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RADIOLOGICAL SURVEILLANCE REPORT FOR THE
100-N AREA ENVIRONMENT--1980

Author

E. M. Greager

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RADIOLOGICAL SURVEILLANCE REPORT FOR THE 100-N AREA ENVIRONMENT--1980

Prepared By: Eric M. Greager Date: 10/2/80
E. M. Greager,
Environmental Engineer

Approved By: J. J. Dorian Date: 10/2/80
J. J. Dorian, Manager
Environmental Control

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1.0 SUMMARY

The 100-N Area Environmental Surveillance Program provides monitoring to assist in evaluating the environmental impact of 100-N Reactor facilities. The major objectives of the program are to monitor radionuclide concentrations in radiological release pathways, maintenance of a data base for trend analyses, sampling and data for accidental release analyses, and demonstration of compliance with applicable regulations.

The surveillance program consists of sampling and monitoring of several environmental parameters. Samples of ambient air, groundwater, vegetation, soil, and sediment are collected and analyzed along with direct radiation measurement around the 1301-N Facility and along the river shoreline. Special samples to monitor the potential biotransport of radionuclides may also be included in the surveillance program.

Based on the sampling performed for the environmental surveillance program, 100-N Area facilities are in compliance with applicable regulations and there is no significant adverse environmental impact from reactor operations.

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2.0 ENVIRONMENTAL SURVEILLANCE PROGRAM

2.1 Purpose of the Program

The 100-N Area Environmental Surveillance Program provides monitoring to assist in evaluating the impact of 100-N Reactor facilities on the immediately surrounding environment. The program is designed to evaluate trend changes in releases to various pathways to the environs from reactor facilities. The major objectives of this program are as follows:

- Detection of radionuclide concentrations in identified radiological release pathways.
- Detection and evaluation of changes in the radionuclide concentrations discharged to or existing in the immediate environment. This will serve as a means of detecting system changes or failures, so that appropriate actions may be taken.
- Maintenance of a data base for trend analyses in order to provide the capability for evaluation and response to changes in radioactive material releases from any off-normal or accident condition.
- Provide samples and data to be used for "after the fact" accidental release analyses.
- Demonstrate compliance with applicable regulations.

The evaluation of the population dose resulting from the operation of the N Reactor is the responsibility of Pacific Northwest Laboratory (PNL). UNC Nuclear Industries supplies radionuclide discharge data to PNL for use in the preparation of their analyses. The PNL surveillance program also performs all the animal sampling needed at 100-N Area.

In order to establish monitoring requirements, the radiological release pathways from the facilities to the immediate environment were analyzed and a flow diagram produced (Figure 2.1). This pathway diagram was used as the basis for the monitoring in the surveillance program. The 100-N Area Environmental Surveillance Program is summarized in Table 2.1. Along with the samples listed in this table, special samples to monitor the potential biotransport of radionuclides may also be collected and included in the surveillance program.

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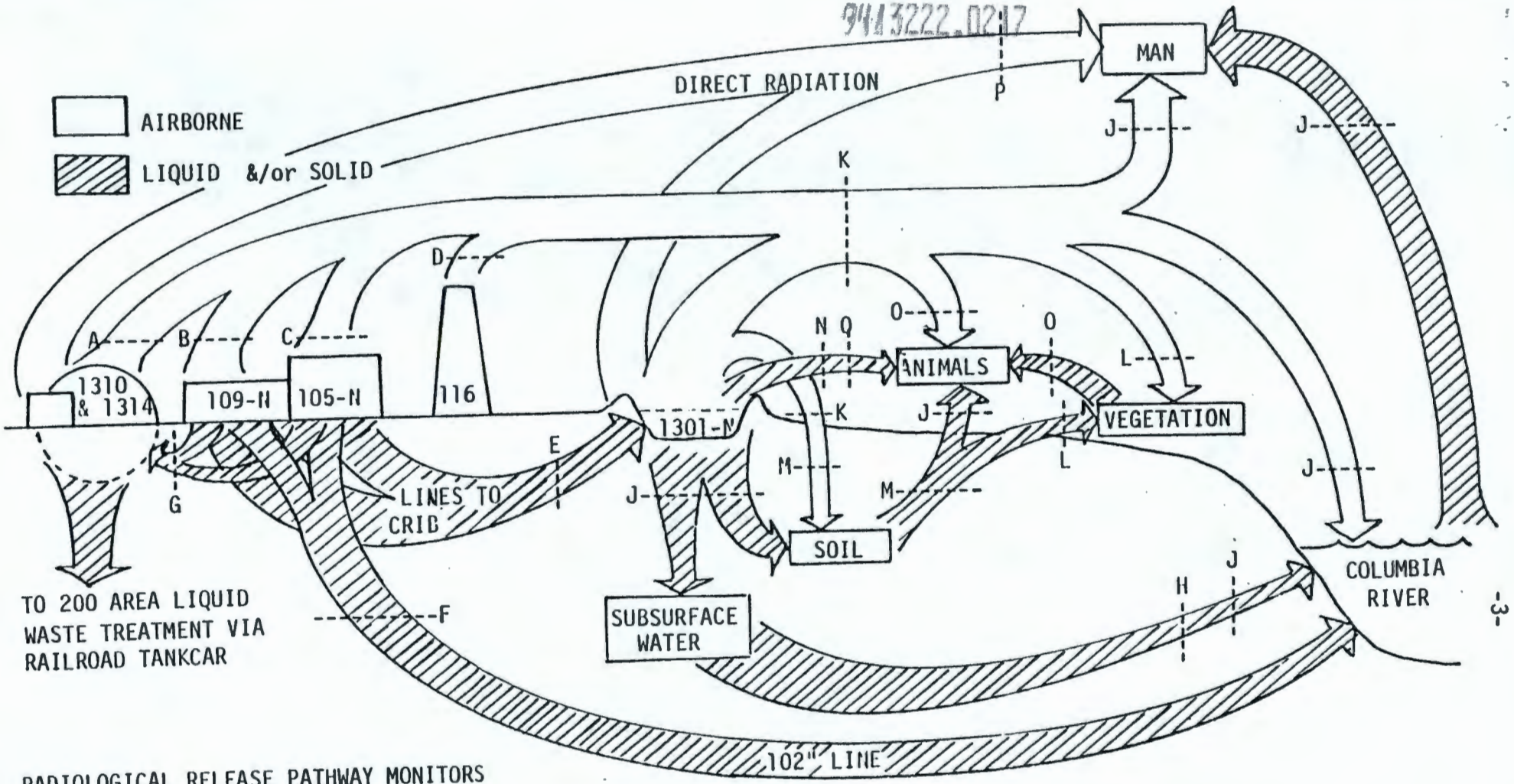

