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UNC NUCLEAR INDUSTRIES
REACTOR AND FUELS PRODUCTION FACILITIES
1985 EFFLUENT RELEASE REPORT

Author D.J. Rokkan

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UNC NUCLEAR INDUSTRIES
REACTOR AND FUELS PRODUCTION FACILITIES
1985 EFFLUENT RELEASE REPORT

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1.0 SUMMARY

This document has been prepared to fulfill the reporting requirements of DOE 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements."

Analyses of routine samples from radioactive liquid and airborne streams were performed using UNC's Radioanalytical Laboratory and the analytical services of U.S. Testing Company. All significant effluent discharges from UNC facilities to the environment during CY 1985 are reported in this document.

The CY 1985 results from UNC's effluent sampling and analysis program indicate that:

- No Technical Specification limit was exceeded.

- The total annual release of Ar-41 via the 116-N Stack decreased by 12% compared to the same release for CY 1984 (65,000 Ci vs. 74,000 Ci). This reduction resulted from 23% less reactor operating time.

- The total annual release of I-131 via the N-Springs increased by 50% compared to the same release for CY 1984 (5.4 Ci vs. 3.6 Ci). Use of the 1301-N Liquid Waste Disposal Facility (LWDF) while the new 1325-N LWDF was out-of-service accounts for the increase. Having reached the end of its designed service-life, the 1301-N facility has been steadily losing its ion-exchange and filtration capabilities. Soon after 1325-N routinely replaced 1301-N, beginning September 19, 1985, I-131 began to show decreased levels at the riverbank springs. The extended year-end maintenance outage, by limiting releases to the LWDFs, helped reduce releases to the N-Springs, also.

- The total annual release of Co-60 via the N-Springs increased by 3% compared to the same release for CY 1984 (0.30 Ci vs. 0.29 Ci). A decreasing trend developed in the last several months of 1985 for the same reasons that caused the year-end reduction in I-131 at the N-Springs.

- The total annual release of Sr-90 via the N-Springs increased by 20% compared to the same release for CY 1984 (8.4 Ci vs. 7.0 Ci). Again, the necessary use of 1301-N explains the increase. Now that 1325-N is fully operational, Sr-90 concentrations are anticipated to drop substantially. This may require a year or more due to the slow groundwater travel-time, longer half-life, and still-contributing 1301-N inventory of Sr-90.

- Compared to the total CY 1984 releases to the LWDFs, reduced releases to the LWDFs were observed in CY 1985 for nearly every identifiable radionuclide, including Co-60 (61%: 590 Ci vs. 1,500 Ci), Sr-90 (23%: 240 Ci vs. 310 Ci), and I-131 (8%: 370 Ci vs. 400 Ci). Reduced reactor operating time stemming from the extended year-end maintenance outage is largely responsible for these decreases. The operation of the 107-N Basin Recirculation Facility also reduced the releases of some longer-lived radionuclides, specifically Sr-90.

- An increase of 67% in the U-Natural releases from the 333 Building Cut-off Saw Stack was measured in CY 1985 compared to the same release for CY 1984 (130 uCi vs. 78 uCi). Though 1985's releases are larger than last year's, they rank as about average when compared against the releases of previous years.

Nonradioactive effluent discharges from UNC's operations for CY 1985 are also included in this report. These releases are consistent with those observed in recent years.

Depicted in the following figures, 1 through 7, are graphs of radionuclides which are chemically or physically indicative of other radionuclides released at 100-N Area. Cumulative effluent discharges of each "indicator" radionuclide are compared for CY 1984 and CY 1985.

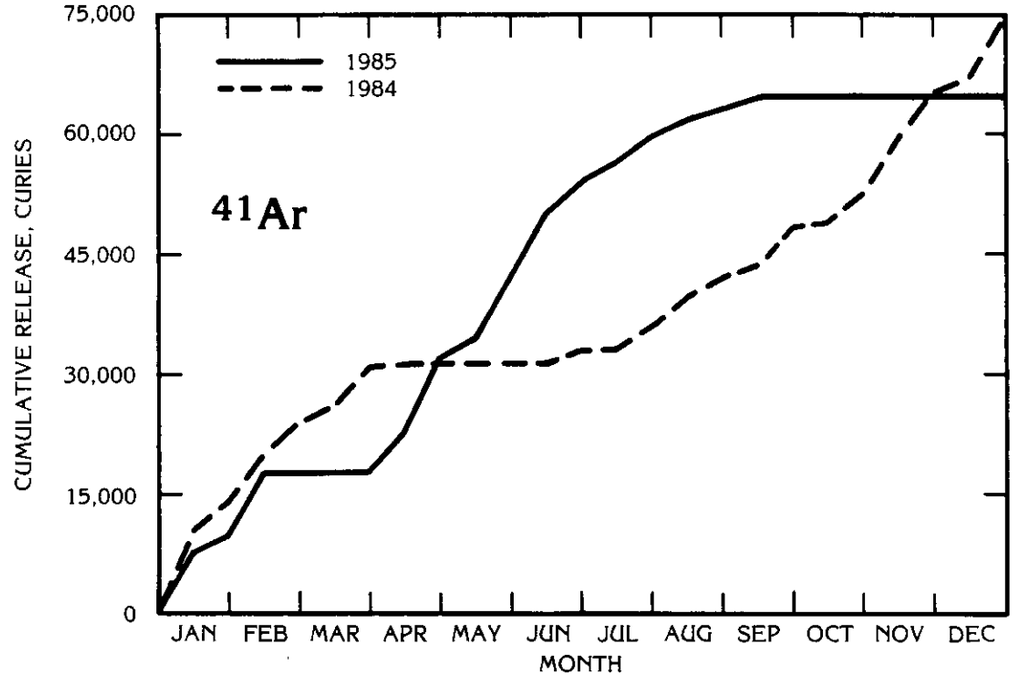

Figure 1: Argon-41 (an airborne activation product) releases from the 116-N Stack.

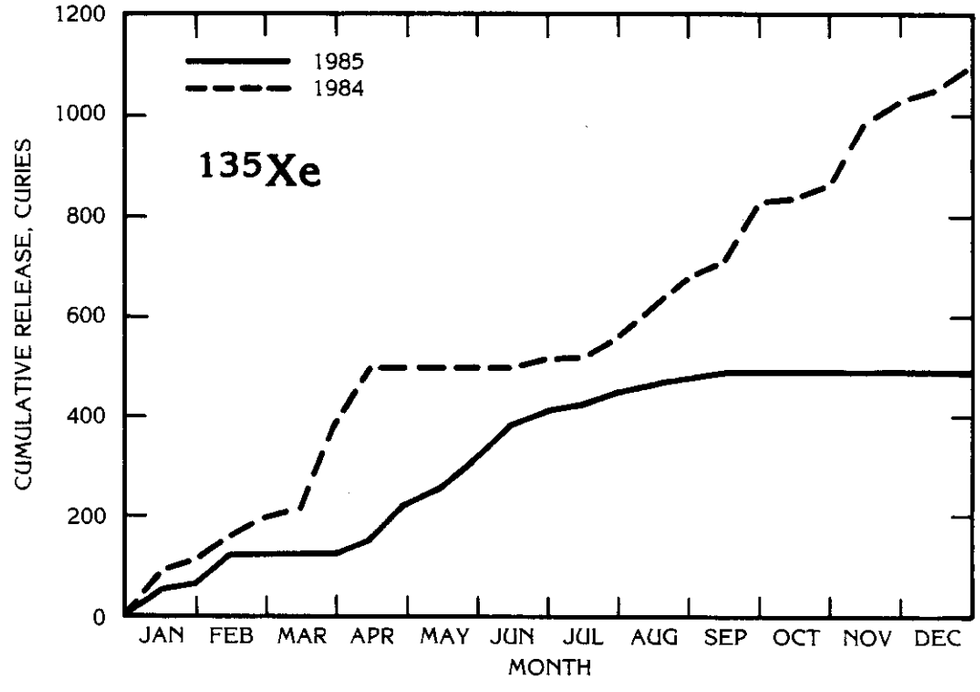

Figure 2: Xenon-135 (an airborne fission product) releases from the 116-N Stack.

