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Westinghouse Hanford Company Environmental Surveillance Annual Report–100 Areas

Calendar Year 1987

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EXECUTIVE SUMMARY

Near-field environmental surveillance of the Hanford 100 Areas is performed by Westinghouse Hanford Company (Westinghouse Hanford) to assess and control the impacts of operations. This involves sampling and analysis from the major environmental pathways of exposure to onsite workers.

Results from the Westinghouse Hanford Environmental Surveillance Program for the Hanford 100 Areas are presented in this report. The environmental surveillance program provides sampling and monitoring of several parameters to evaluate the environmental impact of 100-N Area Reactor Facilities and the shutdown reactor facilities and burial grounds in the retired 100 Areas. Discharges to the environment are reported in annual effluent release reports.

At 100-N Area, samples of ambient air, groundwater, vegetation, and surface soil were collected and analyzed. Direct radiation levels were also monitored at several locations. Samples of ambient air, vegetation, surface soil, and sediment were collected to monitor the environmental impact of the 1301-N and 1325-N Liquid Waste Disposal Facilities (LWDFs). Direct radiation surveys were conducted for each LWDF and along the Columbia River shoreline.

At the retired 100 Areas, vegetation and surface soil samples were collected and analyzed. In addition, samples from groundwater monitoring wells located at 100-K Area were collected and analyzed. The results provided in this report are summarized by the following highlights.

REGULATORY CONTROLS

Radiation dose to workers and the offsite population are regulated by a tiered system of controls. The U.S. Department of Energy (DOE) has established the occupational dose limit at 5,000 mrem/yr. The effective dose equivalent limits for any member of the public were set by the DOE at 500 mrem/yr for occasional annual exposures and at 100 mrem/yr for continuous exposures. An administrative action level of 25 mrem/yr (to the maximum individual member of the public) has been identified by the DOE to ensure that these dose limits are not exceeded.

Derived concentration guidelines (DCGs) corresponding to the 100 mrem/yr effective dose equivalent standard are used for comparison purposes only in this report. It should be noted that the DCGs are applicable at the point of actual exposure to members of the public and are, therefore, not applicable onsite.

GENERAL

The time period involved for this report includes 15 mo of data, rather than the usual 12 mo, specifically October 1, 1986 through December 31, 1987. In previous reports, the 12 mo considered were based on a fiscal year approach. When Westinghouse Hanford assumed the Operations and Engineering contract for the Hanford Site in mid-1987, the reporting period was changed to reflect a calendar year basis. This explains the additional data contained in this document.

The N Reactor was placed in a "standdown" mode on January 7, 1987, and did not operate during the remainder of the year.

AMBIENT AIR MONITORING

Environmental samples of ambient air collected near 100-N Area indicated that the concentrations of airborne radionuclides were less than the DCG and that there was no significant release to the environment. In late 1987, surface disturbances during structural modifications to the 1301-N LWDF caused a short-term increase in ^{60}Co concentrations detected in the ambient air sample station located at the site.

GROUNDWATER

Radionuclide concentrations in the groundwater exceeded the DCG for ^{90}Sr and ^{131}I in monitoring sites near the 1301-N and 1325-N LWDFs during the reporting period. Concentrations of ^{90}Sr also exceeded the DCG at the N Springs. Groundwater tritium concentrations generally increased in the 100-N and 100-K Areas, but did not exceed the DCG at any time during the reporting period.

During the reporting period, six groundwater monitoring locations at 100-N Area were added to the sampling schedule to improve the overall monitoring capability of the environmental surveillance program.

In June 1986, a leaking underground diesel oil pipe spilled about 1,000 gal of #2 diesel oil to the ground near the 184-N Powerhouse. Elevated levels of oil and grease were soon detected in an adjacent groundwater well. Recovery of the oil from the groundwater provided contaminant removal and stabilization by mid-1987.

SOIL AND VEGETATION

Environmental samples of surface soil and vegetation collected at 100-N Area indicated near-background levels of radionuclides in the immediate environment. Trend analysis revealed generally stable radionuclide concentrations in soil and vegetation samples since 1980. Vegetation samples collected near the N Springs portion of the Columbia River shoreline contained above-background levels of ^{90}Sr. Residual concentrations of radionuclides released to the 1301-N LWDF were detected in the surface soil and vegetation adjacent to the facility. Since September 1985, the 1301-N LWDF has not received 100-N Reactor liquid effluent. Facility closure plans are being evaluated that will include biotransport and intrusion barriers.

Environmental samples of surface soil and vegetation collected near the retired 100 Area reactor facilities indicated no significant release or biotransport of radionuclides to the immediate environment. Trend analysis, again, revealed generally stable radionuclide concentration in soil and vegetation samples since 1981.

EXTERNAL RADIATION

In October 1986, five additional environmental thermoluminescent dosimeter (TLD) sites were added to the 100-N Area environmental surveillance program, bringing the total to 41 monitoring points. An internal decontamination of the reactor primary coolant system was conducted in

February 1987 at N Reactor. A slight, short-term increase in environmental dose rates resulted at TLD sites located near the 1310-N Radioactive Chemical Waste Storage Facility. External radiation levels were elevated in radiologically controlled areas near the 1301-N and 1325-N LWDFs.

RADIOLOGICAL SURVEYS

Direct radiation levels measured near the 1301-N LWDF and along the Columbia River shoreline were again higher than in years prior to 1986. The 1301-N LWDF is no longer receiving liquid effluent from N Reactor. The absence of shielding (water) resulted in the increased direct radiation levels.

Direct radiation levels measured near the 1325-N LWDF were significantly higher than in previous annual surveys. The 1325-N LWDF began receiving liquid effluent in September 1985. The increased radionuclide inventory in the facility, along with lower water levels during the low-flow conditions of the 1987 standdown of N Reactor, resulted in the increased direct radiation levels.

LIQUID WASTE DISPOSAL FACILITIES

Sediment samples collected from the 1325-N LWDF crib contained activation and fission products discharged from N Reactor. Discharges to the 1301-N LWDF were discontinued in September 1985; therefore, 1301-N sediment samples were not collected. Residual radionuclide levels will decline as the radionuclides decay.

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1.0 INTRODUCTION

1.1 BACKGROUND

Westinghouse Hanford Company (Westinghouse Hanford), as a prime contractor to the U.S. Department of Energy (DOE) at the Hanford Site, manages the operation of the N Reactor and the storage of spent fuel at 100-K Area and maintains the retired reactor facilities at 100-B/C, -D/DR, -F, -KE/KW, and -H Areas.

The Hanford Site is located within the Pasco Basin in south-central Washington State, approximately 170 mi southeast of Seattle and 125 mi southwest of Spokane. The 100 Areas are located in the north-central part of the Hanford Site, along the southern (right) bank of the Columbia River (see Figure 1-1).

1.2 SCOPE OF THE ENVIRONMENTAL SURVEILLANCE PROGRAM

The Westinghouse Hanford Environmental Surveillance Program for the 100 Areas provides monitoring of specific environmental media. The information is used to assist in evaluating the environmental impact of 100-N Area reactor facilities and the shutdown reactor facilities in the retired 100 Areas (see "Site Characteristics"). The major objectives of the monitoring program follow:

- Detect radionuclides in identified radiological release pathways
- Detect and evaluate changes in radionuclide concentrations discharged or existing in the immediate environment
- Maintain a data base for trend analyses
- Provide data for after-the-fact release analyses
- Demonstrate compliance with applicable regulations.

This document is used by Westinghouse Hanford to evaluate facility operation and management practices. The report does not include estimates of radiation doses to the public resulting from the operation of 100 Area facilities. Reports of population dose commitments and other environmental information for the Hanford Site are prepared and issued by Battelle's Pacific Northwest Laboratories (PNL). Westinghouse Hanford provides radionuclide release information to PNL for the preparation of such documents.

1.3 REGULATORY BASIS

Radiation standards and regulations for protection of the worker and the environment are contained in DOE Order 5480.1B, "Environment, Safety, and Health Programs for DOE Operations" (DOE 1986a). In 1985, DOE issued a memorandum (DOE 1985) that revised the radiation protection standards for protection of the public in the vicinity of DOE facilities. This memorandum became effective on July 1, 1985, and incorporated the radiation dose calculation methodology recommended

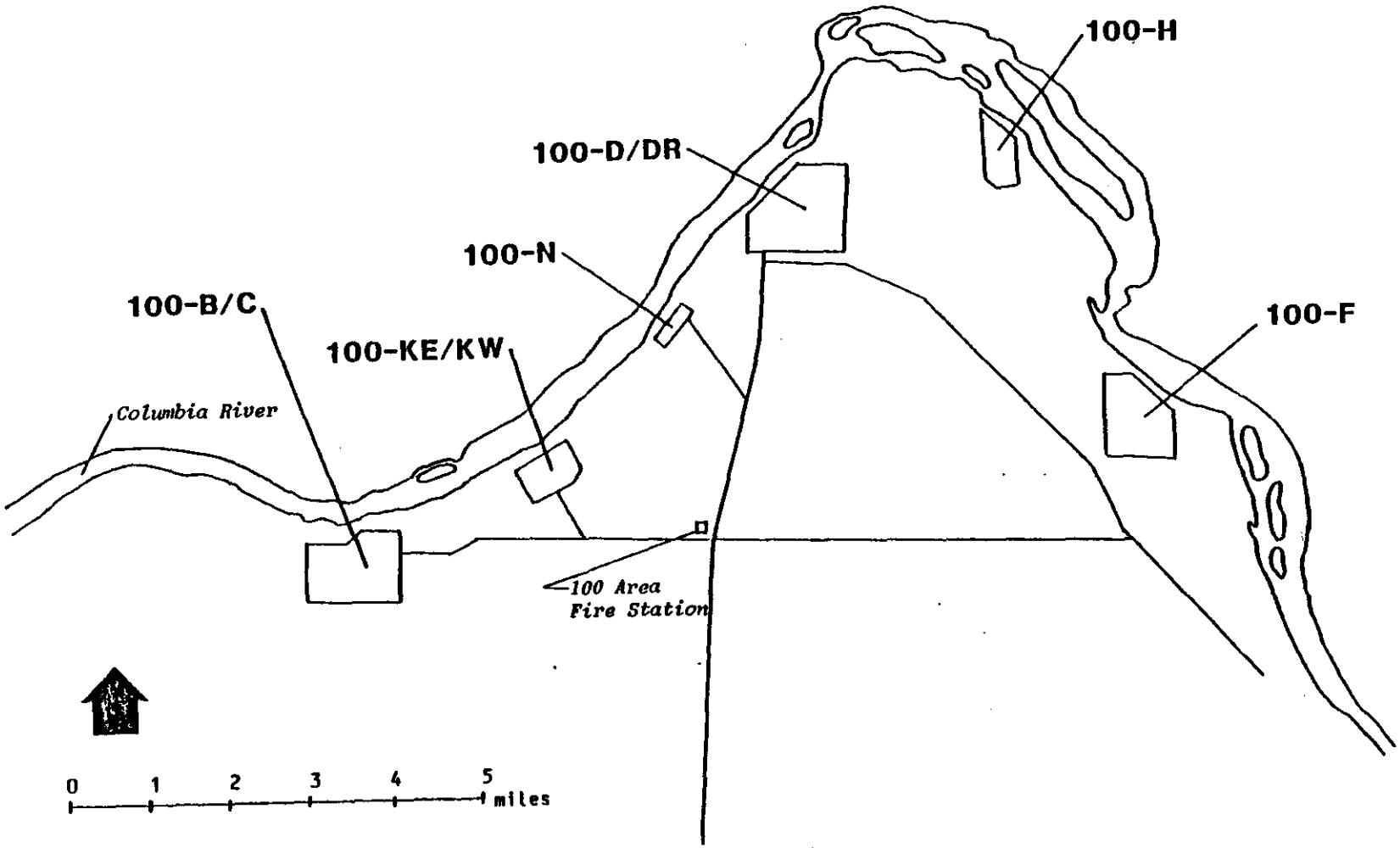


Figure 1-1. Map of the 100 Areas.

by the International Commission on Radiological Protection (ICRP) in Publications 26 and 30 (ICRP 1977, 1979). The memorandum established the maximum allowable radiation dose to the public at 500 mrem/yr for occasional annual doses and at 100 mrem/yr for doses expected to last long than 5 yr. The radiation dose from airborne effluents is limited to 25 mrem/yr whole body dose equivalent and 75 mrem/yr to any organ.

Derived concentration guides (DCGs) corresponding to the 100-mrem/yr effective dose equivalent standard are used as comparisons in this report. It should be noted that the DCGs are applicable at the point of actual exposure to members of the public and are, therefore, not directly applicable onsite. In keeping with Westinghouse Hanford's philosophy to keep doses to workers as low as reasonably achievable (ALARA), the DCGs, are compared to onsite data.

1.4 FACILITY DESCRIPTIONS

1.4.1 100-N Area Facilities

1. 105-N Reactor--The N Reactor is a graphite-moderated, pressurized, light-water cooled reactor that uses slightly enriched uranium fuel in the production of special nuclear materials (SNM) and byproduct steam for use by the Washington Public Power Supply System (Supply System) in the generation of electric power. N Reactor has been placed in a "standdown" mode since January 7, 1987.

2. Liquid Waste Disposal Facilities--Two liquid waste disposal facilities (LWDF), 1301-N and 1325-N, have been used to receive and treat N Reactor liquid wastes containing low-level fission and activation products. The 1301-N LWDF was permanently retired from service in September 1985. The 1325-N LWDF is now the only LWDF receiving radioactive liquid waste discharges.

   The LWDF, also referred to as crib and trench, allows influent to percolate downward into an engineered soil column, where a high percentage of radionuclides contained in the influent is removed by adsorption, filtration, and ion exchange.

3. 1314-N Liquid Waste Loadout Facility--The 1314-N Facility receives the radioactive liquid waste from the 1310-N Facility and the 107-N Facility and transfers it into a railway tank car which carries the liquid to the 200 West Area Tank Farms for processing and disposal (see WHC-EP-0145, Section 1.4.2).

4. 1310-N Radioactive Chemical Waste Storage Facility--The 1310-N Facility is used to temporarily store radioactive waste solution used in the internal decontamination of the N Reactor. After cooling and neutralization, the solution is subsequently transferred through underground piping to the 1314-N Liquid Waste Loadout Facility.

5. 107-N Fuel Storage Basin Recirculation Facility--The 107-N Facility provides for N Reactor's irradiated fuel storage basin water recirculation and necessary filtration and demineralization to reduce radioactive effluent discharges to the 1325-N LWDF. Ion exchange system regeneration effluent and sand filter backwash water are transferred through underground piping to the 1314-N Liquid Waste Loadout Facility.

6. 1304-N Emergency Dump Tank--The 1304-N Emergency Dump Tank (EDT) is a 1.3-million-gallon-capacity steel-walled vessel. In the extremely unlikely event that the thermally hot, pressurized reactor primary coolant system must be rapidly dumped, this tank would provide the necessary quenching to prevent the coolant from flashing to steam. A constant volume of 680,000 gal of unheated water is maintained in the tank. Because of small leakage in the primary coolant system dump valves, the quench water normally contains a small inventory of radioactive materials.