RADIOLOGICAL RELEASE PATHWAY MONITORS (INDICATED BY DASHED LINES):

EFFLUENT RADIOANALYTICAL PROGRAM

- A AIRBORNE SAMPLER ON TANK VENTS
- B CONTINUOUS SAMPLING SYSTEM
- C CONTINUOUS SAMPLING SYSTEM
- D CONTINUOUS SAMPLING SYSTEM
- E FLOW PROPORTIONAL COMPOSITE SAMPLER
- F CONTINUOUS LARGE VOLUME SAMPLER
- G SAMPLE ANALYSIS DURING STORAGE & SHIPMENT
- H MULTIPLE CONTINUOUS COMPOSITE SAMPLERS

ENVIRONMENTAL SURVEILLANCE PROGRAM

- J PNL ENVIRONMENTAL PROGRAM
- K CONTINUOUS AIR SAMPLERS
- L VEGETATION SAMPLING
- M SOIL SAMPLING
- N WIRE MESH TRENCH COVER
- O 100-N AREA PERIMETER FENCE
- P TLDs AND DIRECT RADIATION MEASUREMENT

Figure 2.1. Major Radiological Release Pathways Between 100-N Facilities and the Environs

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Table 2.1 100-N Area Environmental Surveillance Program

Type Sample	Sampling Method	Number of Sample Locations	Sampling Frequency	Type Analysis
Air Samples	Low volume continuous sampler with particulate filtration and charcoal filter. Grab gas sample taken at time of filter change.	6	Monthly	Particulate - Gross alpha and beta and major gamma emitter Others - major gamm emitters.
Ground Water Samples	Sample provided to UNC by PNL.	6	Quarterly	Major gamma emitter
Soil Samples	Surface 2.5 cm deep by 100 cm^2 and subsurface (where possible) sample of second 2.5 cm by 100 cm^2.	18	Semi-Annually	Semi-annual - major gamma emitters. Annual - one composit sample from each transect analyzed f Sr and Pu.
Trench Sediment	Dip samples of ∿50cc of trench bottom sediment.	9	Annually	Major gamma emitter
Riverbank Springs Sediment	Dip samples of ∿50cc of rivershore sediment.	8	Annually	All - major gamma emitters Sp-1 Sprin Zone - Sr and Pu. Composite of other zones - Sr and Pu.
Vegetation Sampling	∿One pound (500 g) sample of vegetation, collected and dried.	6	Annually	Major gamma emitter Sr and Pu.
Riverbank Vegetation Sampling	Same as above	8	Anually	All - major gamma emitters. Sp-1 Spri Zone - Sr and Pu.
Gamma Radiation, 100-N	CaF_2:Mn (TLD400) Dosimeters	22	Monthly	--
Gamma Radiation Crib/ Trench	Integrated count using hand-held survey instrument	24	Annually	--
Gamma Radiation Riverbank Springs	Same as above	50	Anually	--

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2.2 Surveillance Program Procedures

Measurements in the UNC radioanalytical lab are limited to gamma-scans of samples containing varying and unknown concentrations of fission and activation products. To perform the analyses, three lithium-drifted, germanium (Ge-Li) detectors are used. Sample analysis procedures have been established by UNC and documented in Section 2.0 of UNI-M-76 REV1, "Effluent Radioanalytical Program". Strontium and plutonium analyses are performed by the U. S. Testing Company.

The precision and accuracy of radioanalytical instrumentation is maintained thru a laboratory Quality Control Program. The procedures for this Quality Control Program are included in Section 5.0 of UNI-M-76, REV1.

Consistency in sample collection techniques is important in comparing different sets of data and validating trend analyses. Sample collection procedures are described in the following sections.

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2.3 Deficiencies in 1980 Surveillance Program

The Environmental Surveillance Program at 100-N Area is still in the developmental stage. Sampling procedures and techniques are being tested and may be modified. Sampling frequencies are also subject to change based upon analytical results.

A few of the samples indicated in Table 2.1 as part of the surveillance program were not collected during the reporting period. This report is the first annual environmental surveillance report and some of the monitoring systems and/or practices were not yet in place.

The continuous air samplers have not been operated, with the exception of one monitor for only a short period. Locating the air monitors where electrical power is available will require more effort than anticipated. UNC was unable to obtain groundwater samples from PNL. Riverbank springs sediment samples were not taken since a technique for sediment collection along the rocky shoreline was not developed. Soil samples were collected once during the year instead of semi-annually.

UNC is currently working on full implementation of the surveillance program. All monitoring systems will be operating and providing data for the next environmental surveillance report.

3.0 VEGETATION SAMPLING

Vegetation samples are collected annually at locations adjacent the crib and trench (T-1 thru T-9) and at the N Springs on the riverbank (SP-1 thru SP-8). Sample locations are depicted in Figure 3.1. Vegetation samples consist of approximately 500 g (1 lb) of the dominant vegetation at each sampling site. Radionuclide concentrations detected in the vegetation samples collected around the 1301-N Facility are listed in Table 3.1. Radionuclide concentrations detected in the riverbank springs vegetation samples are indicated in Table 3.2.