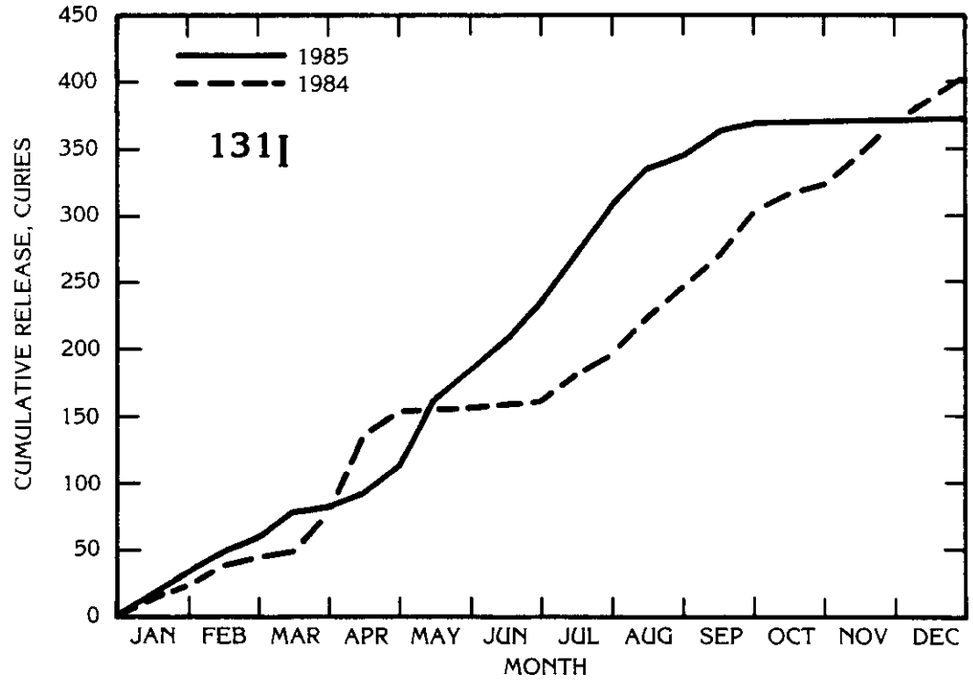

Figure 3: Iodine-131 (a fission product) discharges to the 1301-N and 1325-N LWDFs.

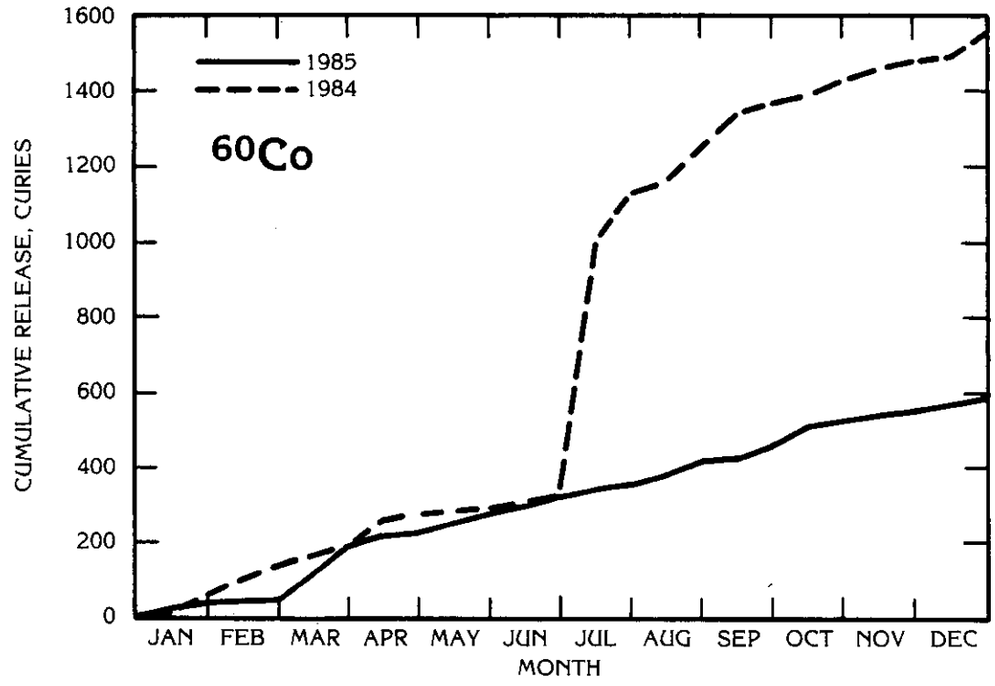

Figure 4: Cobalt-60 (a corrosion product) discharges to the 1301-N and 1325-N LWDFs.

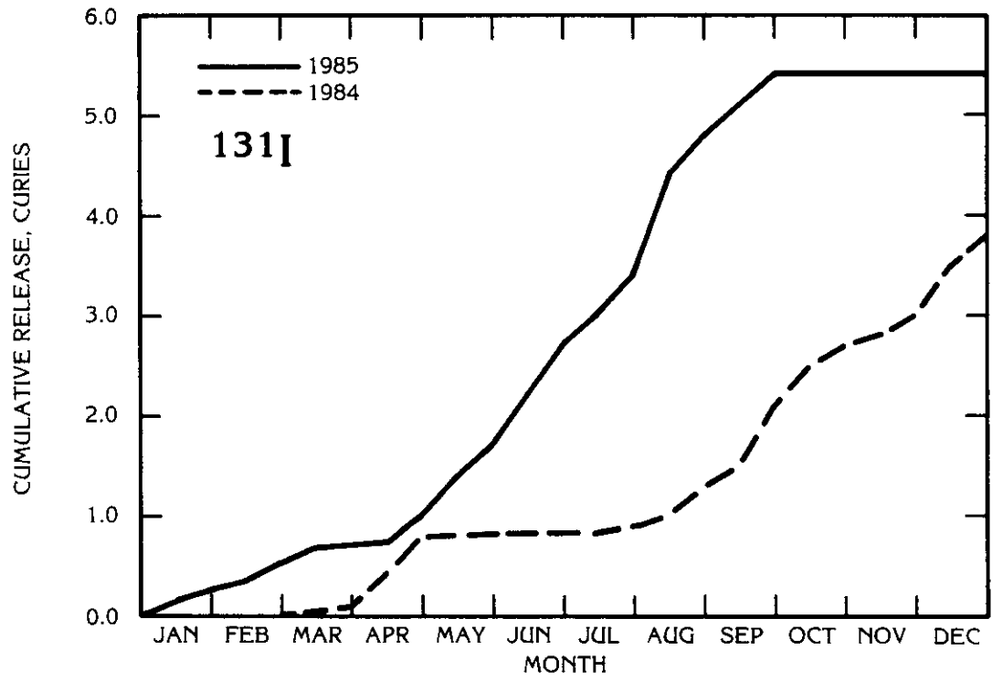

Figure 5: Iodine-131 (an anionic radionuclide) releases via the N-Springs to the Columbia River.

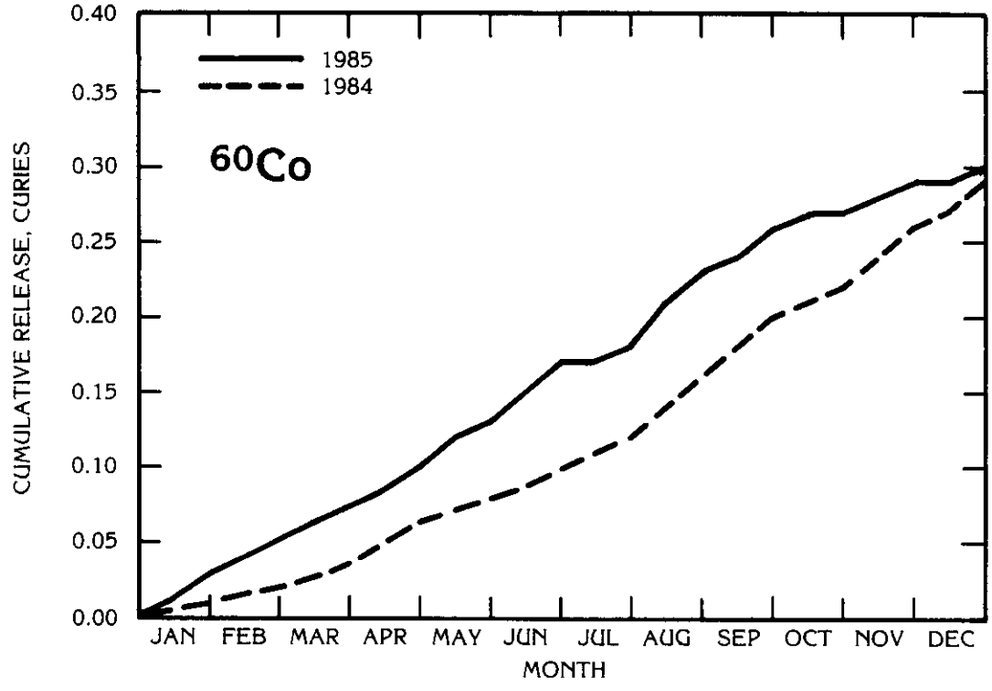

Figure 6: Cobalt-60 (a corrosion product) releases via the N-Springs to the Columbia River.

