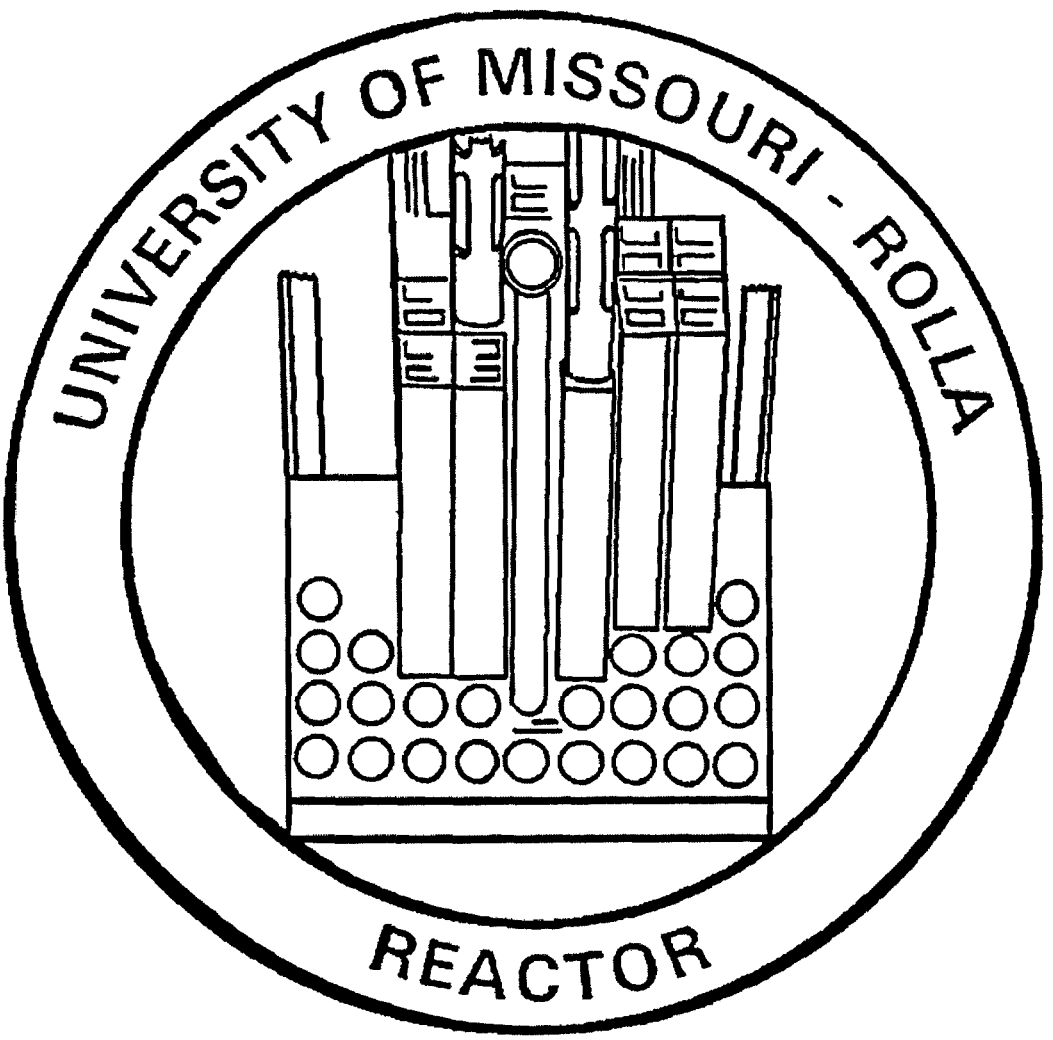
ENVIRONMENTAL REPORT
FOR THE
UNIVERSITY OF
MISSOURI-ROLLA REACTOR



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UMRR Environmental Report

The University of Missouri-Rolla (UMRR) is a pool reactor operating with Materials Test Reactor (MTR) – type fuel. The fuel is enriched to just less than 20% in U-235. the maximum licensed operating power is 200 kilowatts. The UMRR is licensed by the U. S. Nuclear Regulatory Commission pursuant to 10CFR50 as a research and utilization reactor. The facility operating license number is R-79 (Docket No. 50-123).

The principle activities carried on with the reactor are instruction, training and research. Typical experimental activities include nuclear engineering education experiments and demonstrations, basic research, neutron activation analysis, student operation training, neutron radiography, prompt gamma analysis, and spectroscopy studies.

The reactor core sits near the bottom of an approximate 30,000 gallon concrete pool. The reactor is cooled by natural convection flow of pool water and thus has no secondary cooling system or cooling tower. Heat generated by the reactor is transferred to the pool and ultimately dissipated through the pool walls and into the reactor bay.