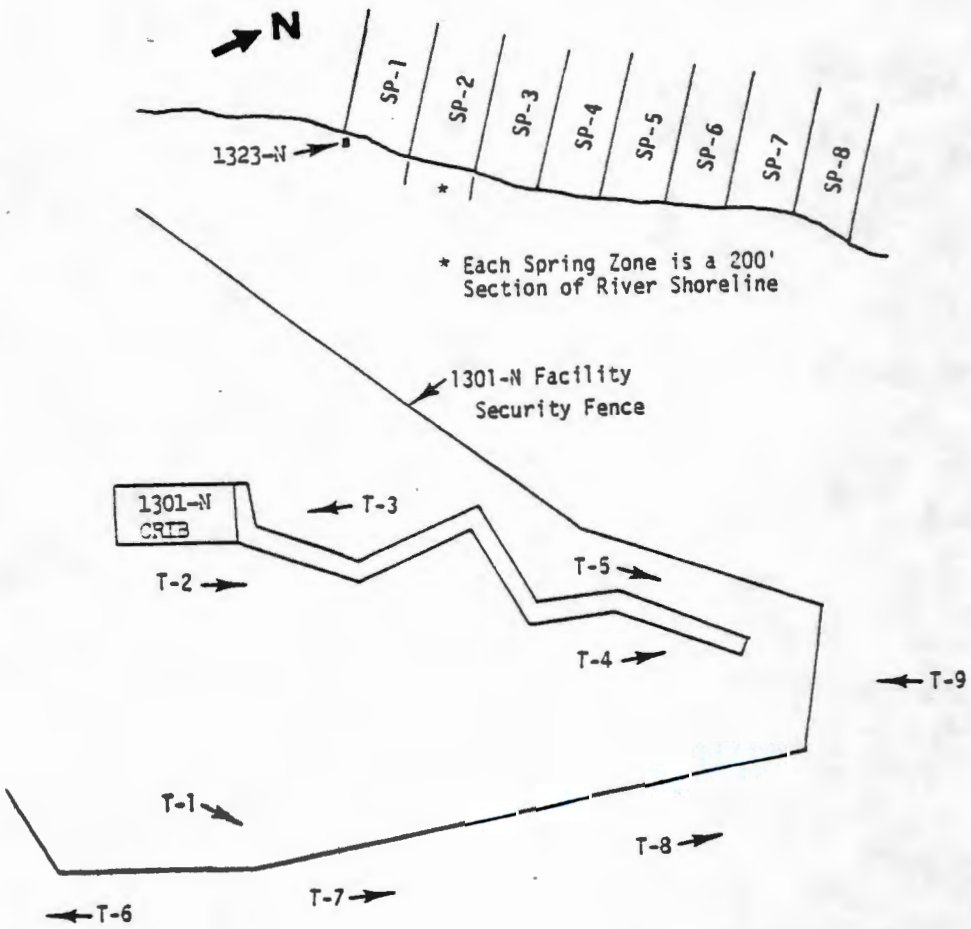

Figure 3.1 Vegetation Sampling Locations Around the 1301-N Facility and at the River Shoreline.

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Table 3.1 Radionuclide Concentration Detected in Vegetation Samples Adjacent to the 1301-N Facility.* Concentrations are in pCi/g.

Sample Location	Mn-54	Fe-59	Co-60	Nb-95	Cs-137	Ce-141	CePr-144
T-1	0.40	ND**	ND	ND	0.21	ND	ND
T-2	1.66	0.55	6.67	2.19	1.14	0.75	6.11
T-3	0.58	ND	1.44	0.34	0.28	0.16	1.33
T-4	3.19	0.62	5.27	0.39	3.22	0.10	0.90
T-5	1.25	ND	2.61	0.21	0.55	ND	0.97
T-6	0.75	0.62	1.31	ND	0.12	ND	ND
T-7	0.22	ND	ND	ND	ND	ND	ND
T-8	0.47	ND	0.71	ND	0.44	ND	ND
T-9	ND	ND	ND	ND	ND	ND	ND
Avg***	1.07	0.60	3.00	0.78	0.85	0.34	2.33

* In addition to the radionuclides listed above, the sample from T-2 contained 1.04 pCi/g of Zr-95 and 0.35 pCi/g of Ru-103; the sample from T-4 contained 0.22 pCi/g of Cs-134, and the sample from T-5 contained 0.11 pCi/g of Co-58.
** Not Detected.
***Average determined from samples with detectable results.

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Table 3.2 Radionuclide Concentrations Detected in Vegetation Samples from the Riverbank Springs. Concentrations are in pCi/g.

Sample Location	Mn-54	Co-60	Ru-103	Ru-106	Sb-124	Sb-125	Cs-137
S-1	0.16	1.82	0.02	ND*	ND	0.14	0.91
S-2	ND	7.74	0.10	1.12	ND	0.17	0.28
S-3	0.08	5.18	ND	ND	ND	0.40	0.26
S-4	0.13	7.05	ND	0.84	0.13	0.48	0.32
S-5	ND	1.63	ND	ND	ND	0.21	0.37
S-6	0.11	2.87	0.12	1.06	ND	0.17	0.47
S-7	0.31	10.40	0.23	1.81	0.20	0.61	0.42
S-8	ND	8.29	ND	ND	ND	0.32	0.49
Avg**	0.16	5.62	0.12	1.21	0.17	0.31	0.44

*Not Detected

**Average based on samples with detectable results.

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4.0 SOIL AND SEDIMENT SAMPLING

Soil and trench sediment samples in and around the 1301-N Facility were collected once during 1980 at the locations indicated on Figure 4.1. Soil sampling sites are T-1 thru T-9 and sediment sample locations are TS-1 thru TS-9.

Soil samples consisted of surface soil collected with a small trowel. Trench sediment samples were collected by attaching a small jar to the end of a long pole and using this device as a scoop. Sediment gathered by the scoop is transferred to a 200 mL jar and the scoop is then rinsed with the water in the trench.

Radionuclide concentrations detected in soil samples and trench sediment samples are presented in Table 4.1 and Table 4.2, respectively. The average concentrations of Co-60, Cs-137, Sr-90, and Pu-239/240 in the trench sediment samples since 1975 are compared in Table 4.3 and Figure 4.2.