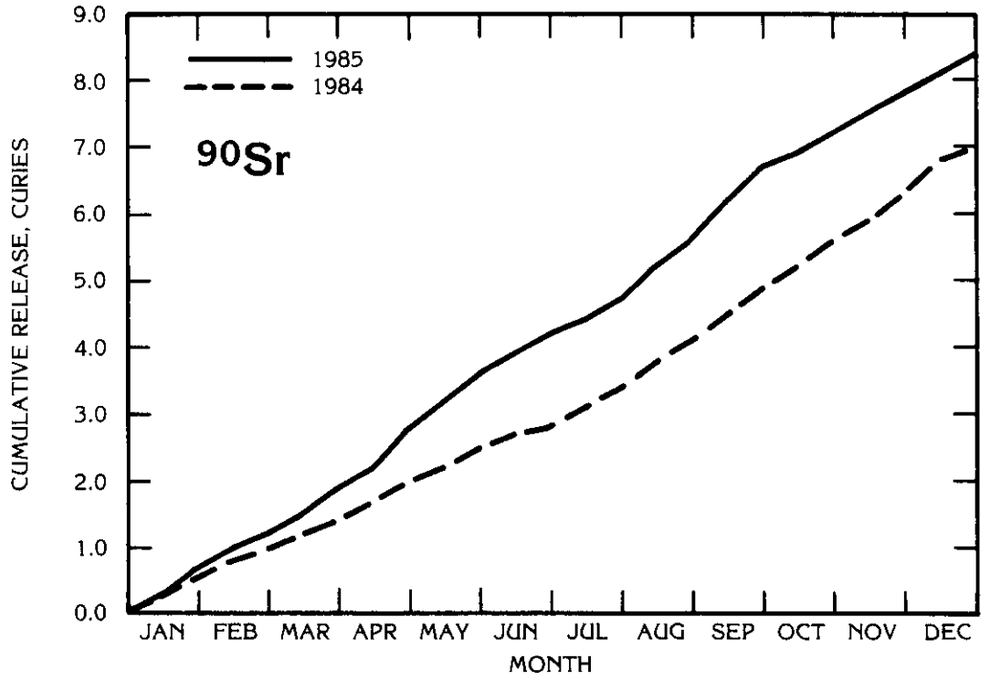

Figure 7: Strontium-90 (a fission product) releases via the N-Springs to the Columbia River.

2.0 ATMOSPHERIC RELEASES TO THE ENVIRONMENT FROM THE 100 AREAS

2.1 Radioactive Airborne Emissions From 100-N Area

2.1.1 Activity Discharged From 116-N Stack, 109-N Zone I Vent, and 109-N Cell 6 Vent

Radionuclide	116-N Stack			109-N Zone I Vent			109-N Cell 6 Vent		
	Release, Ci	Avg. Conc., pCi/L	Peak Conc., pCi/L	Release, Ci	Avg. Conc., pCi/L	Peak Conc., pCi/L	Release, Ci	Avg. Conc., pCi/L	Peak Conc., pCi/L
Gas									
H-3	1.8E0	5.9E0	6.0E1	ND			7.5E-2	1.8E-1	1.8E-1
Ar-41	6.5E4	2.1E4	9.6E4	3.3E3	1.9E3	2.8E4	5.2E2	1.3E3	1.4E4
Cr-51	ND			5.9E-3	3.3E-3	1.9E-2	ND		
Kr-85m	1.4E2	4.5E1	2.8E2	1.0E2	5.7E1	3.4E2	1.8E1	4.2E2	6.2E2
Kr-87	3.7E2	1.2E2	6.3E2	3.4E2	1.9E2	1.1E3	6.1E1	1.5E2	2.5E3
KrRb-88	3.4E2	1.1E2	6.7E2	2.7E2	1.5E2	7.6E2	4.2E1	1.0E2	1.5E3
I-131	1.7E-2	5.3E-3	2.8E-2	1.9E-1	1.1E-1	6.5E-1	2.6E-2	6.3E-2	5.8E-1
I-132	1.2E-1	3.7E-2	1.9E-1	2.4E0	1.4E0	1.3E1	2.0E-1	4.8E-1	7.3E0
I-133	9.9E-2	3.2E-2	1.9E-1	1.6E0	8.8E-1	6.0E0	1.5E-1	3.7E-1	3.6E0
I-135	1.5E-1	4.8E-2	2.6E-1	2.5E0	1.4E0	1.1E1	2.2E-1	5.4E-1	7.0E0
Xe-133	1.2E2	4.0E1	1.7E2	4.4E1	2.5E1	8.8E1	9.7E0	2.3E1	1.4E2
Xe-135	4.9E2	1.6E2	1.1E3	4.5E2	2.5E2	1.5E3	7.3E1	1.8E2	2.4E3
XeCs-138	7.9E2	2.5E2	4.6E3	8.6E2	4.8E2	4.8E3	1.8E2	4.4E2	5.6E3
Particulate									
Na-24	ND			1.3E-1	7.4E-2	5.5E-1	2.2E-2	5.3E-2	9.6E-1
Mn-54	4.6E-4	1.5E-4	4.1E-4	4.5E-3	2.5E-3	1.6E-2	1.4E-3	3.4E-3	2.1E-2
Mn-56	ND			3.0E-1	1.7E-1	1.1E0	1.4E-1	3.3E-1	9.0E0
Fe-59	7.8E-4	2.5E-4	1.3E-3	4.1E-3	2.3E-3	1.4E-2	2.6E-3	6.2E-3	5.1E-2
Co-58	3.3E-4	1.0E-4	2.1E-4	1.2E-3	6.6E-4	4.1E-3	5.4E-4	1.3E-3	1.0E-2
Co-60	1.9E-3	6.0E-4	2.4E-3	1.1E-2	6.3E-3	3.1E-2	8.9E-3	2.1E-2	2.5E-1
As-76	5.3E-2	1.7E-2	1.8E-1	1.1E0	5.9E-1	5.5E0	6.5E-2	1.6E-1	2.4E0
Sr-89	2.4E-5	7.7E-6	1.9E-5	1.4E-2	8.0E-3	1.2E-2	3.0E-3	7.1E-3	1.6E-2
Sr-90	6.5E-5	2.1E-5	4.6E-5	3.1E-4	1.7E-4	4.2E-4	1.3E-4	3.0E-4	3.5E-4
Sr-91	ND			1.3E-1	7.0E-2	5.6E-1	5.1E-2	1.2E-1	2.3E0
Nb-95	3.5E-4	1.1E-4	2.4E-4	1.1E-3	6.1E-4	3.2E-3	6.0E-4	1.4E-3	1.0E-2
Zr-95	5.3E-4	1.7E-4	3.2E-4	1.6E-3	9.1E-4	5.4E-3	7.5E-5	1.8E-3	1.8E-2
MoTc-99m	8.1E-4	2.6E-4	7.9E-4	1.8E-1	1.0E-1	9.1E-1	3.0E-2	7.2E-2	1.0E0
Ru-103	2.9E-4	9.3E-5	2.5E-4	1.0E-3	5.8E-4	3.8E-3	3.7E-4	8.8E-4	5.5E-3
Ce-141	3.0E-4	9.6E-5	1.7E-4	6.3E-4	3.5E-4	3.2E-2	1.7E-4	4.0E-4	4.0E-3
Cs-137	3.3E-4	1.1E-4	5.6E-4	8.5E-4	4.8E-4	3.9E-3	1.9E-4	4.5E-4	2.8E-3
BaLa-140	1.9E-3	6.2E-4	2.1E-3	1.1E-1	6.1E-2	5.2E-1	1.9E-2	4.5E-2	5.7E-1
Cs-134	2.4E-4	7.8E-5	1.4E-4	6.2E-4	3.5E-4	1.1E-3	ND		
CePr-144	ND			1.5E-2	8.4E-3	5.6E-2	2.0E-3	4.8E-3	3.5E-2
Pu-238	5.4E-8	1.7E-8	2.1E-8	8.3E-8	4.6E-8	1.1E-7	5.1E-8	1.2E-7	2.9E-7
Pu 239/240	3.8E-7	1.2E-7	1.8E-7	3.2E-7	1.8E-7	3.7E-7	2.2E-7	5.3E-7	1.1E-6