7. 166-N Fuel Oil Storage Facility--The 166-N facility is an above-ground 1,135,000-gal-capacity storage tank. The tank is surrounded by an earthen berm capable of retaining approximately 2,300,000 gal. The fuel oil transfer piping is protected against corrosion. Fuel oil is used at the 100-N Area for the boiler system.

8. 1715-N Diesel Oil Storage Facility--The 1715-N facility consists of four above-ground 10,500 gal-capacity storage tanks. The tanks are located within an earthen berm capable of retaining approximately 730,000 gal. All underground diesel oil transfer piping is protected against corrosion. Diesel oil is used at the 100-N Area to ignite the boiler systems and to fuel the diesel-driven, emergency cooling system pumps.

1.4.2 Retired 100 Area Facilities

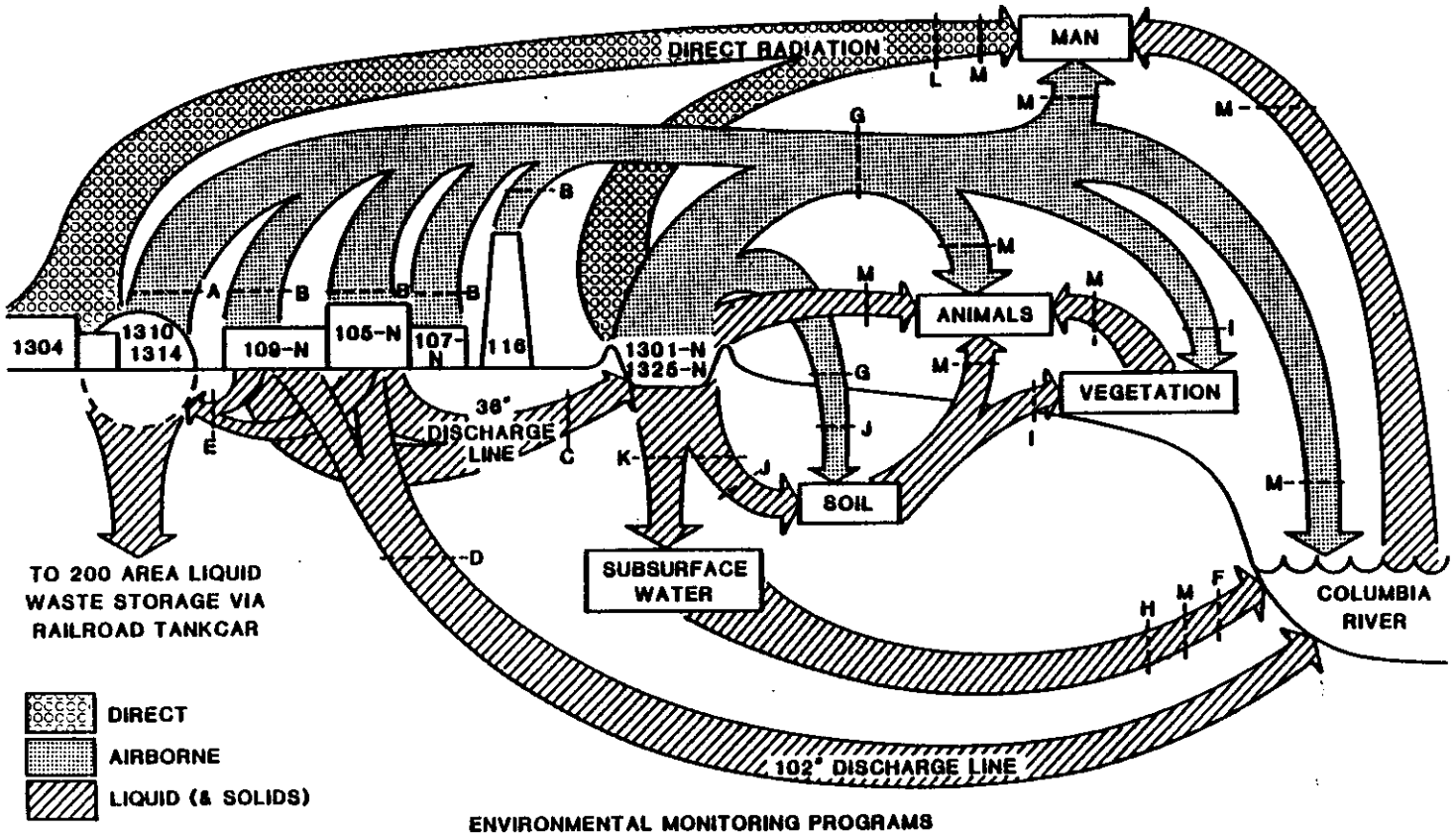
1. 105-K East and West Fuel Storage Basins--These fuel storage basins, located in the retired 100 Areas, are 2 mi upstream of the N Reactor. Irradiated N Reactor fuel elements are stored in these basins awaiting transfer to the Plutonium Uranium Extraction (PUREX) Plant, located in the 200 East Area. (See WHC-EP-0145, Section 1.4.1.)

2. 100-B, -C, -D, -DR, -F, -H, -KE, and -KW Retired Reactor Sites--These eight retired reactors are located along the Columbia River in the northern-most portion of the Hanford Site (see Figure 1-1). Several permanently deactivated liquid and solid waste disposal sites and burial grounds are associated with each facility. Characterization of the remaining radioactivity in these facilities was completed and was reported in 1978 (UNI-946, "Radiological Characterization of the Retired 100 Areas").

1.5 100 AREAS ENVIRONMENTAL SURVEILLANCE PROGRAM

1.5.1 100-N Area

Environmental surveillance at 100-N Area is conducted primarily to monitor and document radionuclides detected in environmental media located near the 100-N Area facilities. The sampling program is designed to monitor the major radiological release pathways of N Reactor. The major release pathways of N Reactor are identified in Figure 1-2.



ENVIRONMENTAL MONITORING PROGRAMS

EFFLUENT RELEASE PROGRAM

- A Air sampler on tank vents
- B Continuous air samplers
- C Flow proportional liquid sampler
- D Continuous large volume liquid sampler
- E Liquid samples during storage and shipment
- F Continuous Composite liquid sampler

ENVIRONMENTAL SURVEILLANCE PROGRAM

- G Continuous air samples
- H Ground water samples
- I Vegetation samples
- J Soil samples
- K Sediment samples
- L Direct radiation measurements
- M PNL Environmental Program

Figure 1-2. Major Radiological Release Pathways Related to 100-N Area Facilities.

As a result of release pathway analyses, two basic monitoring programs have been implemented at 100-N Area. Routine effluent releases are monitored and reported separately as a part of the Effluent Release Program. Environmental media associated with N Reactor release pathways are monitored as a part of the Environmental Surveillance Program. These two programs, along with portions of the PNL Environmental Surveillance Program, ensure that all environmental release pathways are monitored at one or more points.

The Environmental Surveillance sampling for 100-N Area is summarized in Table 1-1. Sampling methods, frequencies, and analyses are based on characteristics of the environmental parameter being sampled.

Table 1-1. Summary of the Westinghouse Hanford Company Environmental Surveillance Program for the 100-N Area.

Sample	Sampling method	Number of sample locations	Frequency	Analyses
Air	Low-volume continuous sampler with particle filter and charcoal bed	4	Every 4 wk	Gamma-emitting radionuclides
Groundwater	Well samples (4-L) provided by PNL	32	Quarterly	Gamma-emitting radionuclides, strontium, and tritium
Groundwater	Well sample (1-qt)	11	Dependent upon well	Oil and grease
Surface soil	Composite sample of about 150 g dry weight	10	Annually	Gamma-emitting radionuclides, strontium, and plutonium
Vegetation	Composite sample of about 500 g dry weight	13	Annually	Gamma-emitting radionuclides, strontium, and plutonium
Direct radiation	TLD-400 Dosimeters (CaF_2:Mn matrix)	41	Every 4 wk	Dose rate and integrated dose
Direct radiation (Columbia River shoreline)	Dose rate using hand-held survey instrument	87	Annually	Dose rate

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The sampling program for the 1301-N and 1325-N LWDFs is summarized in Table 1-2. Sampling methods, frequencies, and analyses are based on characteristics of the parameter being sampled.

1.5.2 Retired 100 Areas

Environmental surveillance in the retired 100 Areas is conducted to monitor radionuclides detected in environmental media located near the retired reactor facilities and 100 Area burial grounds. The program consists primarily of soil and vegetation sampling in each of the retired areas. Groundwater sampling is also conducted at 100-K Area.

Table 1-2. Summary of the Westinghouse Hanford Company Liquid Waste Disposal Facilities Sampling Program.

Sample	Sampling method	Number of sample locations	Frequency	Analyses
Air	Low-volume continuous sampler with particulate filter and charcoal bed	1	Every 4 wk	Gamma-emitting radionuclides
Surface soil	Composite sample of about 150 g dry weight	5	Annually	Gamma-emitting radionuclides, strontium, and plutonium
Vegetation	Composite sample of about 500 g dry weight	5	Annually	Gamma-emitting radionuclides, strontium, and plutonium
1325-N LWDF sediment	Dip samples of bottom sediment	12	Annually	Gamma-emitting radionuclides and strontium
Direct radiation	Dose rates using hand-held survey instrument	80	Annually	Dose rate

NOTE: The monitoring parameters listed in Table 1-2 for the LWDF sampling program will be included in their respective sections, as listed in the contents. The exception to this listing will be the LWDF sediment sampling discussion in Chapter 6.0.

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The sampling program for the retired 100 Areas is summarized in Table 1-3. Sampling methods, frequencies, and analyses are based on characteristics of the environmental parameter being sampled.

Table 1-3. Summary of the Westinghouse Hanford Company Environmental Surveillance Program for the Retired 100 Areas.

Sample	Sampling method	Number of sample locations	Frequency	Analyses
Surface soil	Composite sample of about 150 g dry weight	20	Annually	Gamma-emitting radionuclides, strontium, and plutonium
Vegetation	Composite sample of about 500 g dry weight	20	Annually	Gamma-emitting radionuclides, strontium, and plutonium
Groundwater	Well samples (4-L) provided by PNL	4	Quarterly	Gamma-emitting radionuclides and tritium

NOTE: The monitoring parameters listed in Table 1-3 for the retired 100 Areas sampling program will be included in their respective sections, as listed in the Contents.

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Surface soil and vegetation samples provide a means of evaluating the distribution of radionuclides from current and past releases to the environment.

The sampling techniques used for the retired 100 Areas samples were identical to those used at 100-N Area. Soil samples consisting of 150 g each were collected from the top 2.5 cm of the soil surface. Vegetation samples of 500 g each were collected from the growing portions of perennial vegetation. Gray rabbitbrush (Chrysothamnus nauseosus) was the predominant species sampled.

Duplicate samples of both media were collected. One of each duplicate sample was analyzed for gamma-emitting radionuclides at the 100-N Westinghouse Hanford radioanalytical laboratory. The remaining duplicate samples were analyzed for strontium and plutonium by the U.S. Testing Company Inc. (UST). Groundwater is routinely sampled from four wells located near the 105-KE Reactor Building. These samples are collected to detect potential leakage from the 105-KE Reactor Fuel Storage Basin.

1.6 SUMMARY OF DECOMMISSIONING ACTIVITIES

The environmental impact of decommissioning the retired 100 Area reactor ancillary facilities is mostly beneficial, since decommissioning will remove or stabilize potentially contaminated structures; however, activities conducted to dismantle and decommission the retired 100 Area facilities may disturb radionuclides contained in or on the structures. These disturbances could potentially release radioactivity to the immediate environment. All facilities are surveyed for radioactive contamination before demolition. Contaminated facilities are fully characterized and decontaminated when necessary to ensure that a future resident would receive less than 25 mrem/yr from buried residual radioactive materials.

The following information provides a brief description of major decommissioning activities completed during the reporting period. Several 100 Area retired facilities underwent various stages of decommissioning. The cleanup of the 183-H Basins has made steady progress with the cleanout and lining of Basin 3. The process water tunnels that carried supply water to the 105-F Reactor were demolished and buried in situ as were the 183-B Water Treatment Facility and the 1608-D, -DR, -F, and -H Lift Stations. After demolition, the sites were backfilled and restored to the natural contour of the surrounding land.

Ground disposal facilities in the 100 Areas were sprayed for weed control between November 1986 and February 1987. About 575 lb of Spike 80 and 4,230 lb of Krovar were applied (the two were not mixed) to the various retired disposal facilities to minimize potential biotransport of residual radionuclides. Minor weed growth developed on several inactive burial sites and was primarily in locations where subsidence backfilling and leveling operations had occurred following herbicide application. These areas were later controlled with an application of the herbicide Roundup.

2.0 AMBIENT AIR MONITORING

Air sampling provides a means of monitoring radionuclides released to the air from N Reactor facilities. The 100-N Area environmental air sampling stations are shown in Figure 2-1. Tables C-1 through C-5 list the radionuclide concentrations detected in the 100-N Area air samples for the reporting period.

Air samples were collected with continuously operating low-volume sample pumps. Ambient air was drawn through a 1 ft^3/min orifice into a stainless steel sample cartridge containing a 47-mm millipore filter and a bed of activated charcoal to collect halogens. The sample cartridges were changed approximately every 4 wk and analyzed for gamma-emitting radionuclides at the Westinghouse Hanford radioanalytical laboratory located in the 105-N Reactor Building.

Average radionuclide concentrations detected in 100-N Area air samples are listed in Table C-1. All averages calculated from two or more values include the standard deviation to indicate the distribution of the data. Minimum and maximum concentrations are also shown to indicate the sample range. All radionuclide concentrations were well below the DOE DCG.

The DCGs are shown for comparison at the bottom of the table. These concentration guides are applicable at the point of actual exposure to members of the public. The radionuclides identified in the 100-N Area ambient air samples are at or near the level of detection. Average concentrations of ^{60}Co and ^{131}I detected in 100-N Area air samples from 1981 to 1987 are presented in Figure 2-2. Ambient air monitoring is conducted for the 1301-N LWDF at a location near the inlet end of the facility (station A1).

Average concentrations of ^{60}Co and ^{131}I detected near the 1301-N Facility from 1981 to 1987 are presented in Figure 2-3. Figures 2-2 and 2-3 indicate a significant decrease in ^{131}I concentrations. Due to the extended "standdown" status of 100-N Reactor, this shorter lived (about 8-d half-life) radionuclide has decreased to below detection limits.

There was, however, a noticeable increase in the ^{60}Co average concentration at the 1301-N Facility. Structural modifications were made to the inlet portion of the 1301-N Facility from October through December 1987. Considerable disturbance to the actual crib surface during the construction period caused resuspension of radionuclides in the immediate vicinity. The 1301-N air sampling station (A1) is located within 30 ft of the construction site.

Air sample analysis during the heaviest disturbance period revealed ^{60}Co concentrations higher than those detected before or after this period with subsequent samples showing an immediate return to predisturbance concentrations. An overall average increase of ^{60}Co concentrations for the entire reporting period is attributable to the disturbances, as shown in Figure 2-3.