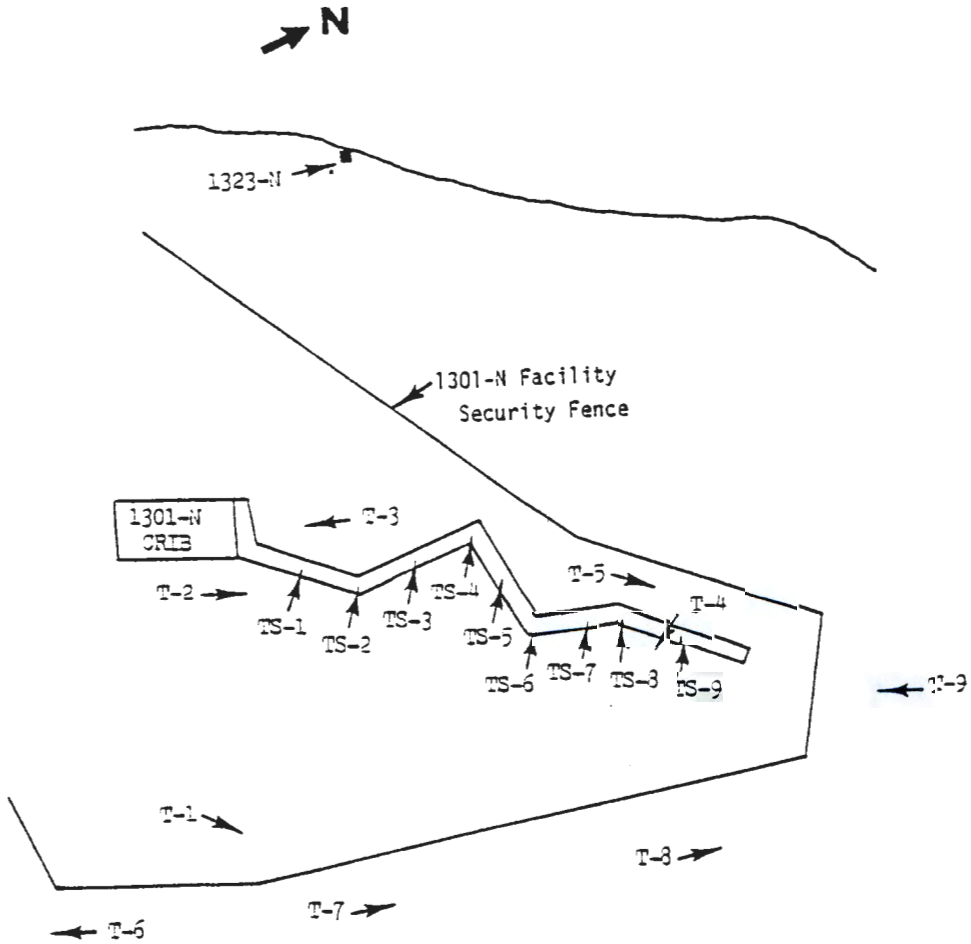

Figure 4.1 Soil and Trench Sediment Sampling Locations

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Table 4.1 Radionuclide Concentrations Detected in Soil Samples Adjacent to the 1301-N Facility. Concentrations are in pCi/g.

Sample Location	Mn-54	Co-60	Cs-134	Cs-137	CePr-144	Eu-155
T-1	0.26	2.62	ND*	0.43	ND	0.09
T-2	5.17	33.10	0.29	4.76	1.73	ND
T-3	2.07	8.31	0.24	4.43	0.56	0.16
T-4	1.83	9.93	0.25	4.66	0.48	ND
T-5	2.99	11.40	0.37	6.03	ND	0.12
T-6	0.10	1.00	ND	0.21	ND	ND
T-7	0.37	1.70	ND	0.74	ND	ND
T-8	ND	0.30	ND	0.21	ND	ND
T-9	ND	0.39	ND	0.84	ND	ND
Avg**	1.83	7.64	0.27	2.48	0.92	0.12

* Not Detected
**Average determined from samples with detectable results.

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Table 4.2 Radionuclide Concentrations Detected in 1301-N Trench Sediment Samples*. Concentrations are in pCi/g.

Sample Location	Mn-54	Co-60	N6-95	Cs-137	CePr-144
TS-1	4.4×10^6	1.3×10^7	3.6×10^6	2.7×10^5	1.1×10^7
TS-2	2.8×10^6	8.8×10^6	1.5×10^6	2.1×10^5	4.1×10^6
TS-3	1.4×10^6	8.4×10^6	2.2×10^5	1.2×10^5	1.1×10^6
TS-4	1.0×10^6	5.1×10^6	2.6×10^5	2.2×10^5	8.0×10^5
TS-5	6.1×10^5	3.1×10^6	1.4×10^5	2.6×10^5	5.1×10^5
TS-6	1.1×10^6	5.6×10^6	2.7×10^5	2.1×10^5	8.6×10^5
TS-7	3.5×10^5	1.7×10^6	9.2×10^4	2.4×10^5	4.1×10^5
TS-8	4.3×10^5	7.6×10^6	ND**	6.3×10^5	ND
TS-9	7.0×10^5	4.3×10^6	1.2×10^5	3.5×10^5	3.3×10^5
Avg.	1.4×10^6	6.4×10^6	7.6×10^5	2.8×10^5	2.4×10^6

* In addition to the radionuclides listed above, sample TS-1 contained 2.5×10^5 pCi/g of Co-58, 1.98×10^6 pCi/g of Zr-95, and 2.7×10^6 pCi/g of Ru-106; sample TS-2 contained 3.3×10^5 pCi/g of Fe-59, 7.9×10^5 pCi/g of Zr-95, 1.1×10^5 pCi/g of Ru-103, and 8.7×10^5 pCi/g of Ru-106; and sample TS-5 contained 4.1×10^4 pCi/g of Cs-134.

** Not Detected.

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Table 4.3 Comparison of Average Concentrations (pCi/g) of Selected Radionuclides in 1301-N Trench Sediment Samples Since 1975.