ND = Not Detected

2.1.2 Miscellaneous Airborne Releases, Ci

Radionuclide	Zone II EF 7,8	Zone III EF 10	Zone IV EF 14,15	Transfer Area	105-N Spacer Decon. Fac.	105-N 14' Decon. Fac.	107-N Exhaust	Total, Ci
Gas								
As-76	5.1E-4	2.7E-3	1.2E-4	ND	ND	ND	ND	3.3E-3
I-131	ND	4.7E-4	3.3E-5	1.4E-4	ND	5.7E-4	5.2E-5	1.3E-3
I-133	1.6E-4	2.9E-3	ND	ND	ND	ND	ND	3.1E-3
Particulate								
Mn-54	1.0E-4	5.9E-4	ND	3.3E-6	ND	ND	1.6E-5	3.1E-3
Fe-59	5.0E-5	ND	ND	ND	ND	ND	2.7E-5	7.7E-5
Co-60	8.1E-4	4.0E-3	3.4E-5	1.5E-5	2.3E-5	2.8E-5	6.5E-5	5.0E-3
MoTc-99m	5.2E-5	9.7E-4	1.3E-5	9.4E-6	ND	ND	9.8E-6	1.1E-3

ND = Not Detected
EF = Exhaust Fan
Decon. Fac. = Decontamination Facility

2.1.3 Flow Rates

116-N Stack . . . . . 2.1E5 cfm
109-N Zone I Vent . . . . . 1.2E5 cfm
109-N Cell 6 Vent . . . . . 2.8E4 cfm
Zone II, EF 7,8 . . . . . 2.3E4 cfm
Zone III, EF 10 . . . . . 1.3E5 cfm
Zone IV, EF 14,15 . . . . . 1.6E4 cfm
105-N Transfer Area . . . . . 2.8E4 cfm
105-N Spacer Decon. Fac. . . . . 4.8E3 cfm
105-N 14' Decon. Fac. . . . . 6.4E3 cfm
107-N Exhaust . . . . . 7.3E3 cfm

2.2 Radioactive Airborne Emissions at 100-K Area

2.2.1 Activity Discharged From 105-KE

Radionuclide	Release, Ci	Avg. Conc., pCi/L
Mn-54	2.8E-5	7.0E-5
Co-60	5.8E-5	1.4E-4
Sr-90	7.3E-4	1.8E-3
Ru-106	2.0E-4	5.0E-4
Cs-137	1.6E-4	4.0E-4
CePr-144	1.2E-4	3.0E-4
Pu-238	1.6E-6	4.0E-6
Pu-239/240	8.6E-6	2.2E-5

2.2.2 Activity Discharged From 105-KW

Radionuclide	Release, Ci	Avg. Conc., pCi/L
Mn-54	2.6E-5	6.4E-5
Co-60	4.6E-5	1.1E-4
Sr-90	1.4E-5	3.5E-5
Cs-137	2.6E-5	6.6E-5
Pu-238	1.2E-7	3.0E-7
Pu-239/240	6.2E-7	1.5E-6

2.2.3 Activity Discharged From 1706-KEL

Radionuclide	Release, Ci	Avg. Conc., pCi/L
Sr-90	5.9E-7	3.3E-6
Pu-239/240	6.4E-9	3.0E-8

2.2.4 Flow Rates

105-KE Vents . . . . . 2.7E4 cfm
105-KW Vents . . . . . 2.7E4 cfm
1706-KEL Vents . . . . . 1.2E4 cfm

2.3 Nonradioactive Airborne Emissions From 100-N Area

2.3.1 Chemicals Discharged From the 184-N Boiler Stacks

The following table lists the airborne emissions at 100-N Area resulting from the combustion of No. 6 Fuel Oil and No. 2 Diesel Oil. The weights of listed materials discharged were calculated using the factors published in "Compilation of Air Pollutant Emission Factors," by the Environmental Protection Agency (1977).

Material	Emissions From: No. 6 Oil, Pounds	No. 2 Oil, Pounds	Total Emissions, Pounds
Particulate	81,000	1,300	82,300
Sulfur Dioxide	1,100,000	42,000	1,142,000
Sulfur Trioxide	14,000	590	14,590
Carbon Monoxide	20,000	3,200	23,200
Hydrocarbons	4,000	650	4,650
Nitrogen Oxides	240,000	14,000	254,000

2.3.2 Flow Rate

The flow rate of the 184-N powerhouse stack was estimated to be 10.0E10 ft^3/yr using the factors published in "Particulate and Sulfur-Dioxide Emissions from the Foster Wheeler Boiler, 184-N Powerhouse," by the Hanford Environmental Health Foundation (1975). This flow rate should be considered as an estimate since steam loading on the boilers varies greatly throughout the year and there is no instrumentation on the boilers to measure flow rate.

3.0 LIQUID RELEASES TO THE ENVIRONMENT FROM THE 100 AREAS

3.1 Radioactive Liquid Releases From 100-N Area

3.1.1 Activity Discharged to the LWDFs and via Seepage to the Columbia River

Radionuclide	To the 1301-N and 1325-N LWDFs			Seepage to river via N-Springs		
	Release, Ci	Avg. Conc., pCi/L	Peak Conc., pCi/L	Release, Ci	Avg. Conc., pCi/L	Peak Conc., pCi/L
H-3	2.7E2	7.4E4	3.9E5	2.7E2+	5.6E4	3.0E5
P-32	2.2E1	5.9E3	3.2E4	1.1E-2	5.9E0	5.9E1
Cr-51	7.5E1	2.0E4	8.5E4	1.3E-1	7.0E1	1.7E2
Mn-54	7.1E2	1.9E5	7.2E5	*		
Co-58	2.8E1	7.6E3	2.3E4	*		
Fe-59	2.6E2	7.1E4	2.2E5	*		
Co-60	5.9E2	1.6E5	6.8E5	3.0E-1	1.6E2	2.7E2
Zn-65	1.5E1	4.0E3	6.0E3	*		
Sr-89	3.9E2	1.1E5	8.3E5	1.3E0	7.2E2	6.0E3
Sr-90	2.4E2	6.5E4	6.5E5	8.4E0	4.5E3	6.1E3
ZrNb-95	3.2E2	8.7E4	2.9E5	*		
MoTc-99m	7.8E2	2.1E5	1.7E6	1.6E-1	8.6E1	4.4E2
Ru-103	5.4E1	1.5E4	7.1E4	3.7E-1	2.0E2	4.3E2
Ru-106	8.0E1	2.2E4	7.0E4	3.0E-1	1.6E2	2.5E2
Sb-124	6.1E0	1.7E3	4.3E3	1.5E-2	8.1E0	1.3E1
Sb-125	1.2E1	3.4E3	6.7E3	3.3E-1	1.8E2	2.4E2
I-131	3.7E2	1.0E5	4.6E5	5.4E0	2.9E3	1.1E4
Xe-133	2.9E2	8.0E4	2.7E5	1.9E0	1.0E3	2.9E3
Cs-134	5.7E0	1.6E3	4.3E3	*		
Cs-137	8.8E1	2.4E4	2.1E5	1.9E-2	1.0E1	1.7E2
BaLa-140	4.1E3	1.1E6	4.4E6	*		
Ce-141	7.4E1	2.0E4	8.0E4	*		
CePr-144	2.8E2	7.6E4	7.2E5	*		
Sm-153	7.2E1	2.0E4	7.7E4	*		
Pu-238	5.0E-1	1.4E2	9.7E2	3.8E-6	2.0E-3	1.2E-2
Pu 239/240	3.4E0	9.4E2	6.5E3	1.7E-5	9.1E-3	5.5E-1
Np-239	3.2E2	8.7E4	6.6E5	*		
SLR	2.6E4	7.1E6	4.3E7	**		

SLR = Short-lived radionuclides ($T_{1/2}$ <48 hours)

* Indicates radionuclides in particulate form or with a high ionic exchange potential which are trapped within the LWDFs' soil columns, and removed beyond detection limits.

** Indicates short half-life radionuclides which have decayed beyond detection limits before reaching in the riverbank springs.

\+ This is the same value as for tritium to the LWDFs, since all tritium released to the LWDFs is assumed to eventually, though not necessarily in one year's time, reach the Columbia River via the N-Springs. Average and peak concentrations represent the analyses of CY 1985 N-Springs seepage.

