborne radioactivity releases during the first quarter of 2000, and direct radiation exposure from the facility during 2000, did not contribute to any increase in the maximum potential dose commitment to the nearest resident (0.15 mrem/y) projected in the FSV ISFSI Safety Analysis Report.

## REFERENCES

- 10 CFR 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste", *Code of Federal Regulations*, Office of the Federal Register, August 1988.
- Rogers & Associates Engineering, *Summary Report for the Period January 1, 2000 through April 3, 2000 for the Fort St. Vrain Independent Spent Fuel Storage Installation (ISFSI) Radiological Environmental Monitoring Program*, July 6, 2000.
- Amendment No. 8 to SNM-2504 - Change in Radiological Environmental Monitoring Program (TAC No. L23040), March 24, 2000.

4. Fort St. Vrain Independent Spent Fuel Storage Installation (ISFSI) Radiological Environmental Monitoring Program (IREMP), Summary Report for the Period January 1 to December 31, 1997, Department of Radiological Health Sciences, Colorado State University, February 26, 1998.
5. EML-608, Semi-Annual Report of the Department of Energy, Office of Environmental Management, Quality Assessment Program, June 2000.