Year	Co-60	Cs-137	Sr-90	Pu-239/240
1975	5.2×10^6	1.1×10^6	2.4×10^3	9.8×10^2
1976	2.0×10^6	1.8×10^5	2.7×10^4	3.7×10^3
1977	7.1×10^5	7.9×10^4	2.1×10^4	4.6×10^3
1978	5.2×10^6	2.2×10^5	2.5×10^4	5.2×10^3
1979	2.6×10^7	8.1×10^5	4.2×10^4	6.2×10^3
1980	6.4×10^6	2.8×10^5	*	*

*Radioanalysis is currently being performed by the U. S. Testing Company and results will be included when available.

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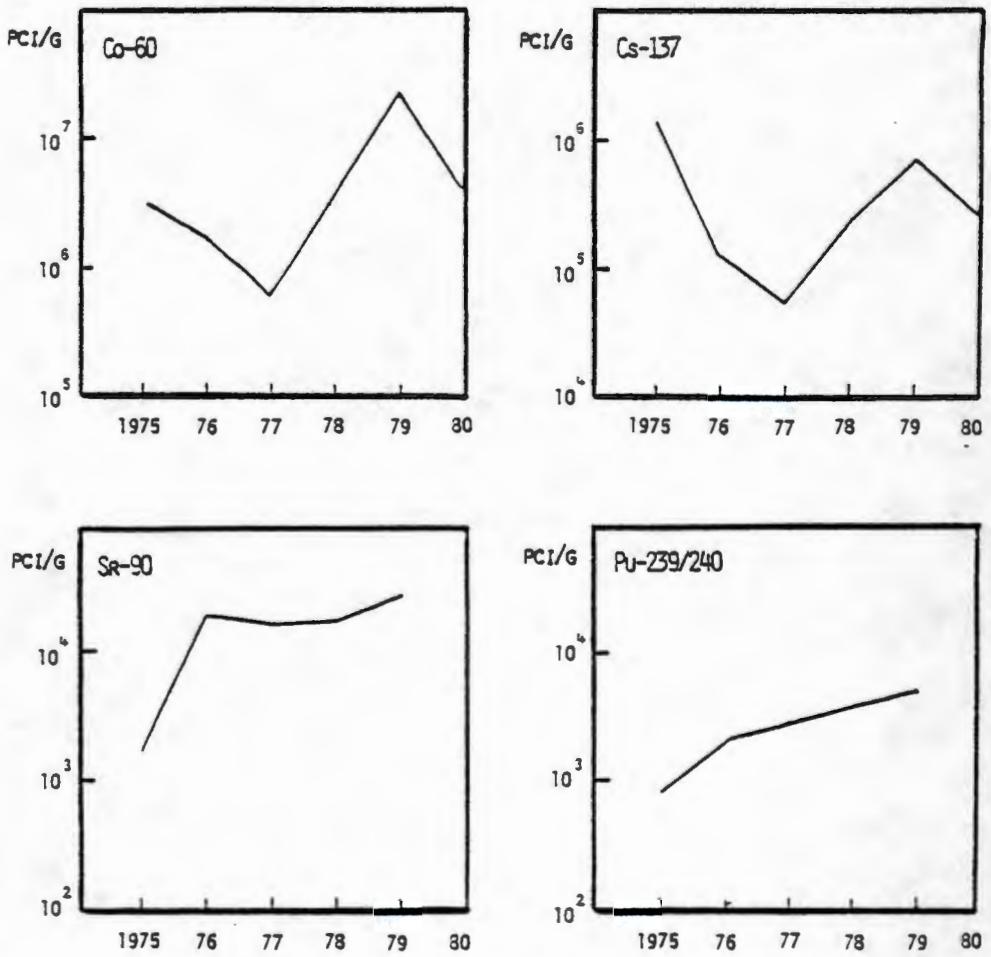

Figure 4.2 Average Concentrations (pCi/g) of Selected Radionuclides in 1301-N Trench Sediment Samples since 1975.

5.0 DIRECT RADIATION MEASUREMENT

5.1 1301-N Grid Survey

A grid network of radiation survey locations is established adjacent to the 1301-N crib and trench (Figure 5.1). Surveys were taken at intersecting points of the grid shown in the figure below. A direct reading count rate integrating instrument (an Eberline HP-210 probe with an Eberline Scaler) was used to measure activity and an Eberline μR meter was used to measure dose rate at each location. Data collected using these instruments is presented in Table 5.1.

Measurements were made at ground level and at a height of one metre. To obtain a count rate per minute, counts were made for two minutes and averaged. Direct radiation surveys of the 1301-N grid are performed annually. This survey was performed on August 7, 1980. At this time, N Reactor had been shut down approximately three months and the crib flow rate was 1650 gpm. There was no internal decontamination of reactor piping during 1980, so there were no decontamination wastes in the 1310-N or 1314-N waste tanks.