3.1.2 Activity Discharged to the Columbia River Via 102" RWR

Radionuclide	To Columbia River via 102" Line		
	Release, Ci	Avg. Conc., pCi/L	Peak Conc., pCi/L
Na-24	1.3E-1	2.3E-1	3.3E0
Cr-51	1.3E-1	2.2E-1	5.7E-1
Mn-54	5.4E-1	9.3E-1	2.3E0
Co-58	4.1E-2	7.2E-2	1.6E-1
Fe-59	3.5E-1	6.0E-1	1.2E0
Co-60	1.7E0	3.0E0	3.7E0
Sr-90	2.8E-1	4.9E-1	2.5E0
ZrNb-95	2.6E-1	4.6E-1	9.3E-1
MoTc-99m	1.3E0	2.2E0	1.5E1
Ru-103	2.7E-2	4.6E-2	1.1E-1
I-131	2.7E-1	4.8E-1	1.3E0
I-133	1.6E0	2.7E0	1.6E1
Cs-137	2.4E-1	4.1E-1	1.8E0
BaLa-140	5.0E-1	8.6E-1	3.2E0
Ce-141	8.0E-2	1.4E-1	4.1E-1
CePr-144	5.5E-1	9.5E-1	1.3E0

3.1.3 Total Flow

Stream	Total Flow, Gallons
To LWDFs	9.6E8
To river via N-Springs	4.9E8
To river via 102" RWR	1.5E11

3.2 Radioactive Liquid Releases From 100-K Area

3.2.1 Activity Discharged to the Columbia River Via 1908-K Outfall

Radionuclide	To Columbia River via 1908-K Outfall		
	Release, Ci	Avg. Conc., pCi/L	Peak Conc., pCi/L
Mn-54	6.1E-3	4.4E0	1.2E1
Co-60	1.8E-2	1.3E1	3.1E1
Sr-90	2.4E-3	1.8E0	4.1E0
Cs-137	8.3E-3	5.9E0	2.1E1
Pu-239/240	8.1E-6	5.8E-3	5.5E-2

3.2.2 Total Flow

Stream	Total Flow, Gallons
To river via 1908-K outfall	3.7E8

3.3 Nonradioactive Liquid Releases from 100-N and 100-K Areas

The discharge of nonradioactive water from UNC-operated facilities to the Columbia River is regulated by the Hanford NPDES Permit. The two tables below show the discharge points of NPDES outfalls and a summary of the analytical results of samples collected from those outfalls during CY 1985.

UNC NPDES Discharge Points

Discharge Designation	Discharge Description
003	181-KE Inlet Screen Backwash
004	1908-K Outfall
005	182-N Tank Farm Overflow (36" RWR)
006	182-N Drain System (42" RWR)
007	181-N Inlet Screen Backwash
009	102" RWR Line
N-Springs	100-N Riverbank Springs

Summary of NPDES Data for CY 1985

Sample Parameter		003	004	w/o low lift 005	low lift 005	w/o FS 006	FS 006	007	009	N-Springs
Flow (MGD)	Max.	0.039	2.5	3.8	35	0.36	12.6	2.6	600	1.6
	Avg.	0.019	1.4	1.3	6.6	0.31	2.1	0.85	390	1.5
Temp. (°F)	Max.	*	72	98	*	68	*	*	80	78
	Avg.	*	55	58	*	61	*	*	55	66
pH	Max.	*	8.1	8.6	*	8.5	*	*	10.6	8.2
	Min.	*	7.6	7.9	*	8.0	*	*	8.0	7.9
Total Suspended Solids (mg/L)	Max.	6.2	5.4	8.2	*	7.1	*	8.6	*	*
	Avg.	3.4	1.9	2.8	*	3.0	*	3.5	*	*
Oil & Grease (mg/L)	Max.	*	*	1.1	*	<2	*	*	*	8.0
	Avg.	*	*	1.0	*	<2	*	*	*	2.8
Iron (mg/L)	Max.	*	*	*	*	*	*	*	*	0.05
	Avg.	*	*	*	*	*	*	*	*	0.03
Ammonia (mg/L)	Max.	*	*	*	*	*	*	*	*	0.36
	Avg.	*	*	*	*	*	*	*	*	0.12
Chromium (mg/L)	Max.	*	*	*	*	*	*	*	*	0.16
	Avg.	*	*	*	*	*	*	*	*	0.05
Chlorine (mg/L)	Max.	<0.04	*	<0.04	*	*	*	*	<0.04	*
	Avg.	<0.04	*	<0.04	*	*	*	*	<0.04	*

FS = Fog Spray
*Measurement not required

4.0 100-N AREA RELEASE TRENDS

The following five semi-log graphs show the annual release totals of selected radionuclides discharged from 100-N Area over the past eleven years. Three of the graphs have yearly N Reactor operating totals plotted to illustrate the relationship between radionuclide release and reactor operating time.

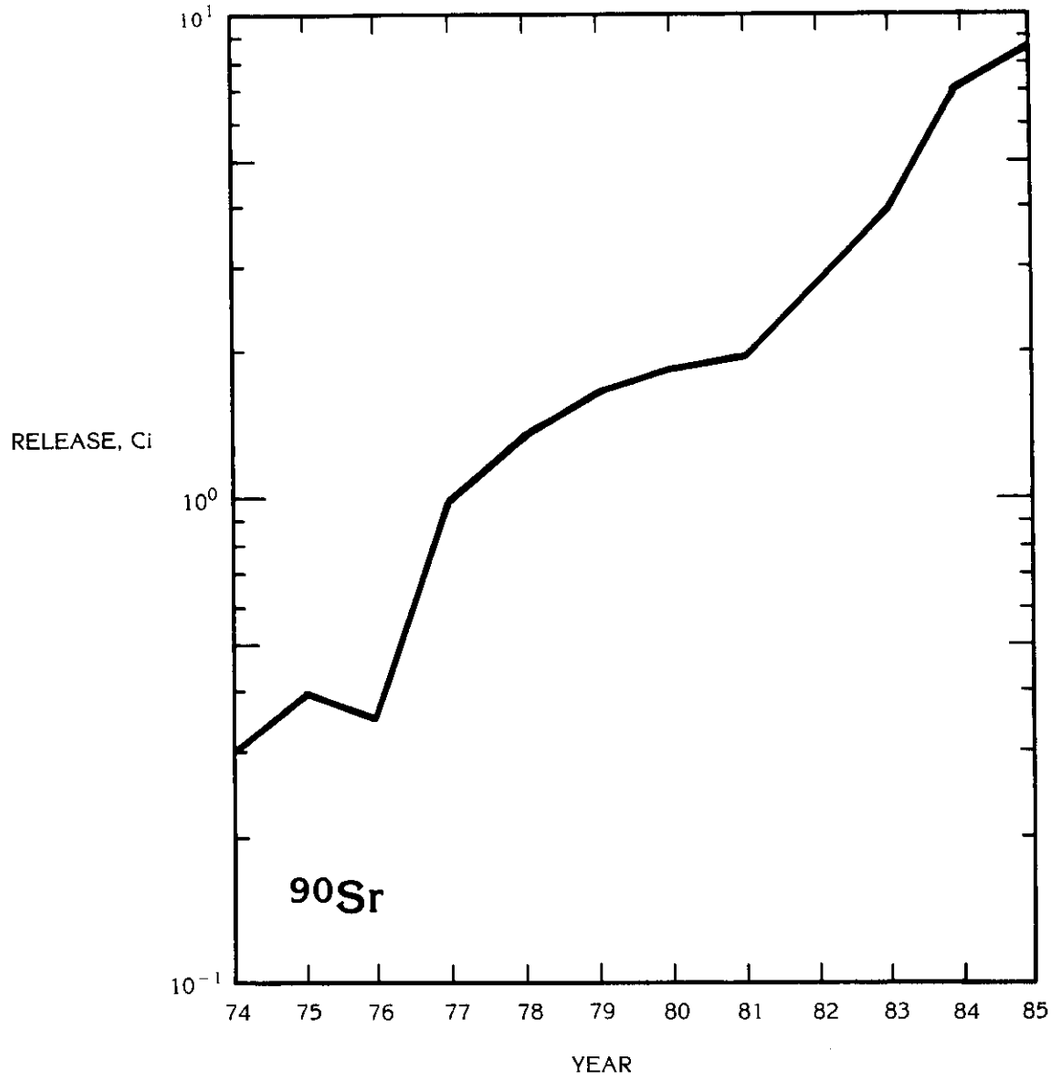

Figure 4.1: Strontium-90 releases via the 100-N riverbank springs. Most of the Sr-90 discharged in the springs originates from, by way of the LWDFs, the Sr-90 inventory in the 105-N spent-fuel storage basin. This inventory is not affected by the operating status of N Reactor.