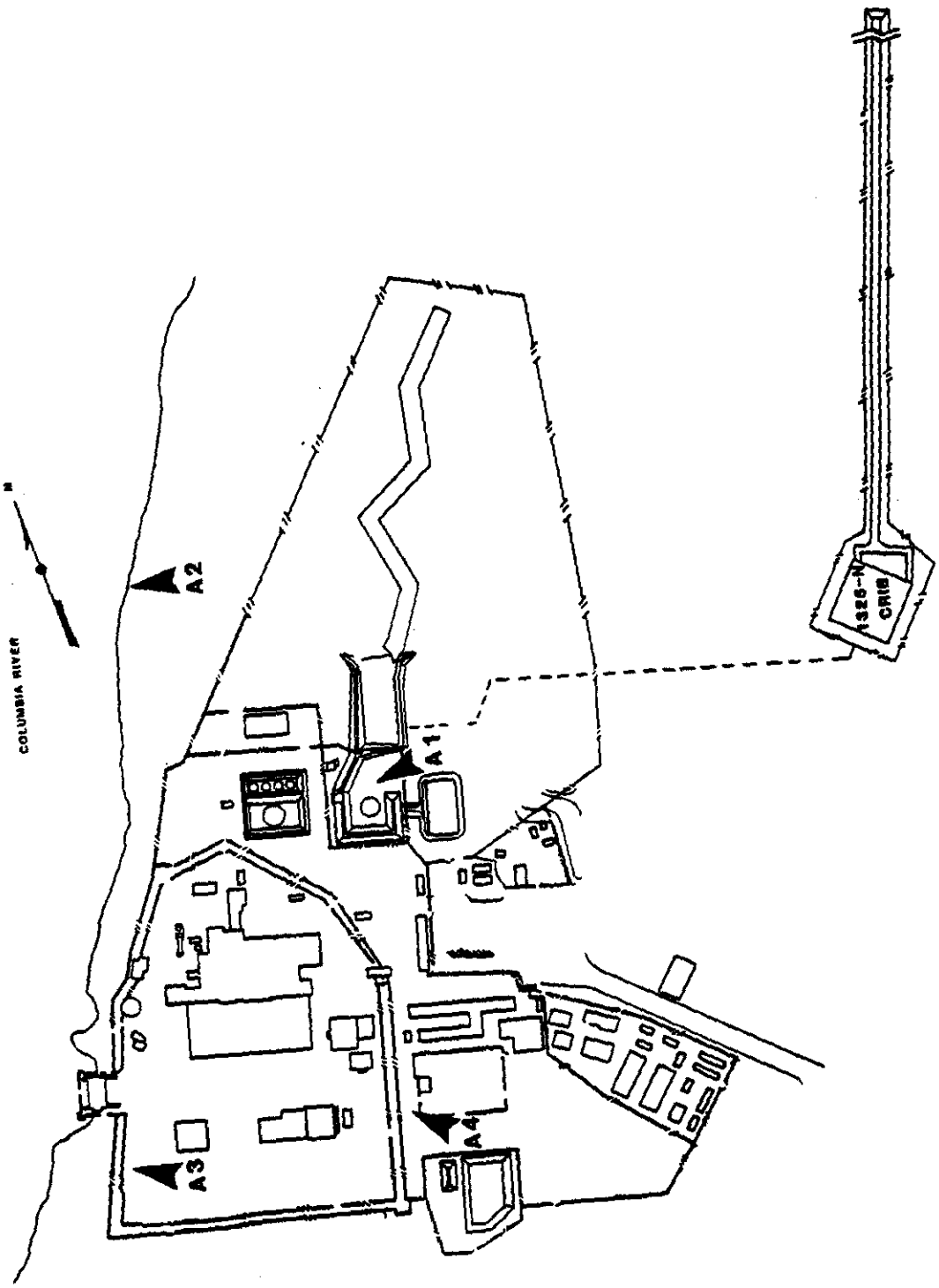

Figure 2-1. Ambient Air Sampling Locations at 100-N Area.

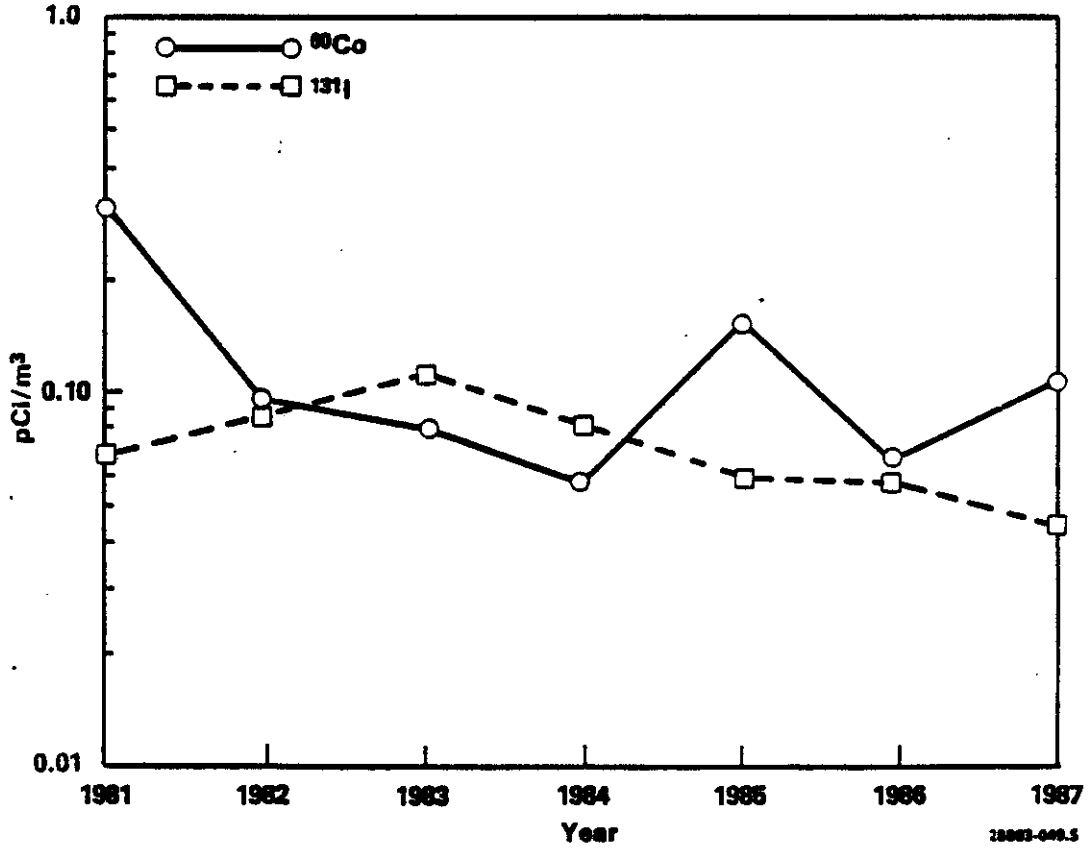

Figure 2-2. Average Concentrations of ^{60}Co and ^{131}I Detected in 100-N Area Ambient Air from 1981 to 1987.

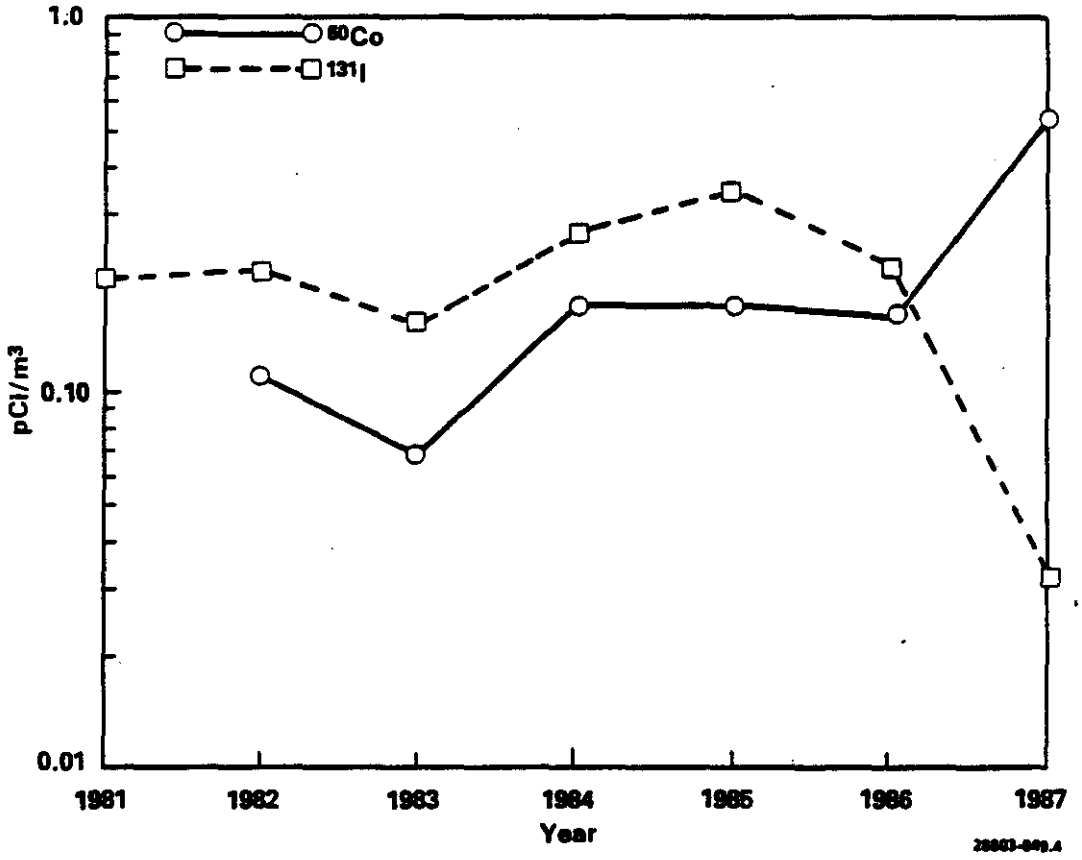

Figure 2-3. Average Concentrations of ^{60}Co and ^{131}I Detected in 1301-N Air Samples from 1981 to 1987.

3.0 GROUNDWATER MONITORING

3.1 RADIOLOGICAL GROUNDWATER SAMPLING--100-N AREA

The 100-N Area groundwater sampling is performed to monitor radionuclide concentrations in the groundwater beneath the 1301-N LWDF, the 1325-N LWDF, and other 100-N Area facilities. Groundwater samples are also collected to monitor the integrity of underground piping, basins, and tanks. The locations of the groundwater sampling wells are shown in Figure 3-1. Samples of groundwater (4-L) were collected quarterly by PNL and analyzed for gamma-emitting radionuclides at the 100-N, Westinghouse Hanford radioanalytical laboratory. Duplicate samples collected by PNL were analyzed for tritium and $^{89,90}Sr$ by UST. Radionuclide concentrations detected in the quarterly groundwater samples are presented in Tables D-1 through D-8. The samples contain radionuclides attributable to liquid effluents discharged to the 1325-N LWDF (Rokkan 1986). Radionuclides that do not either decay or are not retained in the soil column beneath the LWDFs are ultimately released to the Columbia River via the N Springs shoreline. This discharge is monitored at well N-8T and the entire length (about 2 mi) of the shoreline between 100-N and 100-D/DR Areas is characterized annually. Detailed discussions of these sampling results are reported in annual effluent release reports and N Springs characterization reports, respectively. The only radionuclide with concentrations above the DCG at the N Springs is ^{90}Sr.

The average concentrations of ^{60}Co, ^{90}Sr, and ^{131}I detected in well N-2 from 1981 to 1987 are presented in Figure 3-2. These radionuclides are useful as indicators of groundwater contamination and migration. Figure 3-3 shows average concentrations of the same radionuclides detected in well N-7. These two wells were selected for comparison because of their positions relative to the 1301-N and 1325-N LWDFs. In early 1987, construction of new facilities at 100-N Area necessitated the removal of well N-7. To replace this well as an indicator of groundwater radionuclide movement, well N-33 was chosen. This well is about 600 ft north-northeast of the N-7 site, in the same relative (to N-2) groundwater gradient. Figure 3-4 shows average concentrations of ^{60}Co, ^{90}Sr, and ^{131}I detected in well N-33 from 1985 to 1987.

Concentrations of ^{60}Co, ^{90}Sr, and ^{131}I all decreased in well N-2 for the reporting period. This is to be expected since liquid effluent is no longer discharged to the 1301-N LWDF. Rather, the 1325-N LWDF has been receiving this effluent since September 1985. The trend depicted in well N-33 exhibits this increased groundwater contaminant loading. Average ^{90}Sr concentrations in well N-33 decreased to below the DCG in 1987, and ^{131}I concentrations measured in the latter part of 1987 indicate significantly reduced values due to the standdown status of the N Reactor and subsequently decreased liquid effluent discharges to the 1325-N LWDF. The longer-lived ^{60}Co concentrations remained relatively stable throughout the reporting period.

3.2 OIL AND GREASE SAMPLING--100-N AREA

Samples of groundwater (1 qt) were collected on a variable frequency from several oil detection wells. After organoleptic inspection, the samples were sent to the Hanford Environmental Health Foundation (HEHF) and analyzed for oil and grease. These data are used to monitor the integrity of underground oil transfer lines and oil storage tanks at 100-N Area.