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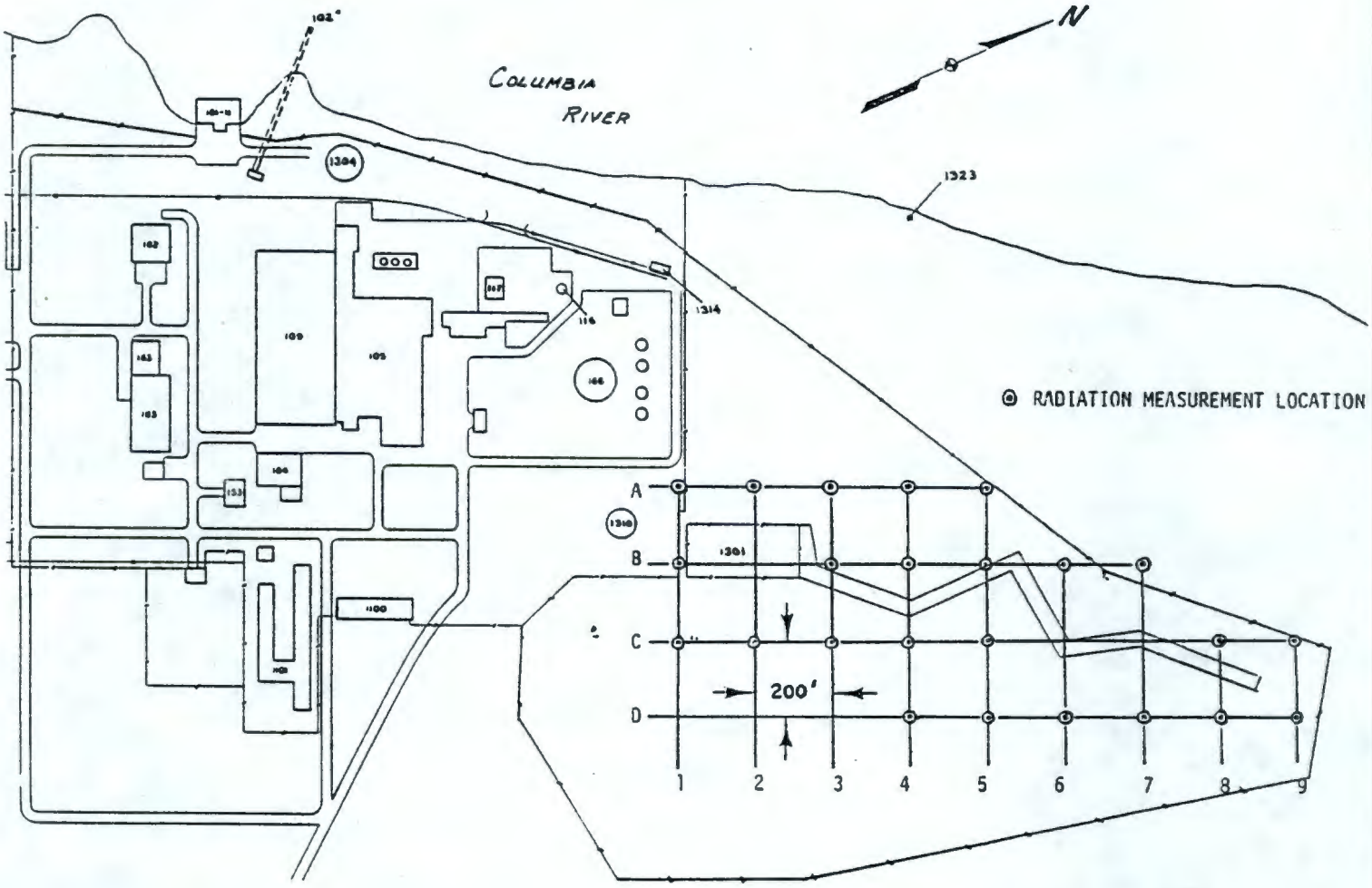

Figure 5.1 Grid Used for Radiation Survey Around the 1301-N Facility.

Table 5.1 Data from 1301-N Grid Survey in counts per minute and μR/hr.

	Ground Level		One Metre	
Grid Point	CPM	μR/hr	CPM	μR/hr
A1	200	90	388	100
A2	225	100	345	110
A3	176	70	234	80
A4	117	70	212	70
A5	102	60	192	60
B1	5960	OS*	25,400	OS
B3	330	220	842	260
B4	200	100	391	170
B5	393	200	3270	OS
B6	200	120	323	120
C1	244	160	512	400
C2	402	250	310	250
C3	536	250	572	400
C4	416	290	467	300
C5	301	260	394	280
C8	204	130	346	130
C9	119	60	202	50
D4	209	100	153	120
D5	130	120	207	130
D6	181	120	300	140
D7	182	120	272	140
D8	466	100	367	100
D9	166	160	480	240

* Off Scale (High Radiation Area)

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5.2 Environmental Dosimeters

External radiation dose information is collected at 100-N Area using CaF_2:Mn (TLD-400) thermoluminescent dosimeters. The dosimeters used are delivered and picked up monthly by PNL where they are read, calibrated, and annealed.

Locations of the environmental dosimeters at 100-N Area are depicted in the figure on the next page. This drawing also shows the area of river shoreline that was surveyed in the annual shoreline survey.

The data collected from the 100-N Area environmental dosimeters is presented in Table 5.2. Included with these data is the average dose rate, continuous occupancy dose, and the dose to workers. The dose to workers is defined as the dose to a person that spends 40 hours per week and 52 weeks per year at the site of a specific environmental dosimeter.