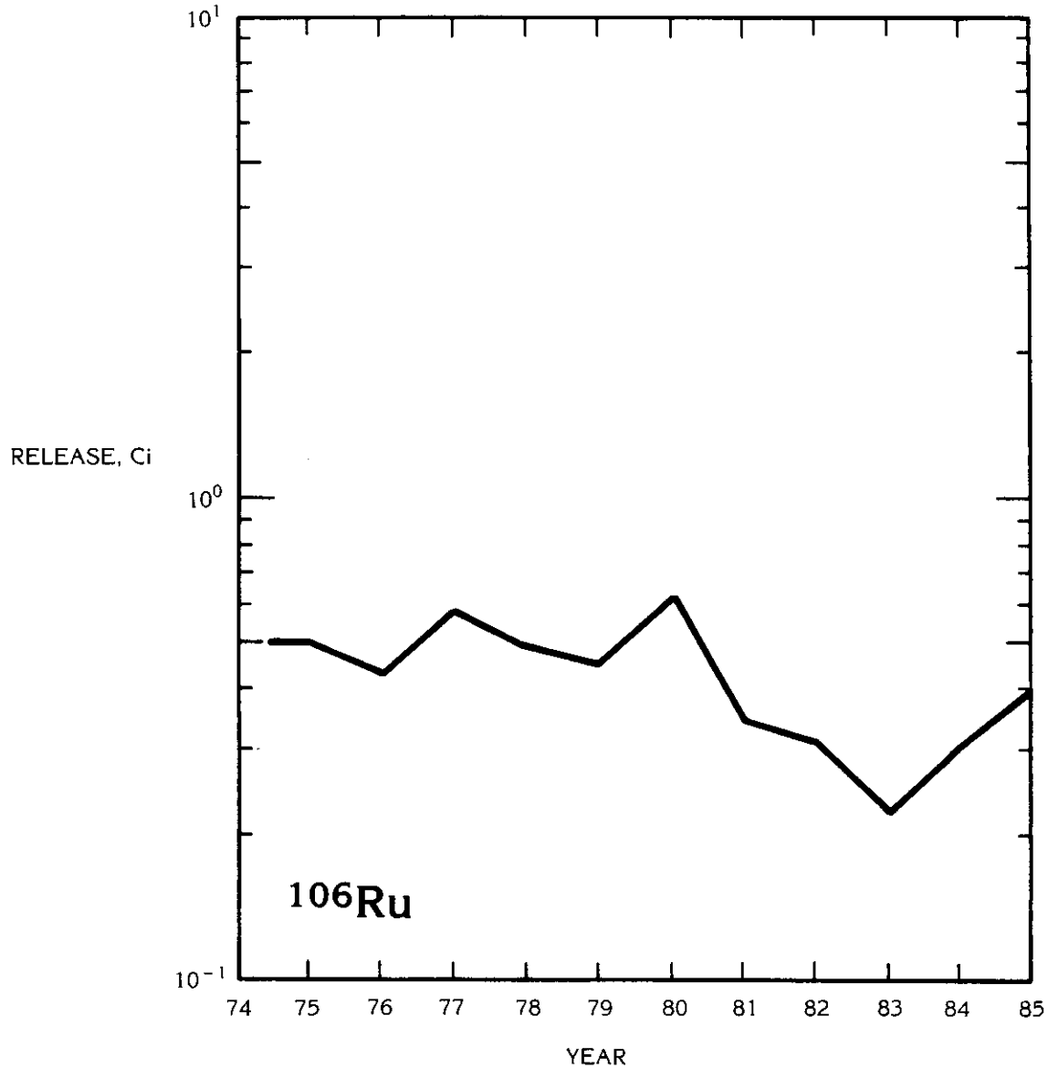

Figure 4.2: Ruthenium-106 releases via the 100-N riverbank springs. Most of the Ru-106 discharged in the springs originates from, by way of the LWDFs, the Ru-106 inventory in the 105-N spent-fuel storage basin. This inventory is not affected by the operating status of N Reactor.

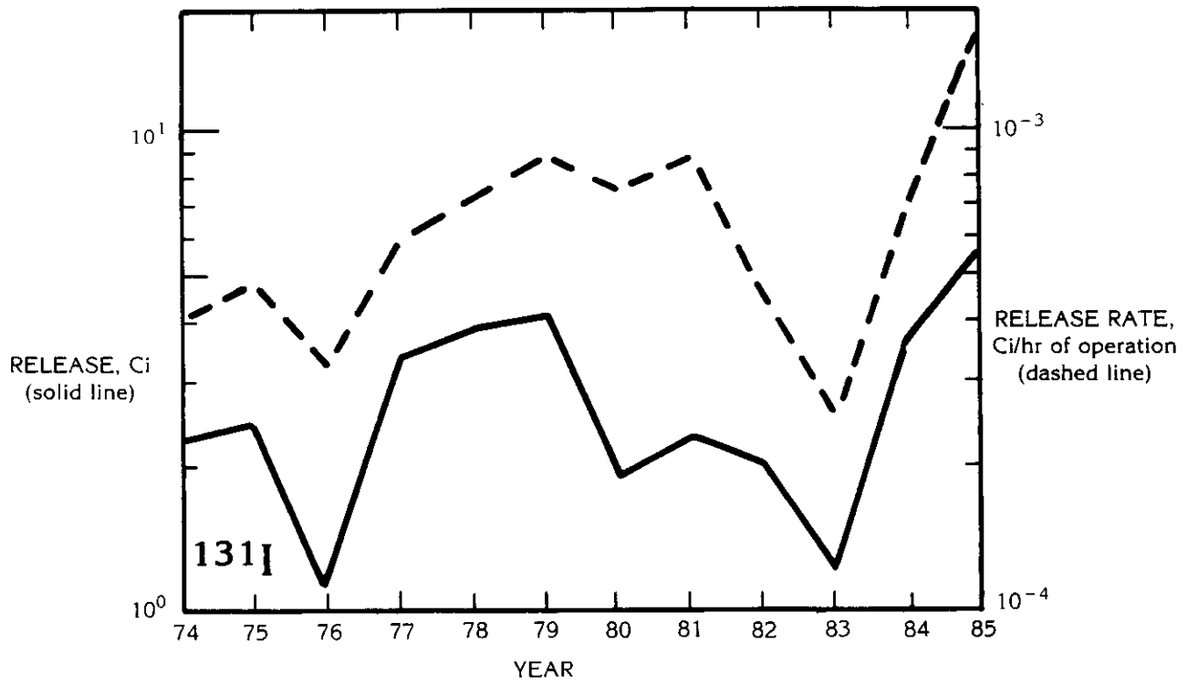

Figure 4.3: Iodine-131 releases via the 100-N riverbank springs.

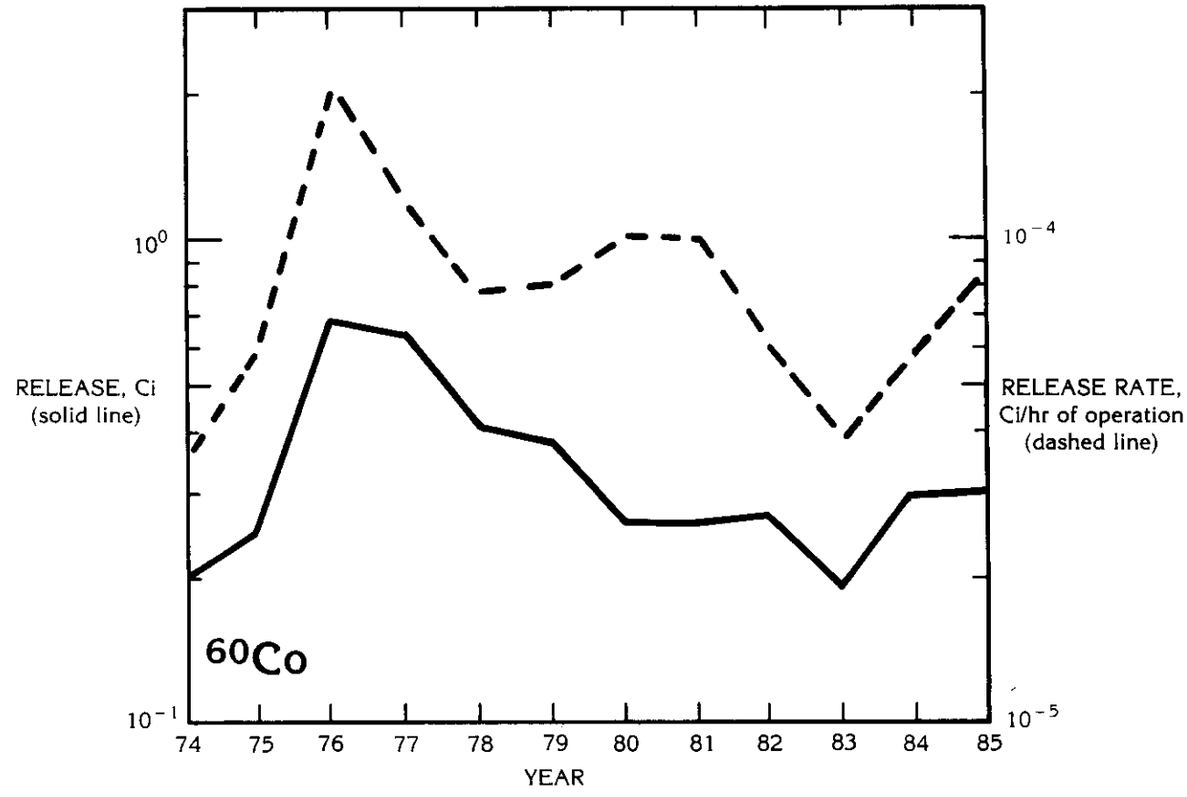

Figure 4.4: Cobalt-60 releases via the 100-N riverbank springs.