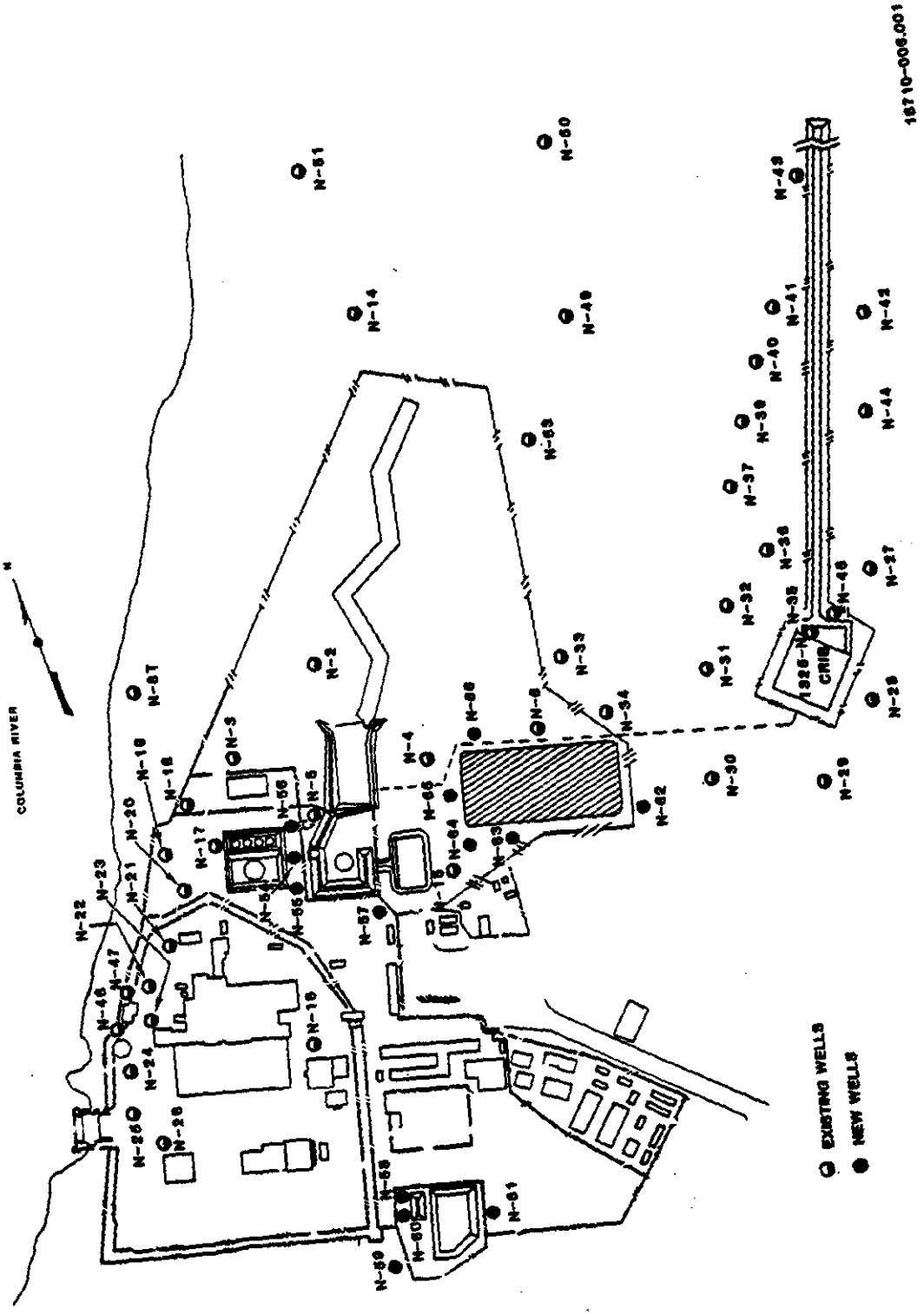

Figure 3-1. Location of Groundwater Wells at 100-N Area.

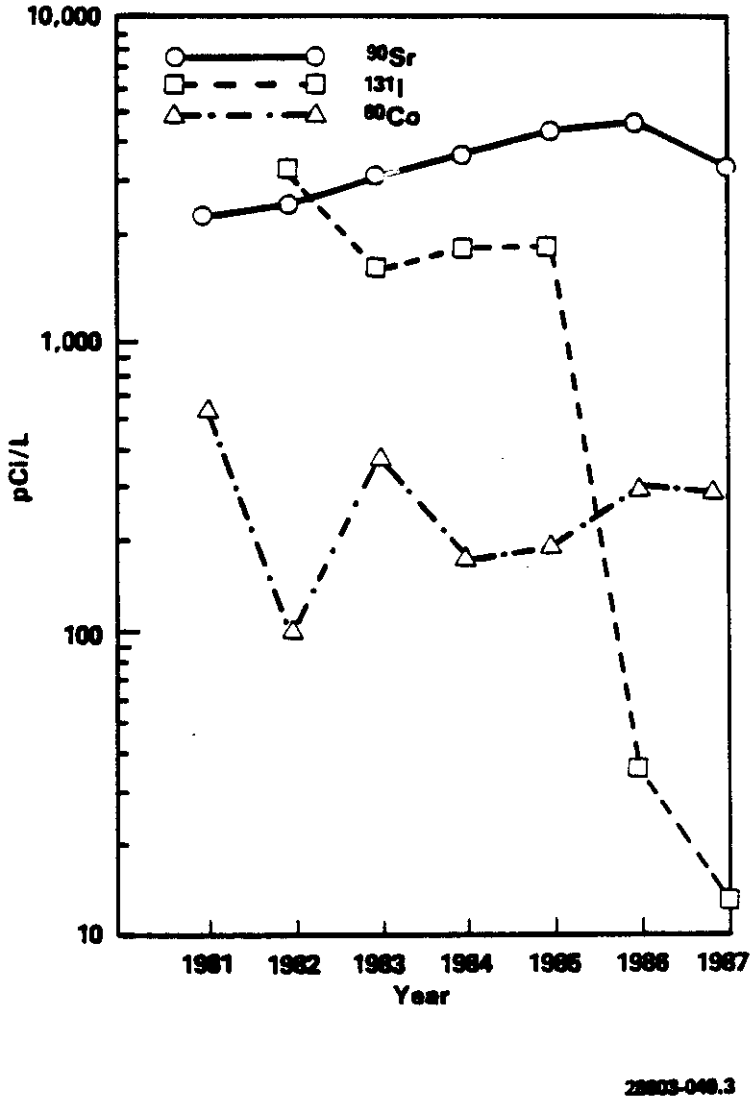

Figure 3-2. Average Concentration of ^{60}Co, ^{90}Sr, and ^{131}I Detected in Well N-2 from 1981 through 1987. (Concentrations for ^{90}Sr obtained from Hanford Site Groundwater Surveillance Reports (1980 through 1986 PNL).)

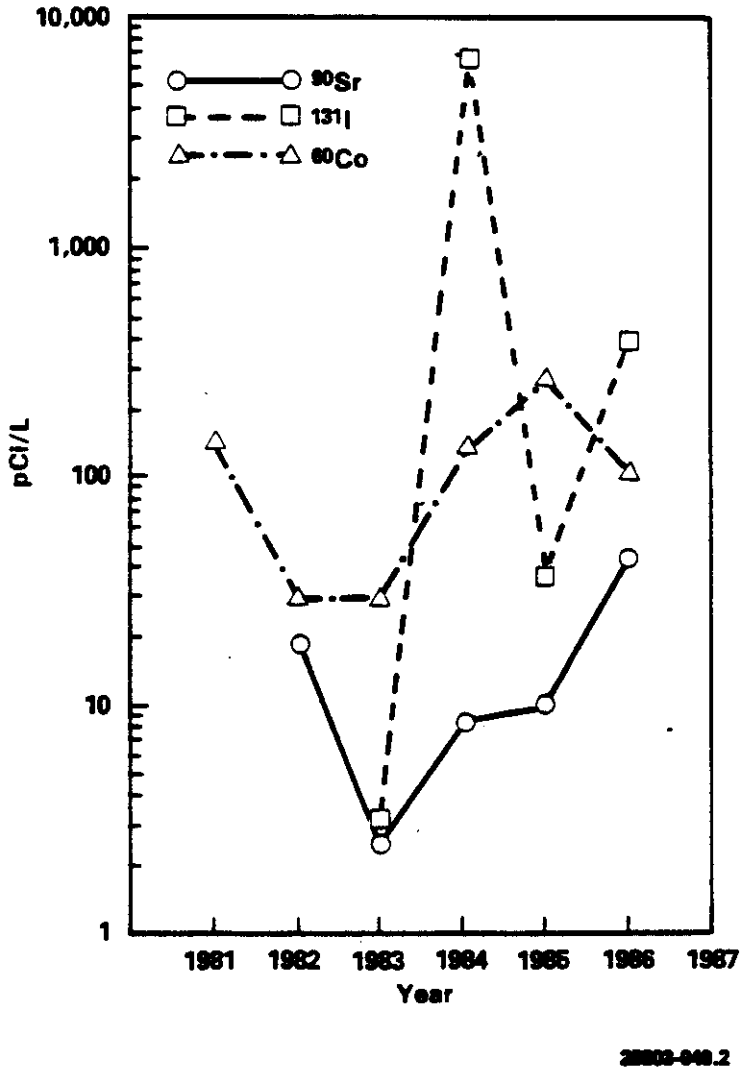

Figure 3-3. Average Concentration of ^{60}Co, ^{90}Sr, and ^{131}I Detected in Well N-7 from 1981 through 1986. (Concentrations for ^{90}Sr obtained from Hanford Site Groundwater Surveillance Reports (1980 through 1986 PNL).)

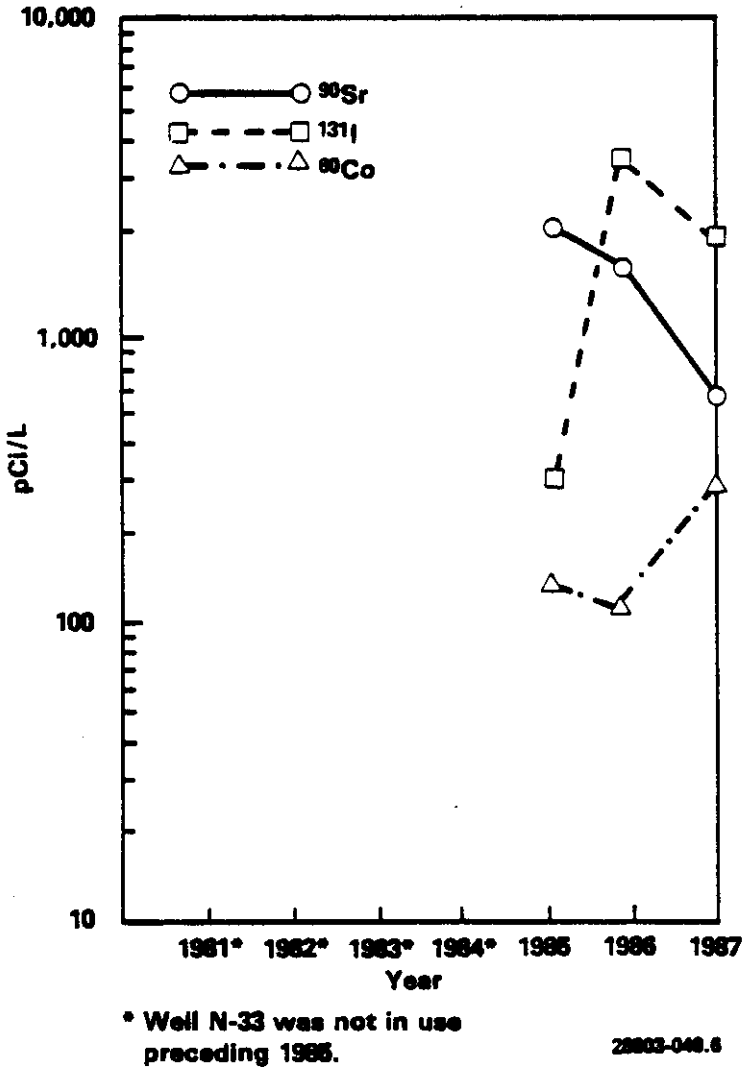

Figure 3-4. Average Concentration of ^{60}Co, ^{90}Sr, and ^{131}I Detected in Well N-33 from 1985 through 1987.

Average oil and grease concentrations detected in 100-N Area groundwater samples are presented in Table 3-1. The lower limit of detection is 1 mg/L. Most samples contained concentrations of oil and grease less than or near the level of detection. Table D-9 lists the oil and grease concentrations detected in 100-N Area groundwater monitoring wells for each reporting date from October 7, 1986 to December 29, 1987.

Table 3-1. Oil and Grease Concentrations Detected in 100-N Area Groundwater (mg/L).

Well[a]	Number of samples	Maximum	Minimum	Average	Standard deviation
N-16	45	17,000	<1.0	1,300	3,200
N-17	14	15	<1.0	2.1	3.8
N-18	14	2.8	<1.0	1.4	0.6
N-19	14	1.1	<1.0	1.0	0.0
N-20	14	1.2	<1.0	1.1	0.4
N-21	9	2.2	<1.0	1.5	1.7
N-22	11	6.7	<1.0	1.5	1.7
N-23	23	1.9	<1.0	1.1	0.2
N-24	24	3.3	<1.0	1.1	0.5
N-25	37	2.6	<1.0	1.1	0.3
N-26	19	1.9	<1.0	1.1	0.3

[a]Locations identified in Figure 3-1. PSTS8-2230-3-1

A leak in the 184-N diesel oil day tank supply line spilled about 1,000 gal of #2 diesel oil from June 19 to 22, 1986. Diesel oil was detected in well N-16 on July 7, 1986.

Some of the oil was recovered by pumping groundwater from well N-16. This recovery operation was conducted until oil and grease concentrations stabilized in June 1987. Continued monitoring indicated that oil and grease concentrations in N-16 remained detectable, but at greatly reduced levels (less than 3 mg/L), for the remainder of the year.

3.3 RADIOLOGICAL GROUNDWATER SAMPLING--100-K AREA

In 1981, a leak was detected in the 105-KE Reactor Fuel Storage Basin. The leak was repaired and water levels in the basin are now continuously monitored and reveal no detectable leakage. In addition, Westinghouse Hanford samples four groundwater wells located near the 105-KE Reactor Building to provide detection of leakage from the storage basin.

Samples (4-L) were collected quarterly and analyzed for gamma-emitting radionuclides at the Westinghouse Hanford radioanalytical laboratory. Duplicate samples collected by PNL were analyzed for tritium by UST. The sampling locations are shown on Figure 3-5. Radionuclide concentrations detected in the 100-K Area groundwater samples are presented in Tables D-1 through D-8. The concentrations of ^{125}Sb detected in samples from wells K-27 and K-28 indicate residual contamination from past leaks of basin storage water.

Average radionuclide concentrations detected in well K-27 from 1982 through 1987 are presented in Table D-10. The data indicate that concentrations of ^{125}Sb (2.7-yr half-life) in well K-27 have stabilized.

Tritium concentrations detected in well K-30 have exceeded those of any other 100 Area groundwater monitoring well since 1982. The range of tritium concentrations is large for this period, with no obvious trend predictable since even the 1987 levels fall within the historic range of tritium concentrations for well K-30. The 1987 concentration average was near 50% of the DCG for tritium (2.0 E+06 pCi/L).

The most probable source of tritium in well K-30 is from the nearby 115-KE crib (see Figure 3-5) which received significant amounts of tritium from the dryer room condensate in the 100-KE Reactor (operated from 1955 to 1971). Well K-30 is located about 200 ft down gradient from the 115-KE crib. Table 3-2 lists average tritium concentrations in each of these 100-K Area wells from 1982 through 1987.

Table 3-2. Tritium Concentrations Detected in 100-KE Area Groundwater (pCi/L) from 1982 through 1987.