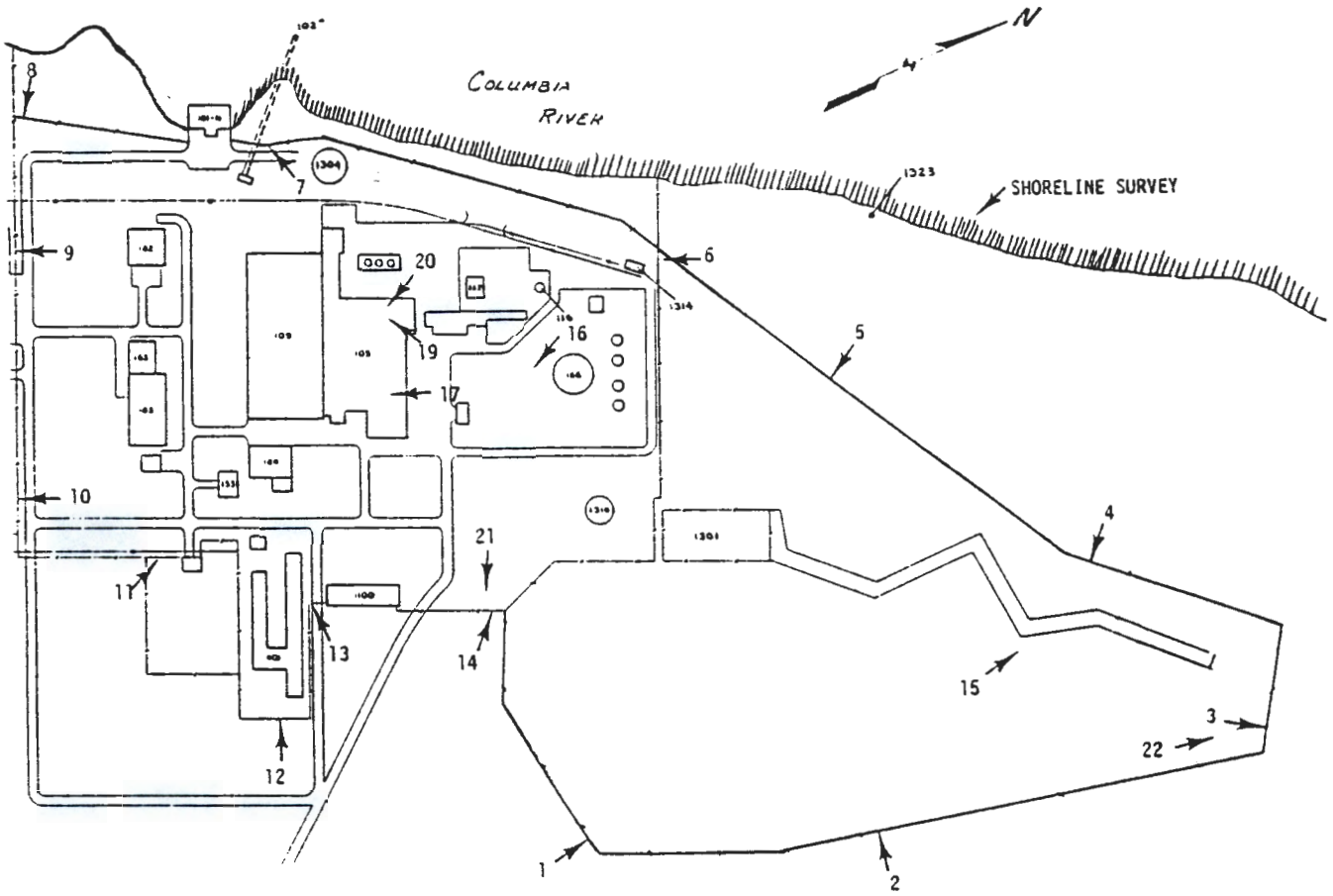

Figure 5.2 Locations of Environmental Dosimeters and Shoreline Survey.

Table 5.2 Dose Rates (mrad/hr) Detected from 100-N Area Environmental Dosimeters

DOSIMETER LOCATION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Sep 1979	.059	.140	.140	.410	.140	.520	.220	.011	.012	.009	.012	.014	.033	.100	2.500	.110	.005	.120	.004	.008	.095	.500
Sep/Oct	.052	.110	.110	.330	.130	1.000	.250	.015	.055	.011	.013	.014	.035	.090	1.900	.190	.006	.120	.005	.011	.100	.350
Oct/Nov	.041	.082	.082	.230	.110	1.500	.230	.012	.008	.010	.013	.017	.031	.080	1.200	.230	.006	.100	.086	.005	.085	.160
Nov	.043	.098	.098	.310	.098	.430	.230	.009	.008	.008	.009	.010	.025	.075	1.700	.097	.005	.100	.005	.005	.093	.250
Dec	.034	.061	.061	.170	.067	.120	.290	.009	.007	.007	.009	.011	.025	.074	.950	.051	.005	.095	.006	.004	.078	.150
Jan 1980	.032	.049	.036	.130	.064	.340	.280	.012	.010	.010	.012	.013	.029	.070	.690	.062	.006	.093	.006	.005	.082	.099
Feb	.035	.066	.052	.186	.080	.738	.353	.009	.006	.007	.009	.009	.027	.069	1.040	*	.005	.088	.004	.005	.081	.141
Mar	.032	.056	.039	.142	.070	.705	.321	.009	.006	.008	.008	.010	.023	.067	.755	.105	.007	.090	.005	.005	.075	.110
Apr	.048	.108	.076	.298	.140	.917	.324	.012	.008	.010	.011	.012	.030	.080	1.835	.098	.006	.103	.006	.005	.091	.240
May	.051	.111	.084	.310	.112	.778	.335	.010	.009	.010	.011	.013	.030	.094	1.848	.099	.006	.114	.006	.006	.096	.284
Jun	.048	.120	.085	.337	.114	.735	.391	.010	.008	.009	.009	.010	.025	.080	2.039	.047	.005	.115	.005	.005	.088	.328
Jul	.060	.162	.134	.484	.145	.673	.351	.008	.007	.007	.009	.010	.026	.093	3.158	.040	.005	.117	.006	.006	.006	.482
Aug	.036	.082	.057	.242	.086	.630	.323	.007	.004	.005	.006	.007	.021	.072	1.413	.029	.003	.096	.004	.004	.079	.239
Average Dose Rate (mrad/hr)	.044	.096	.106	.275	.104	.699	.300	.010	.011	.009	.010	.012	.028	.080	1.618	.097	.006	.104	.011	.006	.081	.256
Continuous Occupancy Dose, mrad/yr	390	840	930	2,400	910	6,100	2,600	88	96	79	88	110	250	700	14,000	850	53	910	96	53	710	2,200
Dose to Workers, mrad/yr	92	200	220	570	220	1,500	620	21	23	19	21	25	58	170	3,400	200	12	220	23	12	170	530

* TLD Lost

5.3 Shoreline Survey

An Eberline μR meter was used to conduct a Columbia River shoreline survey which began just downstream of the 181-N building and ended approximately 1500 feet downstream from the 1323-N sample shed. The measurements were made approximately every 50 feet along the shoreline and, where possible, within three parallel tracts of shoreline. The first tract was at the low water mark, the second from 0 to 50 feet of the river, and the third tract was from 50 to 100 feet of the river. Measurements were taken one metre above ground. Data collected during the shoreline survey is presented in Table 5.3.

The shoreline survey is performed annually. This survey was conducted on May 18, 1980. At that time the reactor had been shut down approximately one week for the summer outage. There was also no internal decontamination wastes in the 1301-N or 1314-N waste tanks at the time of the survey and the crib flow rate was 3500 gpm.

5.4 High Radiation Background and Crib Flow Rate

During a period of high background radiation at 100-N Area, inspection of the 1301-N Trench showed the water level to be extremely low. At that time, some of the trench bottom was exposed and beginning to dry near the start of the trench (south end). The shoreline survey was repeated during this period of high background radiation and low flow to the crib on June 25, 1980.