The UMR Reactor is typically operated during normal working hours. Table 1 presents the annual operating history in MW-hrs back to 1984. On average, the reactor is operated about 10.4 MW-hrs per year. Future operations are expected to follow the historical patterns.

The facility is equipped with a ventilation system that exhaust the atmosphere in the building through vent fans located on the reactor facility roof, approximately 10 meters above grade.

The only gaseous effluent associated with normal operations is Ar-41. Air contains a small amount of Ar-40. Ar-41 is produced when dissolved air in the pool water passes through the reactor core and becomes activated. In order to minimize Ar-41 production, the rabbit facilities are operated with nitrogen gas. Annual Ar-41 releases are minimal. Historical Ar-41 releases since 1984 are presented in Table 2. Information presented in Table 2 shows that the annual average Ar-41 release is only about 100 mCi. Future releases are expected to be similar to the historical releases.

Table 1. UMRR Annual Operating History	
Year	MW-hours
1983-1984	6.3
1984-1985	9.4
1985-1986	5
1986-1987	12
1987-1988	26
1988-1989	6
1989-1990	11.4
1990-1991	11.6
1991-1992	6.4
1992-1993	5.8
1993-1994	8.6
1994-1995	4.6
1995-1996	8.9
1996-1997	5.7
1997-1998	6.8
1998-1999	10.2
1999-2000	7.3
2000-2001	6.1
2001-2002	3.8
2002-2003	12.9
2003-2004	33.6
Average	**10.4**

Table 2. UMRR Annual Gaseous Releases (Ar-41)	
Year	Activity (mCi)
1983-1984	6.1
1984-1985	19.4
1985-1986	46.9
1986-1987	205.7
1987-1988	404.4
1988-1989	63.1
1989-1990	119.4
1990-1991	171.1
1991-1992	138.7
1992-1993	38.9
1993-1994	60.2
1994-1995	60
1995-1996	46.1
1996-1997	31.7
1997-1998	135.6
1998-1999	77.3
1999-2000	46
2000-2001	37.9
2001-2002	45.4
2002-2003	3.8
2003-2004	81.2
Average	**91.9**

Liquid radioactive waste is produced by the regeneration of the demineralizer system, lowering of the pool level for maintenance, and draining of the demineralizer column in order to replace resins. The general philosophy of the facility administration has been to minimize liquid waste discharge. In recent years, the preference has been to replace resins as they become depleted rather than regenerating in order to minimize liquid waste. Liquid waste are analyzed to assure compliance with regulatory requirements and then released to the sanitary sewer system. Table 3 presents the historical annual liquid releases since 1984. Future liquid releases are expected to be minimal and are not expected to exceed the historical trends.

Solid radioactive waste generated during normal reactor operations typically includes ion exchange resins, pool filters, gloves, paper, and low activity samples from laboratory experiments. Solid waste is packaged in accordance with applicable NRC and DOT regulations and is transferred to the campus Materials License and then moved to the Radiation Safety Hazardous Waste Building for future disposal in accordance with applicable regulations. Table 4 presents the historical annual solid releases since 1984. as the data in Table 4 shows, the volume and gross activities associated with solid waste is minimal. Future solid releases are not expected to be significantly different from the historical trends.

Table 3. UMRR annual Liquid Releases		
Year	Activity (mCi)	Volume (Gallons)
1983-1984	0.198	8985
1984-1985	0.257	4650
1985-1986	0.020	3255
1986-1987	0.076	3255
1987-1988	0.332	6310
1988-1989	0.369	3720
1989-1990	0.014	500
1990-1991	1.144	38080
1991-1992	0.263	10678
1992-1993	0.761	11122
1993-1994	0.004	214
1994-1995	0.000	55
1995-1996	0.000	0
1996-1997	0.000	0
1997-1998	0.000	0
1998-1999	0.000	0
1999-2000	0.000	0
2000-2001	0.000	0
2001-2002	0.000	0
2002-2003	0.000	0
2003-2004	0.000	0
Averages	**0.172**	**4541**

Table 4. UMRR Annual Solid Waste Releases		
Year	Volume (ft^3)	Activity (µCi)
1983-1984	0.0	0.00
1984-1985	37.5	1.00
1985-1986	0.0	0.00
1986-1987	7.5	1.00
1987-1988	0.0	0.00
1988-1989	0.0	0.00
1989-1990	0.0	0.00
1990-1991	67.5	1000.00
1991-1992	0.0	0.00
1992-1993	15.0	114.00
1993-1994	15.0	5.50
1994-1995	7.5	5.50
1995-1996	10.0	0.01
1996-1997	19.3	2.90
1997-1998	0.0	0.00
1998-1999	24.0	0.01
1999-2000	45.0	0.01
2000-2001	0.0	0.00
2001-2002	0.0	0.00
2002-2003	0.0	0.00
2003-2004	15.0	0.11
Average	**13.2**	**56.50**