Year	Well[a]			
	K-27	K-28	K-29	K-30
1982	4.5 E+03	3.4 E+03	8.5 E+03	8.8 E+05
1983	3.1 E+03	2.1 E+03	2.0 E+04	6.8 E+05
1984	3.0 E+03	2.5 E+03	4.9 E+04	4.3 E+05
1985	1.8 E+03	3.6 E+03	4.9 E+04	4.2 E+05
1986	1.5 E+03	3.1 E+03	3.7 E+04	6.4 E+05
1987	1.5 E+03	4.2 E+03	9.9 E+03	8.3 E+05

NOTE: DCG = 2.0 E+06 pCi/L.
[a]Locations identified in Figure 3-5. PST88-3230-3-2

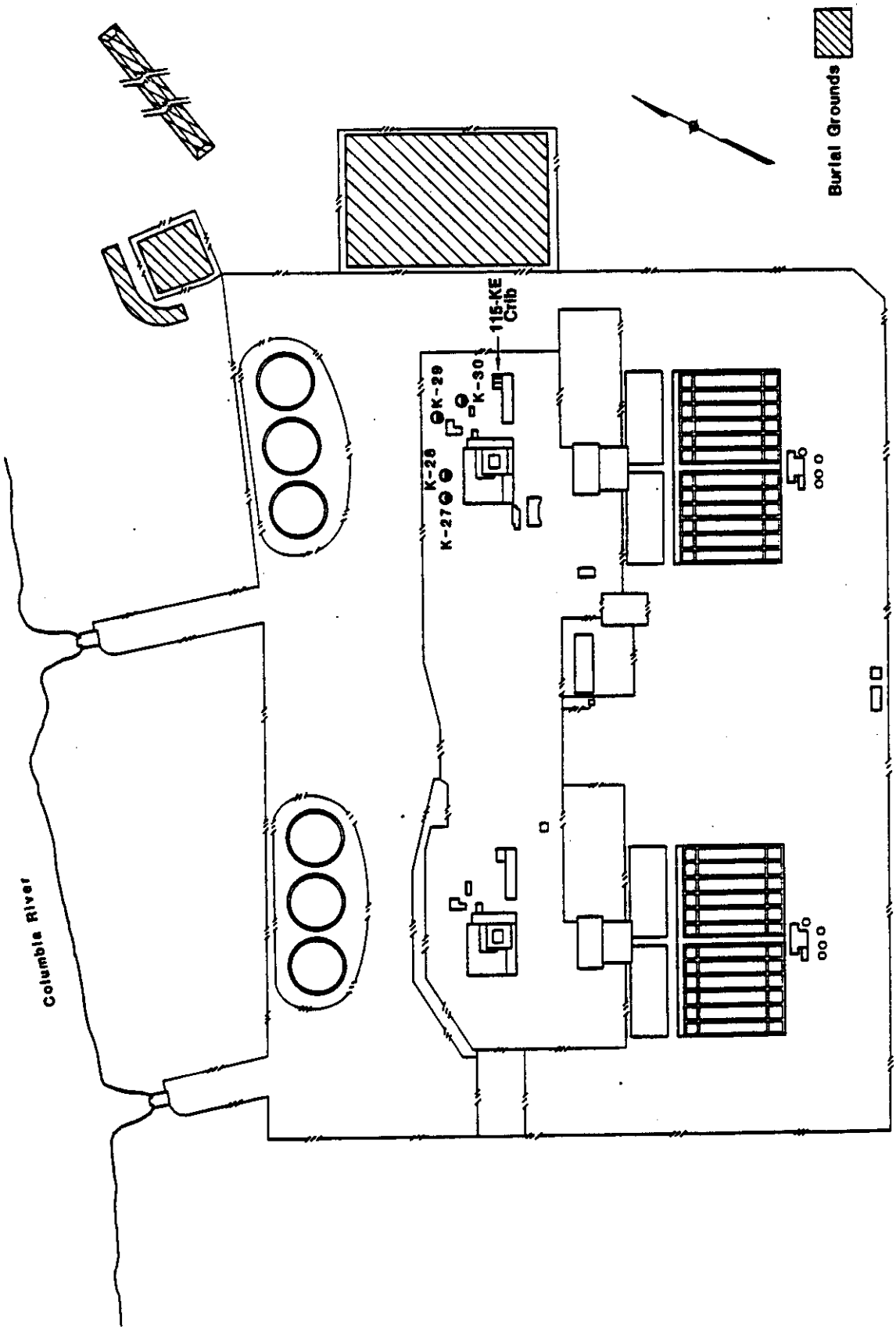

Figure 3-5. Location of Groundwater Wells at 100-K Area.

4.0 SOIL AND VEGETATION MONITORING

4.1 SOIL SAMPLING

Surface soil samples provide a means of evaluating the environmental distribution of radionuclides from releases to the air or liquid releases to the soil.

Surface soil was sampled at each of the locations shown in Figure 4-1. Duplicate samples of about 150 g each were collected from the top 2.5 cm of the soil surface. One of each duplicate sample was sent to UST for strontium and plutonium analysis. Each remaining duplicate sample was analyzed for gamma-emitting radionuclides at the 100-N, Westinghouse Hanford radioanalytical laboratory.

Construction of various new facilities at 100-N Area during the reporting period caused two soil and vegetation sampling locations to be either inaccessible or permanently destroyed. These locations will be reestablished or relocated for future environmental surveillances.

4.1.1 100-N Area

Four of the surface soil samples (N2 through N5) were collected at locations near the 1301-N LWDF. Radionuclides contained in the LWDF effluent were detected in the samples. As the data indicate, the concentrations show a large degree of variance depending upon sample location. In general, the samples collected nearer the 1301-N crib portion of the facility contained relatively higher concentrations of the contaminants. Average radionuclide concentrations detected in 100-N Area surface soil from 1980 through 1987 in locations near the 1301-N LWDF (sites N2-N5) are presented in Table 4-1. Average radionuclide concentrations detected in 100-N Area surface soil from 1980 through 1987 in locations N6 through N12 are presented in Table 4-2.

Radionuclide concentrations detected in 100-N Area surface soil are presented in Tables E-1 and E-2. Average radionuclide concentrations for the Hanford Site and offsite, as reported by PNL for 1986, are included for comparison. The 100-N values are comparable to the Hanford Site averages.

4.1.2 Retired 100 Areas

Environmental surveillance in the retired 100 Areas is conducted to monitor radionuclides detected in environmental media located near the retired reactor facilities and 100 Area burial grounds. The program consists primarily of soil and vegetation sampling in each of the retired areas. Sample locations were chosen immediately adjacent to retired waste disposal facilities in a manner to maximize the potential for detecting contamination. Environmental samples of surface soil collected near the retired 100 Area reactor facilities indicated no elevated levels of radionuclides when compared to the Hanford Site average concentrations. Surface soil and vegetation sampling locations for the retired 100 Areas are presented in Figures 4-2 through 4-6.

Average radionuclide concentrations detected in surface soil samples for each of the retired 100 Areas from 1980 through 1987 are presented in Tables 4-3 through 4-7. The results of the 1987 surface soil analyses for each sample location in the retired 100 Areas are presented in Tables E-3 through E-7.

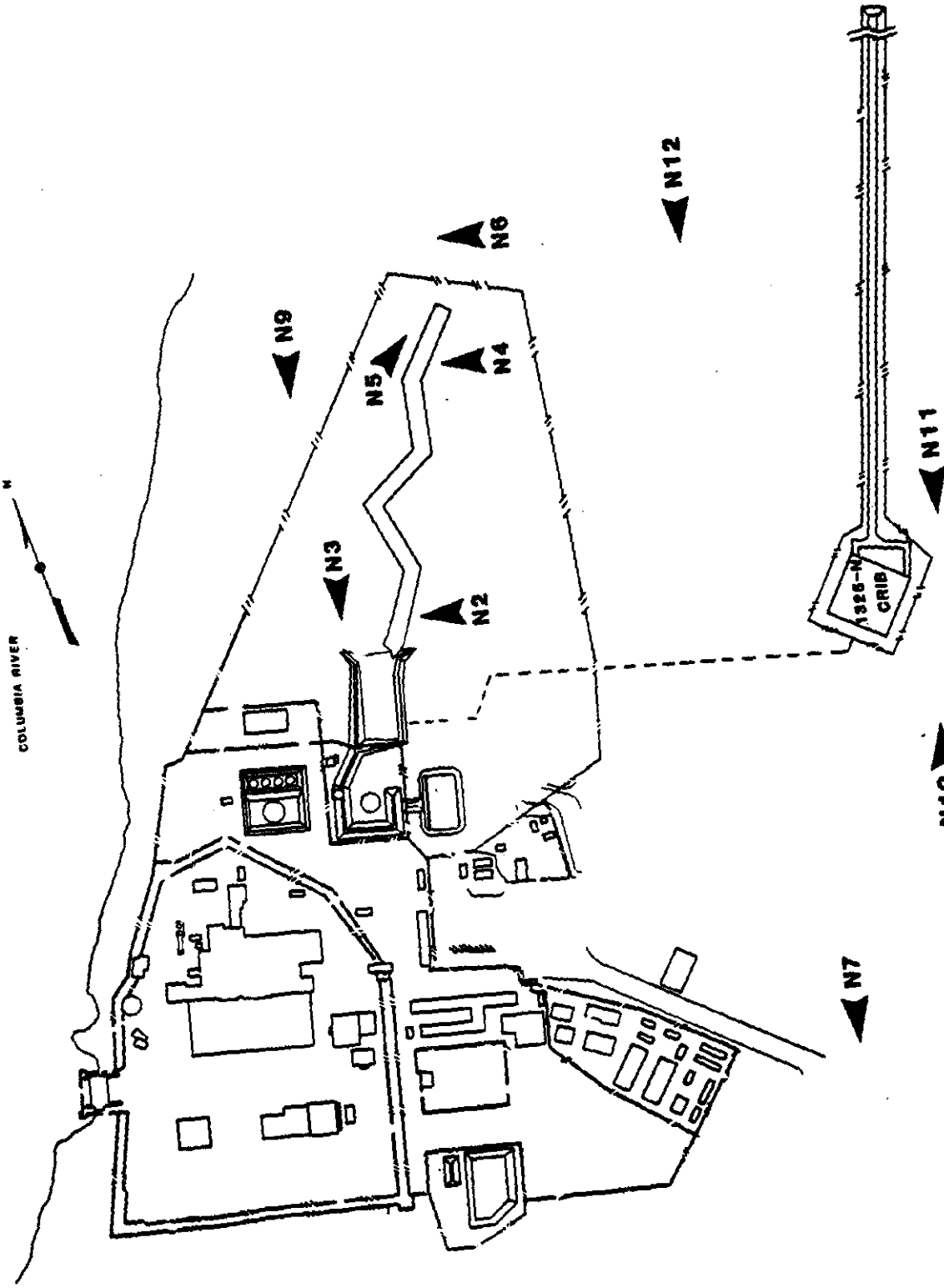

Figure 4-1. Surface Soil Sampling Locations at 100-N Area.

Table 4-1. Average Radionuclide Concentrations (pCi/g) Detected in Soil Samples Near the 1301-N Liquid Waste Disposal Facility from 1980 through 1987.

Year	^{54}Mn	^{60}Co	^{90}Sr	^{137}Cs	$^{239,240}Pu$	^{238}Pu
1980	2.5 E+00	1.3 E+00	3.5 E-01	4.1 E+00	2.5 E-02	NR
1981	6.6 E+00	4.0 E+00	7.0 E-01	6.1 E+00	4.4 E-02	NR
1982	6.6 E-01	6.3 E+00	2.7 E-01	2.7 E+00	1.8 E-02	NR
1983	4.1 E-01	5.4 E+00	1.3 E+00	3.8 E+00	4.3 E-02	NR
1984	1.8 E-01	2.8 E+00	2.1 E-01	1.1 E+00	1.7 E-02	NR
1985	1.5 E+00	1.3 E+01	6.5 E-01	3.9 E+00	3.2 E-02	NR
1986	1.6 E-01	4.5 E+00	2.2 E-01	2.5 E+00	1.7 E-02	NR
1987	3.2 E-01	5.1 E+00	3.4 E-01	1.6 E+00	2.2 E-02	5.4 E-03

NR = Not reported.

PST88-3230-4

Table 4-2. Average Radionuclide Concentrations (pCi/g) Detected in 100-N Area Surface Soil Samples from 1980 through 1987.

Year	^{54}Mn	^{60}Co	^{90}Sr	^{137}Cs	$^{239,240}Pu$	^{238}Pu
1980	2.4 E-01	8.5 E-01	1.8 E-01	5.0 E-01	1.8 E-02	NR
1981	1.6 E-01	1.3 E+00	2.1 E-01	1.0 E+00	1.1 E-02	NR
1982	1.3 E-01	1.6 E+00	9.9 E-02	3.4 E-01	5.0 E-03	NR
1983	2.1 E-01	2.7 E+00	2.9 E-01	4.4 E-01	8.5 E-03	NR
1984	NR	8.8 E-01	2.8 E-01	6.2 E-01	1.4 E-02	NR
1985	1.2 E-01	1.2 E+00	1.3 E-01	5.2 E-01	1.3 E-02	NR
1986	1.1 E-01	4.1 E-01	8.3 E-02	5.0 E-01	8.2 E-03	NR
1987	9.1 E-02	4.1 E-01	1.1 E-01	3.9 E-01	6.7 E-03	1.1 E-03

NR = Not reported.

PST88-3230-5

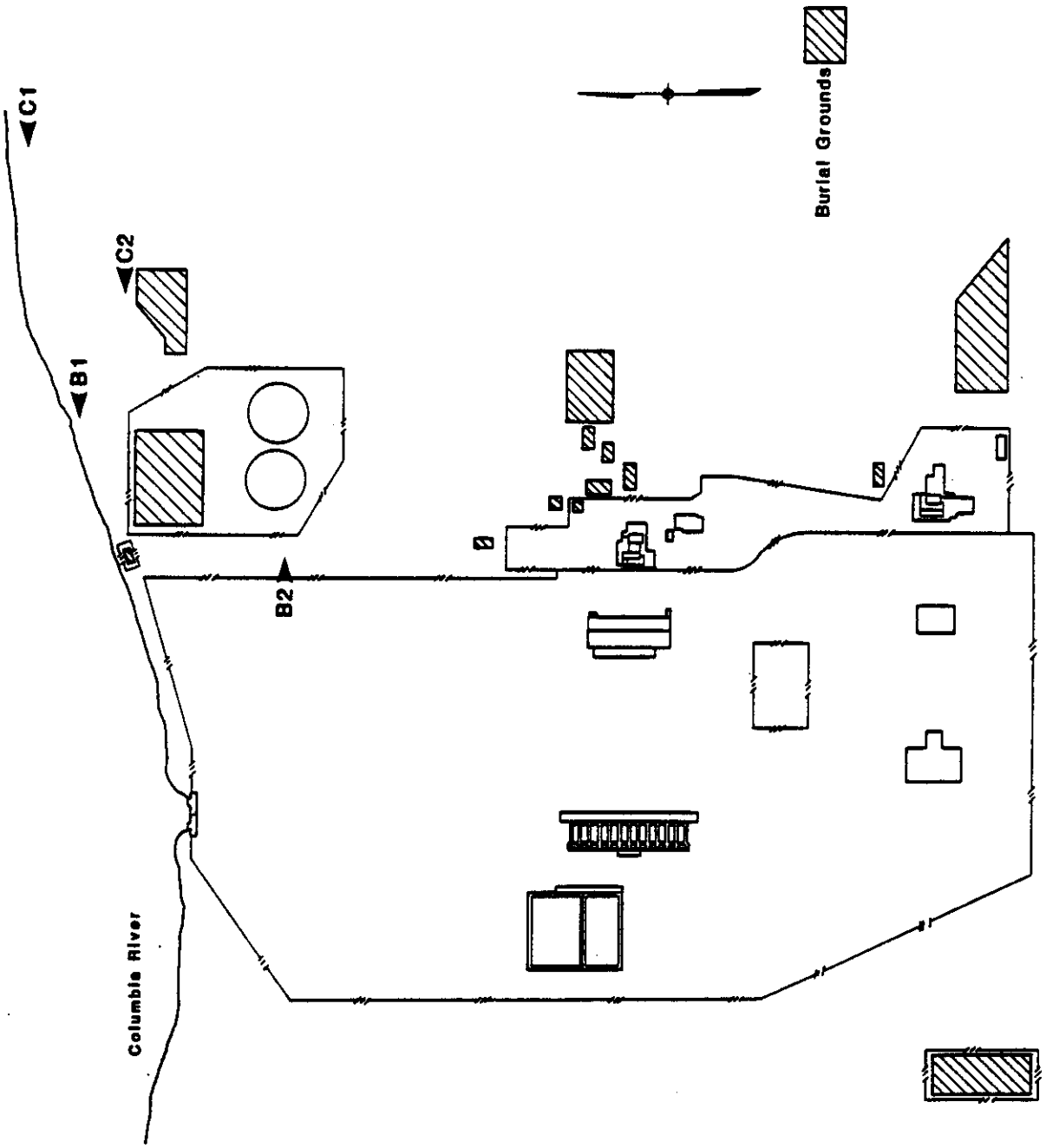

Figure 4-2. Soil and Vegetation Sampling Locations at 100-B/C Area.