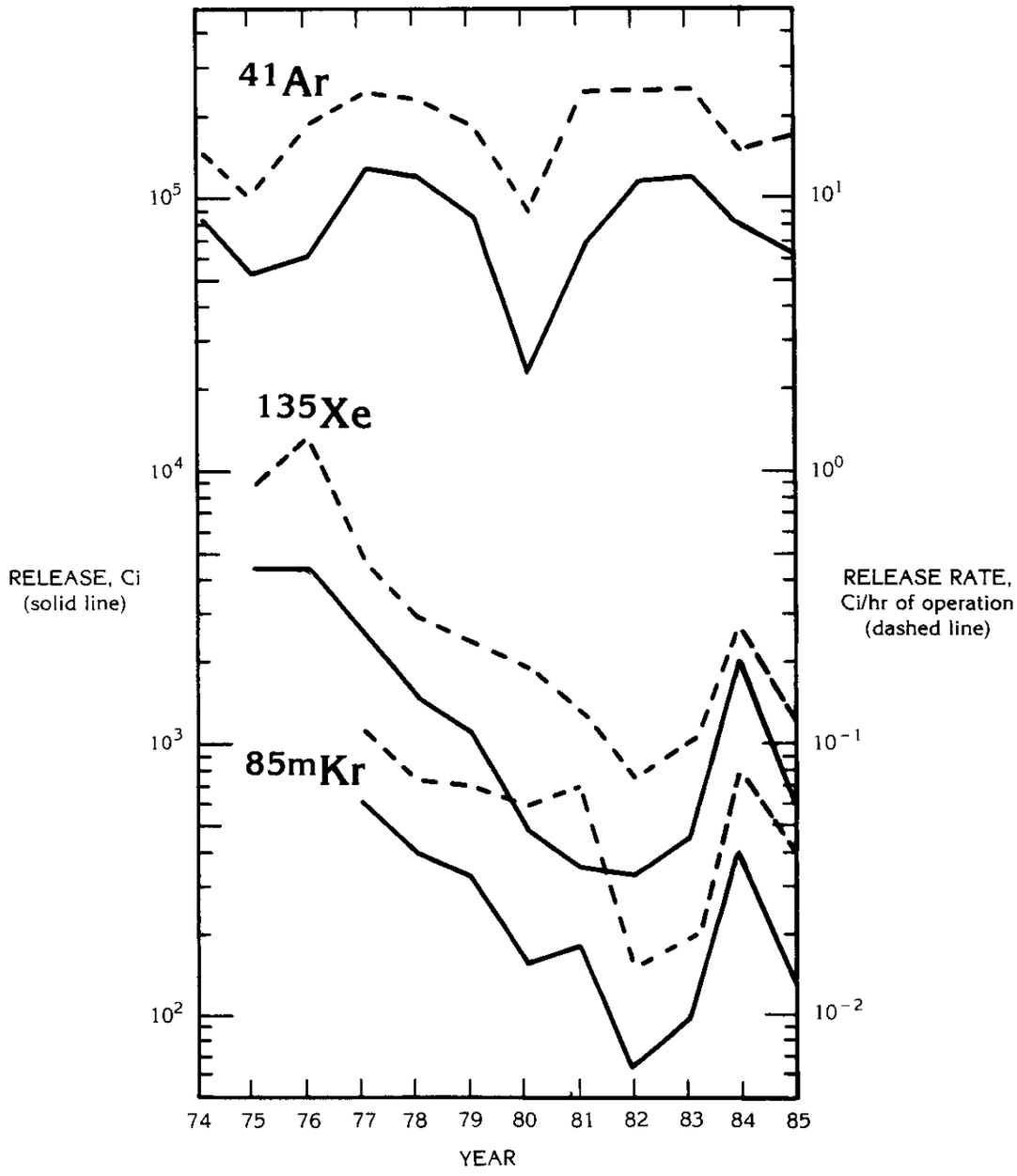

Figure 4.5: Noble gas releases via the 116-N Stack.

5.0 ATMOSPHERIC RELEASES TO THE ENVIRONMENT FROM THE 300 AREA

5.1 Radioactive Airborne Emissions From 300 Area

The total airborne uranium release from the 333 Building Cut-off Saw Stack during CY 1985 was 130μCi. The average flow rate for the Cut-off Saw Stack was 4.1E3 cfm.

5.2 Nonradioactive Airborne Emissions From 300 Area

5.2.1 Chemicals Discharged from Chemical Bay Stack

The amount of NO_x discharged during CY 1985 was based on the totalizer reading on the NO_x monitor.

Material	Pounds	Avg. Concentration, ppm
NO_x	35,000	31

5.2.2 Flow Rate

The 333 Building Chemical Bay exhaust stack averaged 2.7E4 cfm for the year, except when the exhaust fans were shut off or on reduced flow during the summer outage in August.

6.0 LIQUID RELEASES TO THE ENVIRONMENT FROM THE 300 AREA

The quantities of materials listed in the table below represent totals discharged to the process sewer in CY 1985. The discharged quantities are based on the weekly water usage for the 303-M, 313, and 333 Buildings and the weekly composite process sewer samples analyses, subtracting the average content in the inlet water. These amounts represent UNC effluent process streams, not those of other 300 Area contractors. Before the UNC streams reach the process trenches, they merge and are considerably diluted by streams coming from other contractor facilities. The total volume of liquid entering the process sewer from the 303-M, 313, and 333 Buildings during CY 1985 was 2.2E8 gallons.

Quantities of Materials Discharged to the Process Sewer

Material	Pounds	Avg. Concentration, ppm
Nitrate ion	88,000	48
Fluoride ion	1,900	1.1
Copper	380	0.2
Uranium	440	0.2

7.0 DISPOSITION OF 300 AREA CHEMICAL WASTE MATERIAL

7.1 Chemical Waste Discharged to the 183-H Evaporation Basins

The main purpose of the 183-H Evaporation Basins has been to store the chemical wastes generated by the UNC Fuel Fabrication Facilities at the 300 Area. Different organizations within UNC and other Hanford contractors have also used the basins to store some of their chemical wastes.

After November 8, 1985, it was no longer permitted to discharge any chemical waste to the 183-H basins. This was ordered to comply with requirements the Washington State Department of Ecology imposed upon DOE-RL.

The numbers in the following table represent the quantities of chemical materials discharged to the basins from January 1, 1985, through November 8, 1985. The quantities of uranium and copper were derived from analyses of samples taken from each shipment to the basins. The amounts for the other materials are based on analyses of monthly composite samples. The total volume discharged to the basins was 3.7E5 gallons.

Quantities of Materials Discharged to the 183-H Evaporation Basins

Material	Pounds
Ammonium ion	520
Chromium	90
Copper	49,000
Fluoride ion	27,000
Manganese	200
Nitrate ion	550,000
Sulfate ion	97,000
Uranium	440

7.2 Chemical Waste Shipped to RHO

November 8, 1985, was the last day Fuels Operations was allowed to send neutralized waste acid to the 183-H Evaporation Basins. After this date, the liquid portion of this waste was shipped to HEDL's Radioactive Liquid Waste System in the 340-B Building. From 340-B, the liquid waste is sent to RHO tank farms for final disposal. A total of 4.6E4 gallons was shipped during CY 1985.

Using centrifuge and filter equipment in the 313 Building, solid waste is separated from the non-recoverable uranium-bearing neutralized waste acid slurry. Solids collected in this manner are shipped directly to RHO for burial. A total of 3.0E3 gallons was shipped during CY 1985.