While repeating the shoreline survey, the μR/hr readings increased as the road from the 1323-N sample station rose to the top of the bank. At the top of the bank, readings of 300-400 μR/hr were found. Because the 1301-N trench was the suspected source of the high background, readings were taken while walking directly inland towards the trench. At the perimeter fence, background radiation levels had risen to 1500 μR/hr. Only direct gamma radiation was observed.

It appears that the flow rate to the 1301-N crib, and the corresponding water level in the trench, is a major influence on the background radiation levels at 100-N Area. The following data supports this conclusion.

Date	Bkgd, μR/hr*	Crib Flow, GPM
Normal	10-12	2600
6-23	13	1300
6-24	20	1000
6-25	25	950
6-26	10-12	2500

*Background readings observed in 1114-N Building

Table 5.3 Data from 100-N Area Shoreline Survey

Location	μR/hr Tract #1 Low River	μR/hr Tract #2 0'-50'	Location	μR/hr Tract #3 50'-100'
			31	30
1	22		32	40
2	46		33	40
3	60		34	40
4	80		35	40
5	65	100		40
	60	78		40
	40	40		38
	25	25		40
	20	20	40	45
10	22	25		40
	20	20		45
	20	20		40
	20	25		60
	22	30	45	60
15	25	25		58
		30		58
		28		60
		35		60
		50	50	60
20		58		50
		50		55
		50		58
		50		60
		50	55	55
25		40		50
		40		50
		40		40
		40		40
		35	60	40
30		30	61	30
			62	40

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6.0 SPECIAL ENVIRONMENTAL SAMPLES

The 100-N Area Environmental Surveillance Program requires that results of any special samples of the 100-N Area environs be included in the annual surveillance report. These special samples are listed in the following subsections.

6.1 Radioanalysis of 100-N Area Swallow Nests

A study was performed to characterize the radionuclide content of swallow nests at 100-N Area. Swallows construct their nests from mud and other materials, so mud from the exposed 1301-N trench is a potential nest material for these birds.

The study of the nests was initiated on May 15, 1979. Random samples of nests were taken from various locations at N Area as described below:

Nest #1	North side of 105-N Roof
Nest #2	Above the First Aid entrance (1100-N)
Nest #3	Second story of 1100-N
Nest #4	Pumphouse bridge crane (181-N)
Guano	Excrement taken near next #1

The results of radioanalysis of these samples is given in the table below.

Table 6.1 Concentrations of Radionuclides Detected in Swallow Nests and Guano Collected at 100-N Area. Concentrations are in pCi/g.

Radionuclide	#1	#2	#3	#4	Guano
Mn-54	2.5	.14	.16	.59	--
Fe-59	--	--	--	.54	--
Co-60	19	.58	.55	7.4	17
Nb-95	--	--	--	.13	--
Sb-125	--	--	--	.12	--
Cs-137	2.9	--	--	.42	--
Nd-147	--	.27	.20	.25	--
Total Activity	24	1.0	.91	9.5	17

Since small amounts of radioactivity were measured in the tests, a background check was made for a local source of mud which was known to be used by the swallows. A sample of the surface mud was analyzed and proved to contain similar levels of radioactivity. The concentrations of the radionuclides seen in the mud sample were similar to those measured by PNL for the Hanford reservation due to world wide fallout. Two exceptions were the levels of Co-60 found in the nests from the north side of the 105-N roof. The following table shows the additional sampling of freshly built nests and the environmental surveillance sampling of soil around Hanford during 1979 (Houston, et al 1980).

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Table 6.2 Concentrations of Radionuclides in Swallow Nests Compared to N Area and Hanford Soil Sample. Concentrations are in pCi/g.

Radionuclide	#1	#2	#3	#4	Surface Soil N-Area	Surface Soil Hanford
Mn-54	1.9	.14	--	.27	.90	--
Co-60	15	1.2	.64	1.5	2.7	--
Nb-95	--	--	--	--	--	.05
Cs-137	5.5	.28	--	.19	.61	.70
Nd-147	--	--	.45	--	--	--
Total Activity	22	1.6	1.1	2.0	4.2	.75

6.2 Contaminated Nests

A contaminated bird's nest was found January 17, 1980 on the side of a JA Jones craft building. It appears to be a Robin's nest which was partly built with mud from the 1301-N Trench. A C.P. reading of 250 mrad/hr was the highest observed for the nest.

Subsequent surveys located a contaminated wasp's nest on top of the same building, and approximately fifteen contaminated wasps' nests inside of the same building (up to 15,000 c/m). No additional contaminated nests were discovered during detailed surveys of all the other JA Jones buildings.

A radioanalysis was performed of a regular sample of the wasps' nests. Results of this analysis indicated the following concentrations of radionuclides in these nests:

- 1.68×10^5 pCi/g of Mn-54
- 1.06×10^6 pCi/g of Co-60
- 1.55×10^5 pCi/g of Cs-137, and
- 5.02×10^4 pCi/g of CePr-144.

The nests were removed and the nesting sites cleaned up and decontaminated. Activity levels at the nesting sites were all less than 200 cpm after decontamination.

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REFERENCES

Diediker, L. P. 1980. External Radiation Levels in the 100-N Area Environment for CY 1979. UNI-1530.

Greager, E. M., 1979. Radioactivity in Vegetation and Soils Around the 1301-N Facility. UNI-1383.

Houston, J. R. and P. J. Blumer, 1980. Environmental Surveillance at Hanford for CY-1979. PNL 3283.

Letter, L. P. Diediker to J. J. Dorian, "Contaminated Nests", dated February 6, 1980.

Letter, L. P. Diediker to J. J. Dorian, "Radioanalysis of N Area Swallow Nests", dated June 7, 1979.

Letter, L. P. Diediker and V. R. Richards to J. J. Dorian, "High Background at N Area", dated June 27, 1980.

Poppe, L. K., 1979. Onsite Environmental Surveillance Program for the 100-N Area. UNI-1347.

United States Department of Energy. 1980. Environmental Assessment Operation of N Reactor and Fuels Fabrication Facilities. DOE/EA 0030, REV1