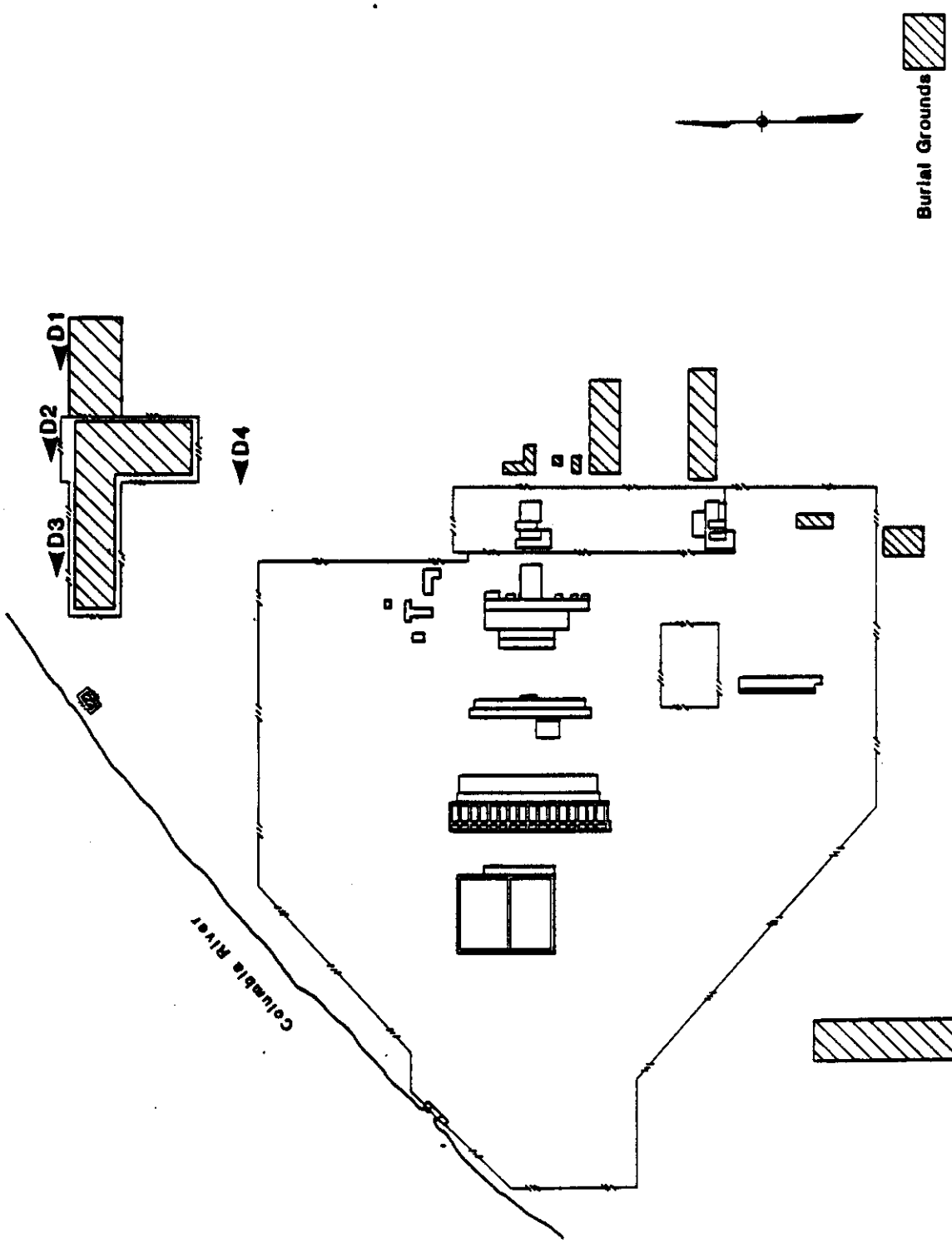

Figure 4-3. Soil and Vegetation Sampling Locations at 100-D/DR Area.

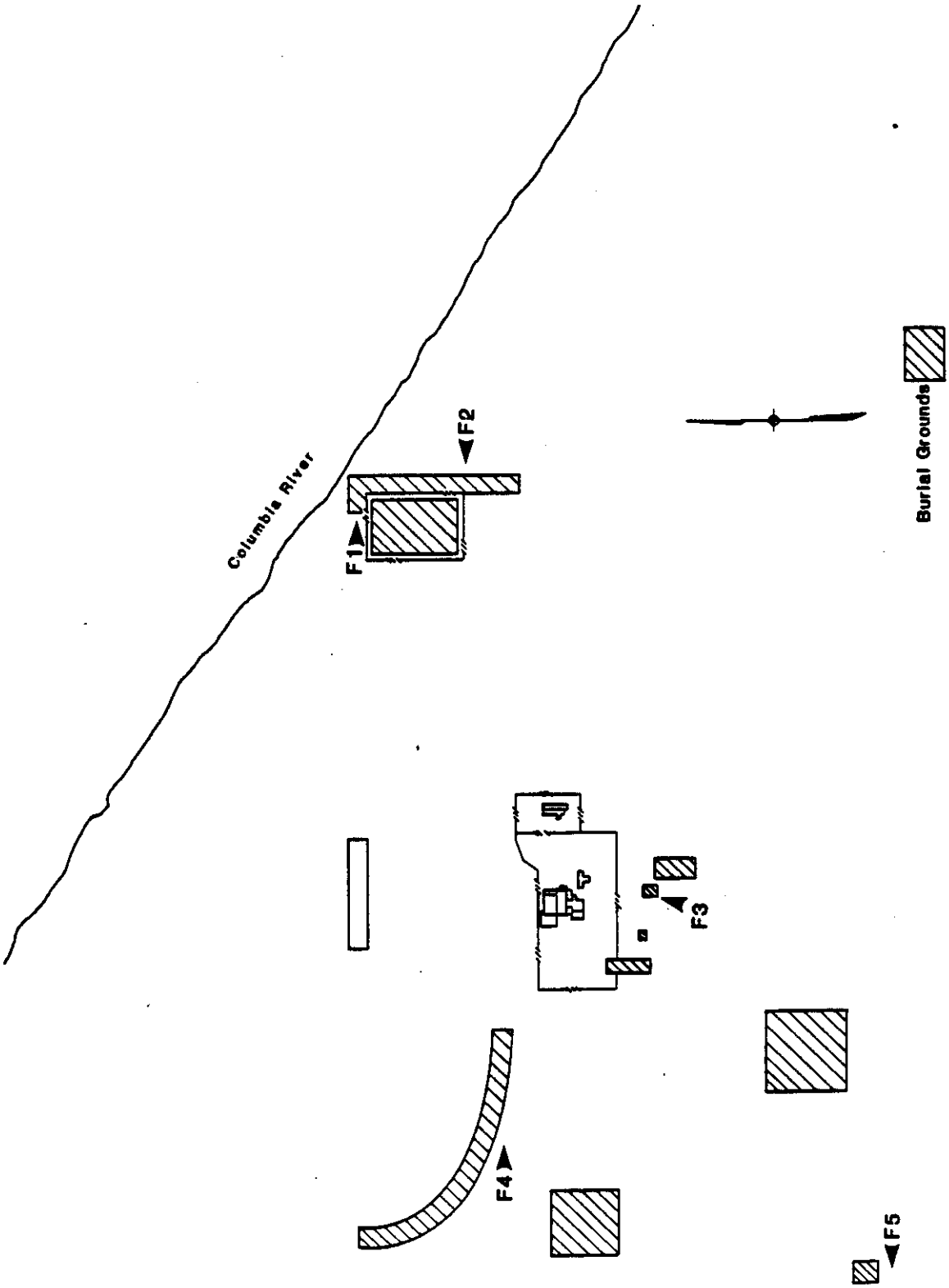

Figure 4-4. Soil and Vegetation Sampling Locations at 100-F Area.

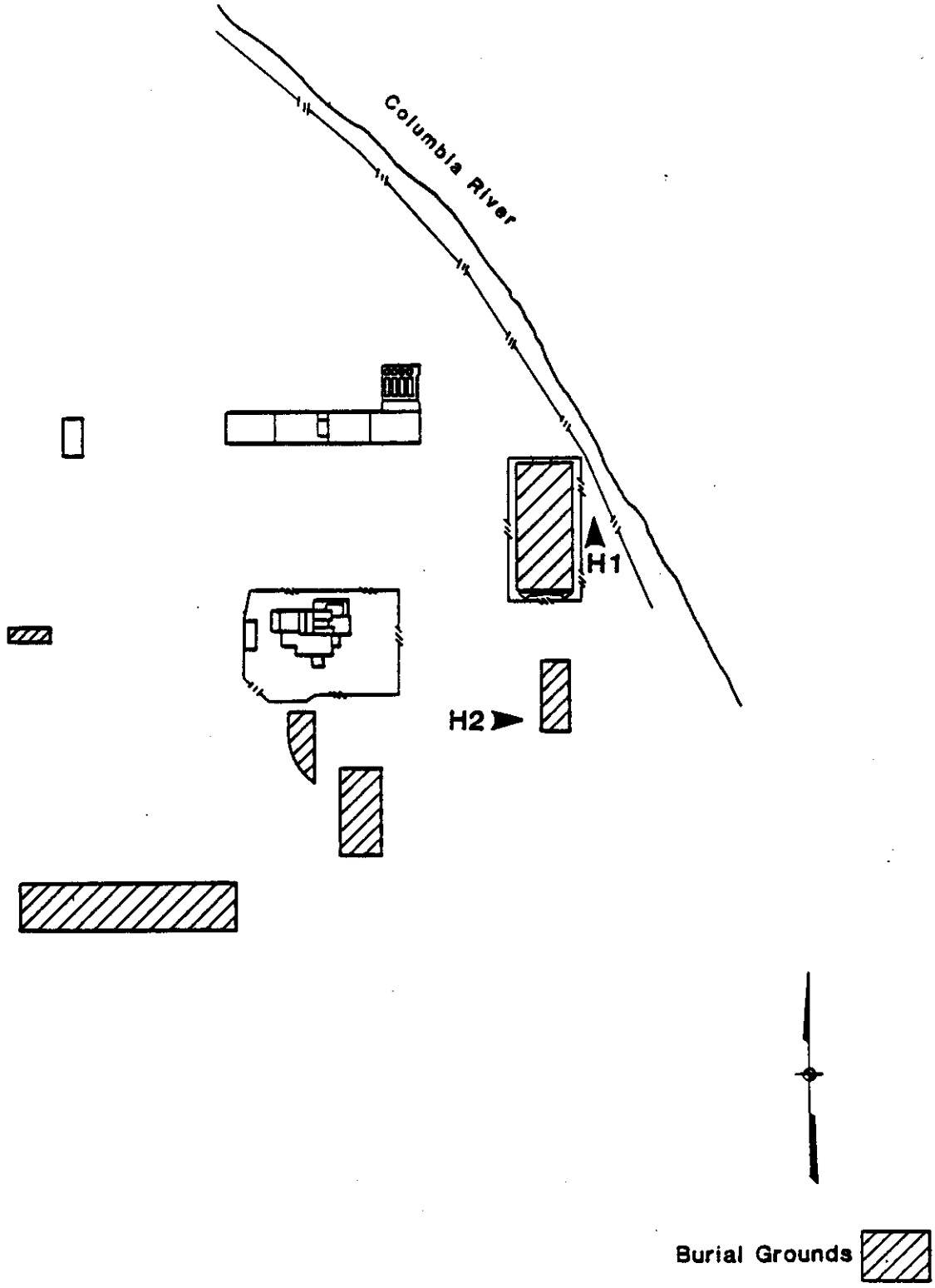

Figure 4-5. Soil and Vegetation Sampling Locations at 100-H Area.

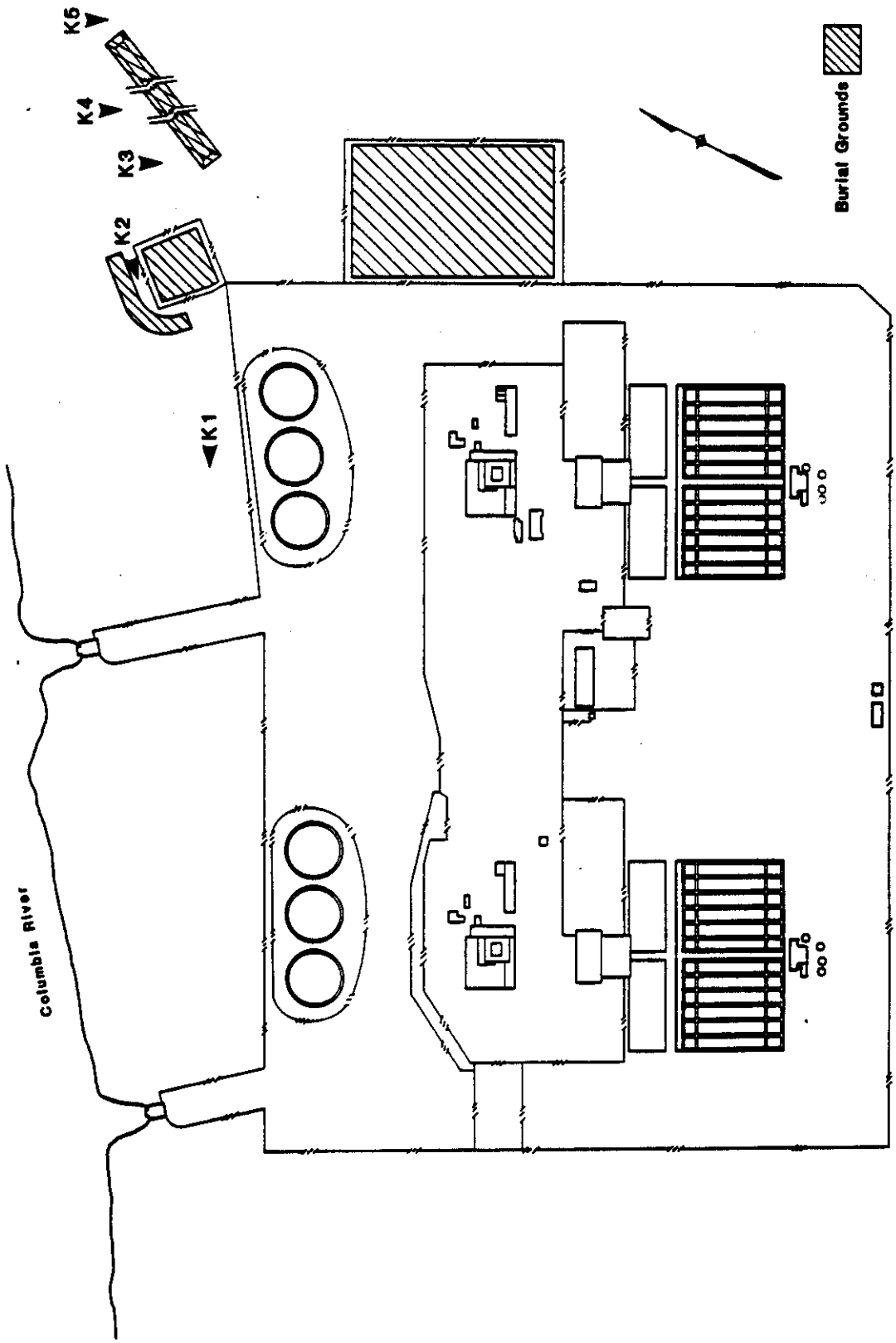

Figure 4-6. Soil and Vegetation Sampling Locations at 100-K Area.