The weights of liquid and solid waste materials sent to RHO from November 8, 1985, through December 31, 1985, are shown in the following two tables.

Quantities of Liquid Material Shipped to RHO

Material	Pounds
Chromium	1
Copper	2
Fluoride ion	7,000
Nitrate ion	40,000
Sulfate ion	17,000
Uranium	1

Quantities of Solid Material Shipped to RHO

Material	Pounds
Chromium	13
Copper	9,900
Fluoride ion	3,000
Manganese	30
Nitrate ion	3,100
Uranium	97

8.0 CONSUMPTION OF CHEMICALS

8.1 Chemicals Consumed in the 100 Areas

Material	Total Consumed From: 100-KE, Pounds	100-N, Pounds	Total Consumed From All Facilities, Pounds
Aluminum sulfate	98,000	390,000	488,000
Chlorine	8,000	28,000	36,000
Polyacrylamide		650	650
Sulfuric acid		1,300,000	1,300,000
Hydrazine		19,000	19,000
Morpholine		4,600	4,600
Sodium hydroxide		980,000	980,000
		Gallons	Gallons
Ammonium hydroxide		64,000	64,000

8.2 Dispositions of Chemicals Consumed in the 100 Areas

The chemicals consumed in the 100 Areas are used in several different applications. The following qualitative descriptions indicate the environmental discharges, if any, of each chemical noted in the preceding table.

8.2.1 Aluminum Sulfate

Aluminum sulfate is used as a flocculant in filtered water production at the 100-N and 100-KE Areas. Most of the sulfate is retained by the filtered water and either discharged to the Columbia River or trapped in the anion resins in the demineralized water plant and discharged to the 163-N/183-N waste disposal ponds when the resins are regenerated. The aluminum is trapped in the filters and discharged to the 163-N/183-N waste disposal ponds during filter backwashes at 100-N Area or settles out in the filtered water plant backwash hold-up basin at 100-K Area.

8.2.2 Chlorine

Chlorine is used as an algaecide and for producing potable water in the 100-N and 100-KE Areas. After reacting with water, most of the chlorine is transformed to a chloride ion form and discharged mainly to the 1301-N and 1325-N LWDFs or the sanitary tile field at 100-K Area.

8.2.3 Polyacrylamide

Polyacrylamide (Separan) is used as a filter aid and coagulant in filtered water production at the 100-N and 100-KE Areas. Most of the polyacrylamide is backwashed to the 163-N/183-N waste disposal ponds at 100-N Area or settles out in the filtered water plant backwash hold-up basin at 100-KE Area.

8.2.4 Sulfuric Acid

Sulfuric acid is used at 100-N Area to regenerate the cation resins in the demineralized water plant. After resin regeneration, it is flushed to the 163-N/183-N ground disposal pond. At the 100-K Areas it is retained in a tank where it is neutralized with waste sodium hydroxide, then discharged via the 1908-K Outfall.

8.2.5 Sodium Hydroxide

Sodium hydroxide is used at 100-N Area to regenerate the anion resins in the demineralized water plant. After resin regeneration, it is flushed to the 163-N/183-N ground disposal pond. At the 100-K Areas it is retained in a tank where it is neutralized with waste sulfuric acid, then discharged via the 1908-K Outfall.

8.2.6 Ammonium Hydroxide

Ammonium hydroxide is used to control the pH of the water in the primary cooling system (PCS) and the graphite and shield cooling system (GSCS). Small quantities of this chemical entered the 1301-N and 1325-N LWDFs due to a purity bleed maintained on the PCS and GSCS.

8.2.7 Hydrazine

Hydrazine is used to control the oxygen concentration in the secondary cooling system (SCS), rod cooling system (RCS), PCS, and GSCS. Small quantities of hydrazine reached the 1301-N and 1325-N LWDFs in the same manner as ammonium hydroxide. Small quantities of hydrazine are discharged from the SCS to the Columbia River by way of steam air ejectors and steam generator blowdowns.

8.2.8 Morpholine

Morpholine is used to control the pH of the SCS. Small quantities of morpholine are discharged to the Columbia River in the same way that hydrazine is discharged to the river.

8.2.9 Miscellaneous Chemicals

Small quantities of chemicals consumed in the laboratory facilities at the 100 Areas are disposed of through the RHO Hazardous Materials Disposal Facility.

8.3 Chemicals Consumed at the 300 Area

Material	Total Consumed, Pounds
Hydrofluoric acid	79,000
Nitric acid	610,000
Sodium hydroxide	490,000
Sulfuric Acid	150,000
Perchloroethylene	28,000
1,1,1-trichloroethane	330

8.4 Dispositions of Chemicals Consumed at the 300 Area

8.4.1 Hydrofluoric, Nitric, and Sulfuric Acids

The main uses for these acids of the fuel fabrication process include etching copper and zirconium components, chemically milling fuel pieces, and cleaning fuel pieces. Nitric acid converted to NO_x during etching is partially scrubbed out and released to the process sewer. The unscrubbed NO_x is discharged from the Chemical Bay stack. Waste acids that contain recoverable amounts of uranium are neutralized, filtered, packaged in drums, and returned to the uranium billet fabricators for final uranium recovery. Waste acids with non-recoverable amounts of uranium are neutralized and were allowed to be shipped to the 183-H Evaporation Basins through November 8, 1985, and thereafter to RHO, either directly or by way of HEDL.

8.4.2 Sodium Hydroxide

Sodium Hydroxide is used for neutralizing uranium-bearing acids bound for uranium recovery and waste acids that were allowed to be shipped the 183-H basins through November 8, 1985, and thereafter to RHO, either directly or by way of HEDL.

8.4.3 Perchloroethylene and 1,1,1-Trichloroethane

These chemicals are used as degreasing solvents in the fuel fabrication process. The degreasing solvents are replaced as necessary. It was allowed through November 8, 1985, to place waste solvent in the waste solvent evaporation lugger where the volume of solvent was reduced by evaporation. After this date, the solvent evaporation process was discontinued and replaced with a solidification process. The residual sludge was removed from the solvent evaporator and solidified for disposal at RHO.

9.0 UNPLANNED RELEASES

9.1 Underground Radioactive Leak

On April 30, 1985, analysis of a routine sample from well N-48 indicated increased radionuclide concentrations in the surrounding groundwater. Iodine-131 had increased from 4.9 pCi/l on 4-23-85 to 2.3E4 pCi/l on 4-30-85. This condition suggested that an underground radioactive drain pipe was leaking nearby. As a result, N Reactor was shut down and the leaking pipe located and repaired. Special riverbank sampling showed no measurable radioactive releases to the Columbia River; therefore, no increase to offsite dose commitments will result from the leak. This incident was reported as Unusual Occurrence (UO) 85-11.

9.2 NPDES pH Violation

On July 2, 1985, the NPDES pH limit for the 009 discharge point (102" Outfall to the Columbia River) at N Reactor was exceeded. A review of the NPDES log found a recorded pH measurement of 10.1 for that date; the upper NPDES limit is 9.0. Subsequent sampling and testing revealed two more violations. These violations occurred on August 7 and 12, 1985, with respective pHs of 9.7 and 10.6. The investigation initiated as a result of these incidents determined that the high pH conditions were a consequence of anion regeneration waste from the 163-N Demineralized Water Plant being flushed out through 009 with only two of four circulating raw water pumps operating. Contributing to the pH problem was a low-flow, higher-than-normal-pH (8.3) condition of the river. Revised process controls were implemented to prevent any additional pH violations from this source. These events are reported in UO 85-14.

10.0 SANITARY SEWAGE DISCHARGED TO THE GROUND

10.1 100 Area Facilities

The 100 Area sewage flows are calculated by assuming 30 gallons of sewage discharged per person each day. The number of people in each area is based on routine personnel assignment locations. Temporary personnel are not included in the tabulation.

Sanitary Sewage Discharged, gpd

100-B	100-D	100-F	100-K	100-N	Total Released
450	2,500	840	3,700	48,000	55,490

10.2 300 Area Facilities

Westinghouse Hanford Company operates and reports the discharges from the 300 Area sanitary sewage system.

11.0 SOLID WASTE DISCHARGED TO THE GROUND

11.1 Radioactive Solid Waste

Radioactive solid waste generated in the 300 Area and 100 Area facilities is buried by RHO in the 200 Area waste disposal facilities.

11.2 Nonradioactive Solid Waste

Nonradioactive solid waste generated in the 300 and 100 Areas is compacted (when applicable) and buried by RHO in the central landfill facility.