Table 4-3. Average Radionuclide Concentrations (pCi/g) Detected in 100-B/C Area Surface Soil Samples from 1981 through 1987.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1981	5.7 E-01	NR	1.2 E+00	NR	NR
1982	8.2 E-01	NR	1.3 E+00	NR	NR
1983	4.2 E-01	NR	1.5 E+00	NR	NR
1984	5.4 E-01	3.2 E-01	1.9 E+00	1.0 E-03	2.4 E-02
1985	2.7 E-01	2.4 E-02	4.5 E-01	2.9 E-04	8.8 E-04
1986	1.8 E-01	1.2 E-01	6.4 E-01	5.5 E-04	8.3 E-03
1987	2.6 E-01	1.1 E-01	9.2 E-01	6.2 E-04	1.4 E-02

NR = Not reported. PST88-3228-6

NOTE: Table E-3 lists the results of the 1987 analysis of 100-B/C Area surface soil samples.

Table 4-4. Average Radionuclide Concentrations (pCi/g) Detected in 100-D/DR Area Surface Soil Samples from 1981 through 1987.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1981	3.6 E-01	NR	4.0 E-01	NR	NR
1982	4.9 E-01	NR	3.2 E-01	NR	NR
1983	4.2 E-01	NR	1.7 E-01	NR	NR
1984	2.2 E-01	1.4 E-01	1.6 E-01	1.4 E-04	9.8 E-03
1985	2.4 E-01	5.6 E-02	2.7 E-01	2.1 E-04	3.0 E-03
1986	2.6 E-01	7.3 E-02	8.7 E-01	3.2 E-04	5.8 E-03
1987	2.8 E-01	2.0 E-01	1.1 E+00	1.6 E-03	1.8 E-02

NR = Not reported. PST88-3230-7

NOTE: Table E-4 lists the results of the 1987 analysis of 100-D/DR Area surface soil samples.

Table 4-5. Average Radionuclide Concentrations (pCi/g) Detected in 100-F Area Surface Soil Samples from 1981 through 1987.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1981	2.9 E-01	NR	6.0 E-01	NR	NR
1982	1.4 E+00	NR	1.7 E+00	NR	NR
1983	2.7 E-01	NR	8.6 E-01	NR	NR
1984	1.1 E+00	4.4 E-01	7.0 E-01	5.0 E-04	1.0 E-02
1985	3.0 E-01	2.9 E-01	8.3 E-01	6.5 E-04	9.8 E-03
1986	2.3 E-01	2.7 E-01	7.4 E-01	3.8 E-04	1.1 E-02
1987	1.9 E-01	2.4 E-01	5.5 E-01	6.4 E-04	9.3 E-03

NR = Not reported. PST96-3230-8

NOTE: Table E-5 lists the results of the 1987 analysis of 100-F Area surface soil samples.

Table 4-6. Average Radionuclide Concentrations (pCi/g) Detected in 100-H Area Surface Soil Samples from 1981 through 1987.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1981	1.5 E-01	NR	9.0 E-02	NR	NR
1982	1.8 E-01	NR	3.4 E-01	NR	NR
1983	1.6 E-01	NR	4.7 E-01	NR	NR
1984	3.7 E-01	2.4 E-01	1.7 E+00	6.9 E-04	1.5 E-02
1985	1.4 E-01	9.8 E-02	2.3 E-01	1.9 E-04	5.7 E-03
1986	1.8 E-01	7.1 E-02	8.9 E-01	6.1 E-04	1.0 E-02
1987	2.8 E-01	1.9 E-01	2.0 E+00	8.5 E-04	3.1 E-02

NR = Not reported. PST96-3230-9

NOTE: Table E-6 lists the results of the 1987 analysis of 100-H Area surface soil samples.

Table 4-7. Average Radionuclide Concentrations (pCi/g) Detected in 100-K Area Surface Soil Samples from 1981 through 1987.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1981	8.3 E-01	NR	4.4 E+00	NR	NR
1982	2.6 E+01	NR	8.8 E-01	NR	NR
1983	5.5 E+01	NR	5.3 E+01	NR	NR
1984	3.3 E+00	8.4 E-01	1.2 E+01	9.6 E-04	2.9 E-02
1985	7.4 E-01	2.9 E-01	1.1 E+00	1.4 E-03	3.2 E-02
1986	1.0 E+00	1.8 E-01	1.1 E+00	9.1 E-04	2.3 E-02
1987	1.2 E+00	4.3 E-01	1.3 E+00	2.7 E-03	5.5 E-02

NR = Not reported. PSTS8-3230-10

NOTE: Table E-7 lists the results of the 1987 analysis of 100-K Area surface soil samples.

4.2 VEGETATION SAMPLING

Vegetation samples provide a means of evaluating the distribution of radionuclides deposited on vegetation from airborne releases or the uptake of radionuclides from the soil. Duplicate samples of green vegetation (about 500 g each) were collected from available perennial shrubs at the same locations from which surface soil samples were obtained (Figure 4-1). The vegetation consisted of gray rabbitbrush (Chrysothamnus nauseosus). Strontium and plutonium analyses were conducted by UST; gamma analyses were conducted at the 100-N, Westinghouse Hanford radioanalytical laboratory.

4.2.1 100-N Area

Four of the vegetation samples (N2 through N5) were collected at locations near the 1301-N LWDF. Radionuclide concentrations detected in vegetation samples collected near the 1301-N LWDF are listed in Table E-8. Average radionuclide concentrations detected in the vegetation from 1980 through 1987 are presented in Table 4-8. The concentrations can be attributed to uptake of the radionuclides from the contaminated soil near the 1301-N LWDF.

Radionuclide concentrations detected in the 100-N Area vegetation samples outside the 1301-N LWDF area are presented in Table E-9. Concentrations in 100-N Area vegetation samples were comparable to those reported for the Hanford Site average. Average radionuclide concentrations detected in 100-N Area vegetation from 1980 through 1987, from sampling sites N6 through N12, are presented in Table 4-9.

Vegetation samples were also collected from three locations at 100-N Area along the Columbia River shoreline (Figure 4-7). This portion of the shoreline, N Springs, contains small springs caused by underground drainage of 1325-N LWDF effluent (see explanation in Groundwater Monitoring section). Wildrye (Elymus sp.) growing near the N Springs was sampled. The plants were growing through the cover of boulders along the shoreline. The samples were collected and analyzed using the methods previously described.

Table 4-8. Average Radionuclide Concentrations (pCi/g) Detected in Vegetation Samples Near the 1301-N Liquid Waste Disposal Facility from 1980 through 1987.

Year	^{54}Mn	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1980	1.4 E+00	4.0 E+00	NR	1.1 E+00	NR	NR
1981	2.5 E+00	1.2 E+01	1.8 E+00	1.8 E+00	NR	7.1 E-03
1982	4.6 E-01	1.6 E+00	1.2 E-01	2.6 E-01	NR	2.6 E-03
1983	4.5 E-01	1.9 E+00	6.0 E-01	3.9 E-01	NR	3.2 E-03
1984	2.9 E-01	1.0 E+00	1.2 E-01	8.3 E-02	NR	8.5 E-04
1985	5.9 E-01	1.7 E+00	1.9 E+00	1.0 E-01	NR	1.5 E-03
1986	6.8 E-01	3.5 E+00	7.3 E-02	6.5 E-01	NR	2.6 E-03
1987	4.9 E-01	2.8 E+00	6.3 E-02	2.0 E-01	1.2 E-03	5.6 E-03

NR = Not reported.

PSTS8-3230-11

Table 4-9. Average Radionuclide Concentrations (pCi/g) Detected in 100-N Area Vegetation Samples from 1980 through 1987.

Year	^{54}Mn	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1980	4.8 E-01	1.0 E+00	NR	2.8 E-01	NR	NR
1981	1.8 E+00	2.5 E+01	5.8 E-01	7.1 E-01	NR	2.1 E-02
1982	4.9 E-01	1.5 E+00	2.0 E-01	1.3 E-01	NR	7.8 E-03
1983	3.6 E-01	1.0 E+00	2.9 E-01	9.0 E-02	NR	8.6 E-03
1984	1.3 E-01	4.6 E-01	8.1 E-02	9.0 E-02	NR	1.3 E-03
1985	3.6 E-01	1.4 E+00	5.1 E-02	1.6 E-01	NR	8.7 E-04
1986	2.6 E-01	9.5 E-01	2.2 E-01	7.9 E-01	NR	1.1 E-03
1987	1.1 E-01	7.0 E-01	2.6 E-01	9.4 E-02	1.3 E-04	5.8 E-04

NR = Not reported.

PSTS8-3230-12

Radionuclide concentrations detected in the N Springs vegetation samples are presented in Table E-10. The average radionuclide concentrations detected on the Hanford Site are again shown for comparison. The N Springs samples contained above-background concentrations of ^{90}Sr. Growing plants will assimilate available strontium and cesium from the soil (Kathren 1984). Although liquid effluent discharged to the 1325-N LWDF has decreased since N Reactor was placed in standdown status, residual ^{90}Sr in the 1301-N LWDF soil column continues to influence the shoreline vegetation. Average radionuclide concentrations detected in N Springs vegetation from 1980 through 1987 are presented in Table 4-10. The concentrations of ^{90}Sr detected in 1987 were similar to levels reported in 1986.

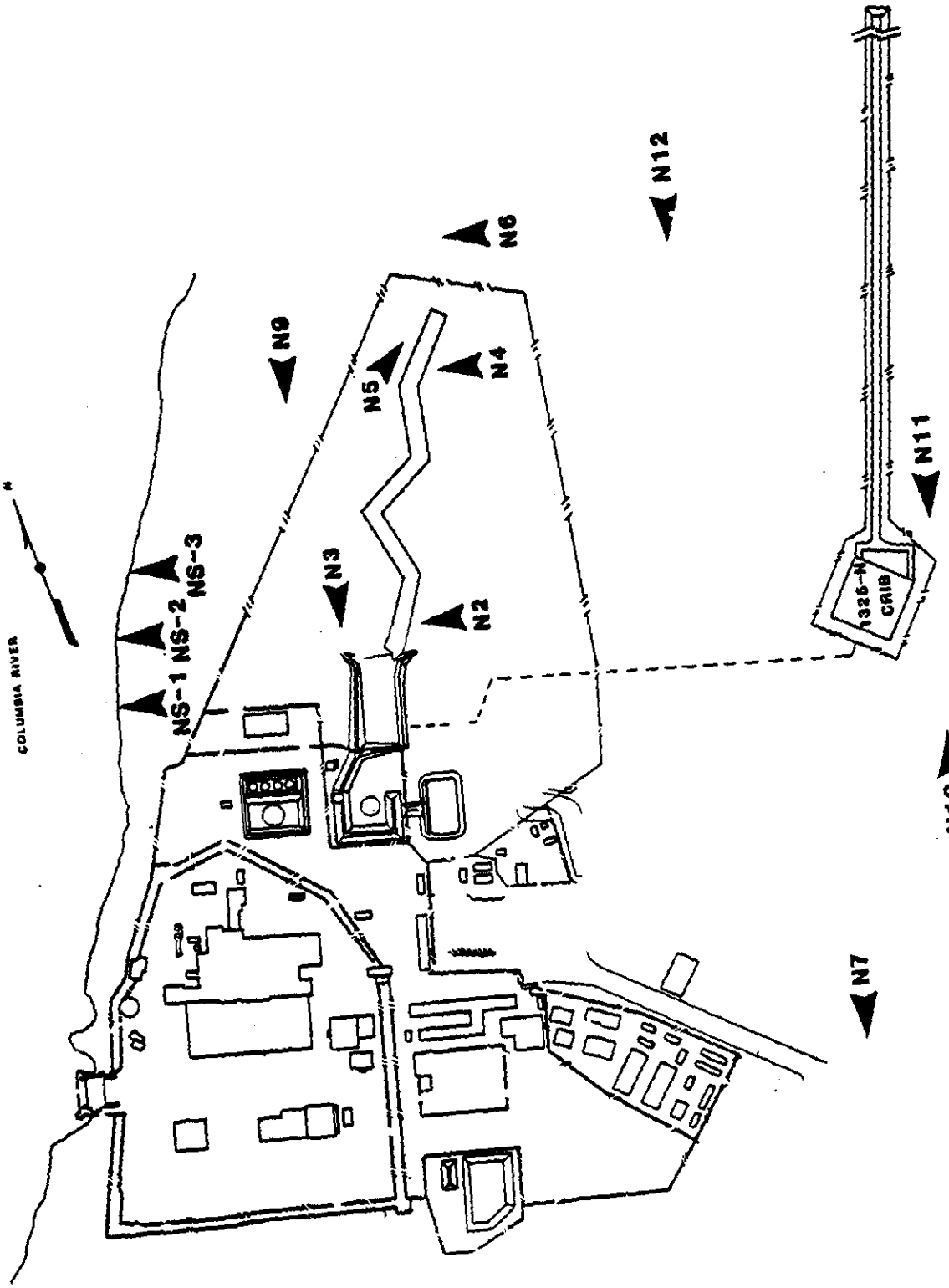

Figure 4-7. Vegetation Sampling Locations at 100-N Area.

Table 4-10. Radionuclide Concentrations (pCi/g) Detected in N Springs Vegetation Samples from 1980 through 1987.

Year	^{54}Mn	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1980	1.5 E-01	5.6 E+00	NR	4.4 E-01	NR	NR
1981	NR	3.3 E+00	2.0 E+02	NR	NR	3.7 E-03
1982	1.5 E-01	2.8 E+00	4.8 E+02	NR	NR	8.3 E-03
1983	7.0 E-02	3.0 E+00	3.3 E+02	4.0 E-02	NR	8.0 E-03
1984	NR	NR	NR	NR	NR	NR
1985	7.6 E-02	1.2 E+00	4.2 E+02	1.7 E-01	NR	4.4 E-04
1986	1.6 E-01	1.1 E+00	2.2 E+02	2.1 E-01	NR	4.2 E-04
1987	2.0 E-01	9.0 E-01	2.9 E+02	1.1 E-01	<1.3 E-04	7.6 E-04

NR = Not reported. PST88-3230-13

4.2.2 Retired 100 Areas

Vegetation sampling locations in the retired 100 Areas coincide with the surface soil locations shown in Figures 4-2 through 4-6. Average radionuclide concentrations detected in vegetation samples for each of the retired 100 Areas from 1980 through 1987 are presented in Tables 4-11 through 4-15. The results of the 1987 vegetation sample analysis for each sample location in the retired 100 Areas are presented in Tables E-11 through E-15. Environmental samples of vegetation collected near the retired 100 Area reactor facilities indicated no elevated levels of radionuclides when compared to the Hanford Site average concentrations.

Table 4-11. Average Radionuclide Concentrations (pCi/g) Detected in 100-B/C Vegetation Samples from 1981 through 1987.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1981	3.6 E+00	NR	3.6 E-01	NR	NR
1982	1.9 E-01	NR	1.1 E-01	NR	NR
1983	1.8 E-01	NR	8.0 E-02	NR	NR
1984	1.3 E-01	1.4 E+00	8.7 E-02	2.4 E-04	6.0 E-04
1985	4.6 E-01	1.4 E+00	1.2 E-01	2.5 E-04	1.0 E-03
1986	2.5 E-01	2.0 E-01	2.8 E+00	2.5 E-05	6.2 E-04
1987	1.5 E-01	2.3 E-01	1.0 E-01	4.6 E-04	6.5 E-04

NR = Not reported. PST88-3230-14
NOTE: Table E-11 lists the results of the analysis of 100-B/C Area vegetation samples.

Table 4-12. Average Radionuclide Concentrations (pCi/g) Detected in 100-D/DR Area Vegetation Samples from 1981 through 1987.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1981	1.2 E+00	NR	1.6 E-01	NR	NR
1982	1.1 E-01	NR	2.7 E+00	NR	NR
1983	9.5 E-02	NR	1.4 E-01	NR	NR
1984	2.1 E-01	2.8 E-01	1.7 E+00	1.8 E-03	5.8 E-04
1985	2.4 E-01	6.9 E-02	6.8 E-01	1.2 E-04	7.0 E-04
1986	2.7 E-01	1.5 E-01	1.7 E+00	0.0 E+00	3.1 E-04
1987	2.5 E-01	9.5 E-02	6.3 E-01	1.6 E-04	2.8 E-04

NR = Not reported. PST88-3230-15

NOTE: Table E-12 lists the results of the analysis of 100-D/DR Area vegetation samples.

Table 4-13. Average Radionuclide Concentrations (pCi/g) Detected in 100-F Area Vegetation Samples from 1981 through 1987.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1981	9.2 E-01	NR	2.2 E+00	NR	NR
1982	1.6 E-01	NR	7.9 E-01	NR	NR
1983	2.8 E-01	NR	1.0 E+00	NR	NR
1984	2.2 E+00	7.6 E+00	2.0 E+01	4.9 E-04	3.9 E-03
1985	3.3 E-01	1.4 E+00	5.8 E-01	4.9 E-05	5.3 E-04
1986	1.7 E-01	9.3 E-02	1.1 E+00	8.3 E-05	1.2 E-04
1987	2.4 E-01	1.8 E-01	1.9 E-01	3.8 E-04	1.7 E-04

NR = Not reported. PST88-3230-16

NOTE: Table E-13 lists the results of the analysis of 100-F Area vegetation samples.

Table 4-14. Average Radionuclide Concentrations (pCi/g) Detected in 100-H Area Vegetation Samples from 1981 through 1987.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1981	6.8 E-01	NR	1.5 E-01	NR	NR
1982	NR	NR	NR	NR	NR
1983	1.3 E-01	NR	9.0 E-02	NR	NR
1984	1.8 E-01	2.0 E+00	1.3 E-01	2.0 E-04	1.7 E-03
1985	2.0 E-01	6.0 E-02	4.5 E-02	1.0 E-04	5.1 E-04
1986	2.2 E-01	5.3 E-01	1.3 E+00	1.3 E-04	4.4 E-05
1987	2.6 E-01	2.6 E-01	1.0 E-01	3.5 E-05	2.7 E-04

NR = Not reported. PSTS8-3230-17

NOTE: Table E-14 lists the results of the analysis of 100-H Area vegetation samples.

Table 4-15. Average Radionuclide Concentrations (pCi/g) Detected in 100-K Area Vegetation Samples from 1981 through 1987.

Year	^{60}Co	^{90}Sr	^{137}Cs	^{238}Pu	$^{239,240}Pu$
1981	1.2 E+00	NR	1.0 E-01	NR	NR
1982	2.4 E-01	NR	9.7 E-01	NR	NR
1983	1.5 E-01	NR	2.5 E-01	NR	NR
1984	1.8 E-01	1.3 E+00	1.3 E-01	2.9 E-04	6.9 E-04
1985	4.6 E-01	3.9 E-01	1.3 E-01	1.9 E-04	7.1 E-04
1986	2.8 E-01	4.0 E-01	1.5 E+00	2.5 E-04	7.9 E-04
1987	2.3 E-01	1.3 E+00	1.1 E-01	1.9 E-04	2.2 E-04

NR = Not reported. PSTS8-3230-18

NOTE: Table E-15 lists the results of the analysis of the 1987 100-K Area vegetation samples.

5.0 EXTERNAL RADIATION MONITORING

Environmental thermoluminescent dosimeters (TLDs) are used to measure direct radiation at 100-N Area. The measurements are used to evaluate environmental dose rates at several locations within the 100-N Area fenceline.

The environmental TLDs (CaF2:Mn matrix) are delivered, calibrated, and read every 4 wk by PNL. The locations of the environmental TLDs at 100-N Area are shown in Figure 5-1. The average dose rate in mrem/h, extrapolated dose rate per work year for each of the TLD locations, and the ALARA occupational exposure guideline for comparison are presented in Table F-1.

The dose per work year is defined as the accumulated dose over a period of 40 h/wk and 52 wk/yr at the site of a specific environmental dosimeter. The value is used only to indicate the significance of background radiation levels. It does not show actual occupational exposure as workers rarely spend large amounts of time at most of these locations, especially inside established radiation zones. In October 1986, five TLD locations were added to the 100-N Area external radiation monitoring program. These sites, numbers 37 through 41, were included to assess dose rates to workers housed in offices located near the 1301-N LWDF. The results indicate that the ALARA exposure guidelines for nonradiation zone workers (240 mrem/yr) were not exceeded at these locations.

Direct radiation levels were higher near facilities that contained or received liquid effluent from N Reactor. These facilities include the 1304-N Emergency Dump Tank, the 1301-N LWDF, and the 1325-N LWDF. The environmental dose rates detected near the 1301-N LWDF were, as in 1986, higher than in previous years. This is due primarily to the fact that as of September 19, 1985, the facility is no longer being used and no longer contains water. The water contained by the facility during operation shielded direct radiation to levels similar to those in 1985. Plans for permanent closure and stabilization of the 1301-N LWDF are being developed and reviewed. The environmental dose rates detected near the 1325-N LWDF were also higher than in previous years. Liquid effluents from N Reactor were discharged to the 1325-N when the 1301-N LWDF was retired. The N Reactor was subsequently placed in standdown status in January 1987. Effluent discharged to the 1325-N, which would provide shielding from direct radiation under normal operating conditions, decreased substantially, due to lower flow rates, following the initiation of standdown. The increase in radionuclide inventory in the 1325-N LWDF, coupled with lack of shielding water, explains the increased dose rates measured at the affected TLD locations.

In February 1987, an internal decontamination of the N Reactor primary coolant piping was conducted. The expended solution used for this procedure was temporarily stored in the 1310-N Radioactive Chemical Waste Storage Facility until transferred to the 1314-N Liquid Waste Loadout Facility and subsequent rail car transfer to the 200 West Area for processing and disposal. This storage (about 90 d) resulted in a 70% increase in environmental dose rates near the 1310-N (TLD locations 14, 16, 18, 21, and 31) through April 1987.

A table of the monthly dose rate measurements for each environmental TLD location is included in Table B-2.

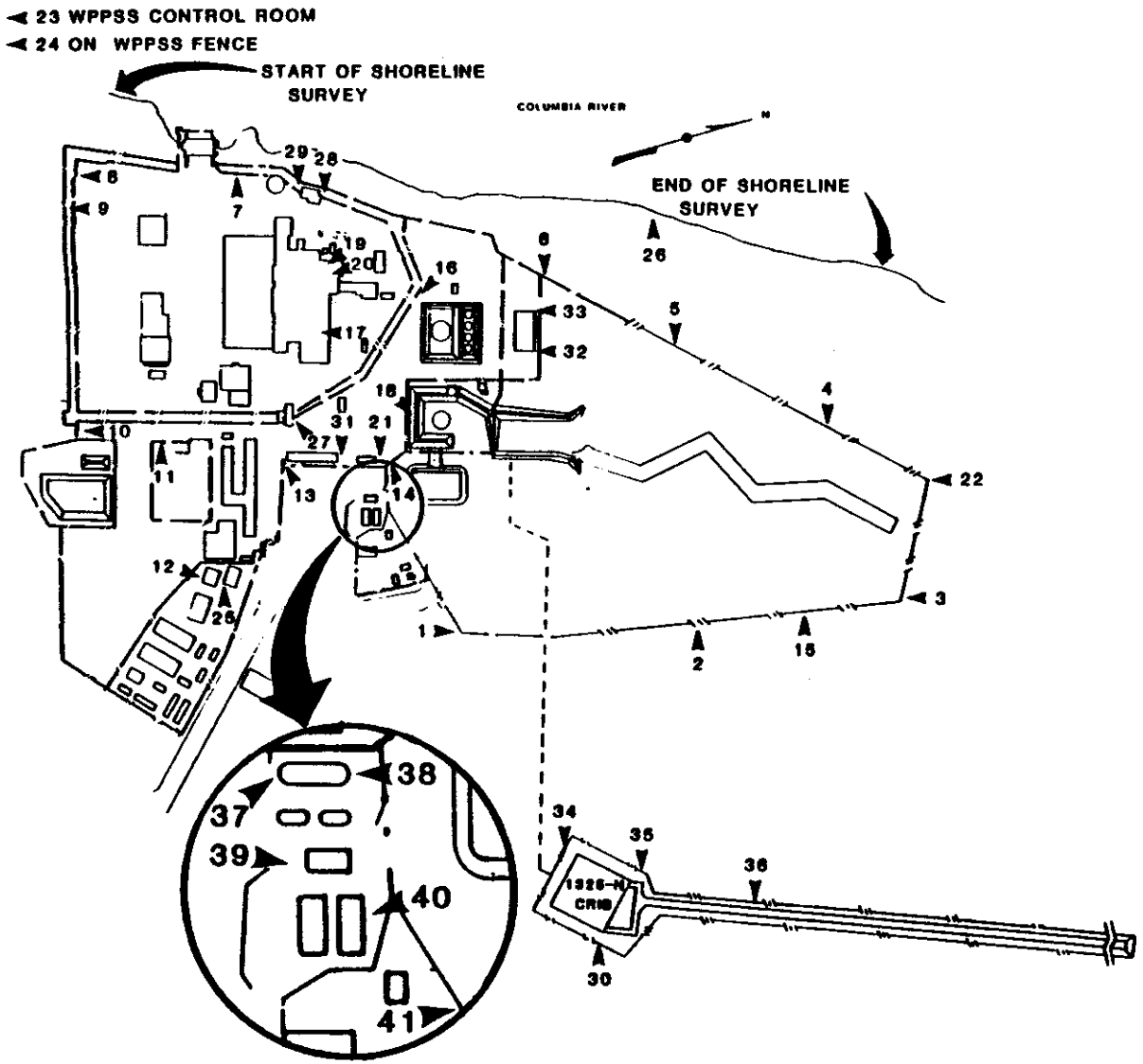

Figure 5-1. Location of Environmental Dosimeters and the Columbia Shoreline Survey at 100-N Area.

6.0 LIQUID WASTE DISPOSAL FACILITY MONITORING

Environmental surveillance of the 1301-N and 1325-N LWDFs is performed to monitor and document the environmental impact associated with these disposal facilities. Several parameters including ambient air, vegetation, surface soil, and bottom sediments are sampled and analyzed. Ambient environmental dose rates are also monitored annually. Ambient air, vegetation, surface soil, and external radiation monitoring for the LWDFs have been included in their respective sections previous to this. The following section, Radiological Surveys, will address the annual ambient environmental dose rate surveys associated with LWDF monitoring. This section, LWDF monitoring, will discuss the sampling and analysis of the 1325-N LWDF bottom sediments.

The 1325-N LWDF receives liquid effluent from N Reactor. The liquid effluent is discharged to a soil column that retains the radionuclides as the effluent percolates through the subsoil. Samples of surface sediment were obtained from the bottom of the 1325-N LWDF on August 18, 1987. The samples, about 10 g each, were collected by means of several sampling ports located in the cover over the disposal facility (Figure 6-1). At the time of sampling, the 1325-N facility was receiving liquid effluent from N Reactor. The samples were analyzed for gamma-emitting radionuclides at the 100-N, Westinghouse Hanford radioanalytical lab. The samples were then shipped to UST for $^{89,90}Sr$ and plutonium analyses.

Comparison of radionuclide concentrations detected in the 1325-N sediments from 1985 to 1987 are presented in Table 6-1. Radionuclide concentrations detected in sediments sampled from the 1325-N LWDF crib are presented in Table G-1.

Use of the 1301-N LWDF was discontinued on September 19, 1985. Emphasis on LWDF sediment sampling subsequently shifted to the 1325-N LWDF. As the radionuclides contained in the 1301-N LWDF decay, concentrations will decrease. Stabilization and permanent closure of the facility are being studied at this time.

Table 6-1. Average Radionuclide Concentrations (pCi/g) Detected in 1325-N Liquid Waste Disposal Facility Sediment Since 1985.

Year	^{60}Co	^{90}Sr	^{137}Cs	$^{239,240}Pu$
1985	8.3 E+05	5.4 E+04	3.7 E+04	1.3 E+04
1986	2.8 E+06	5.9 E+03	9.3 E+04	NR
1987	8.7 E+05	9.7 E+04	2.3 E+04	3.3 E+04

NR = Not reported.

PST88-3230-19

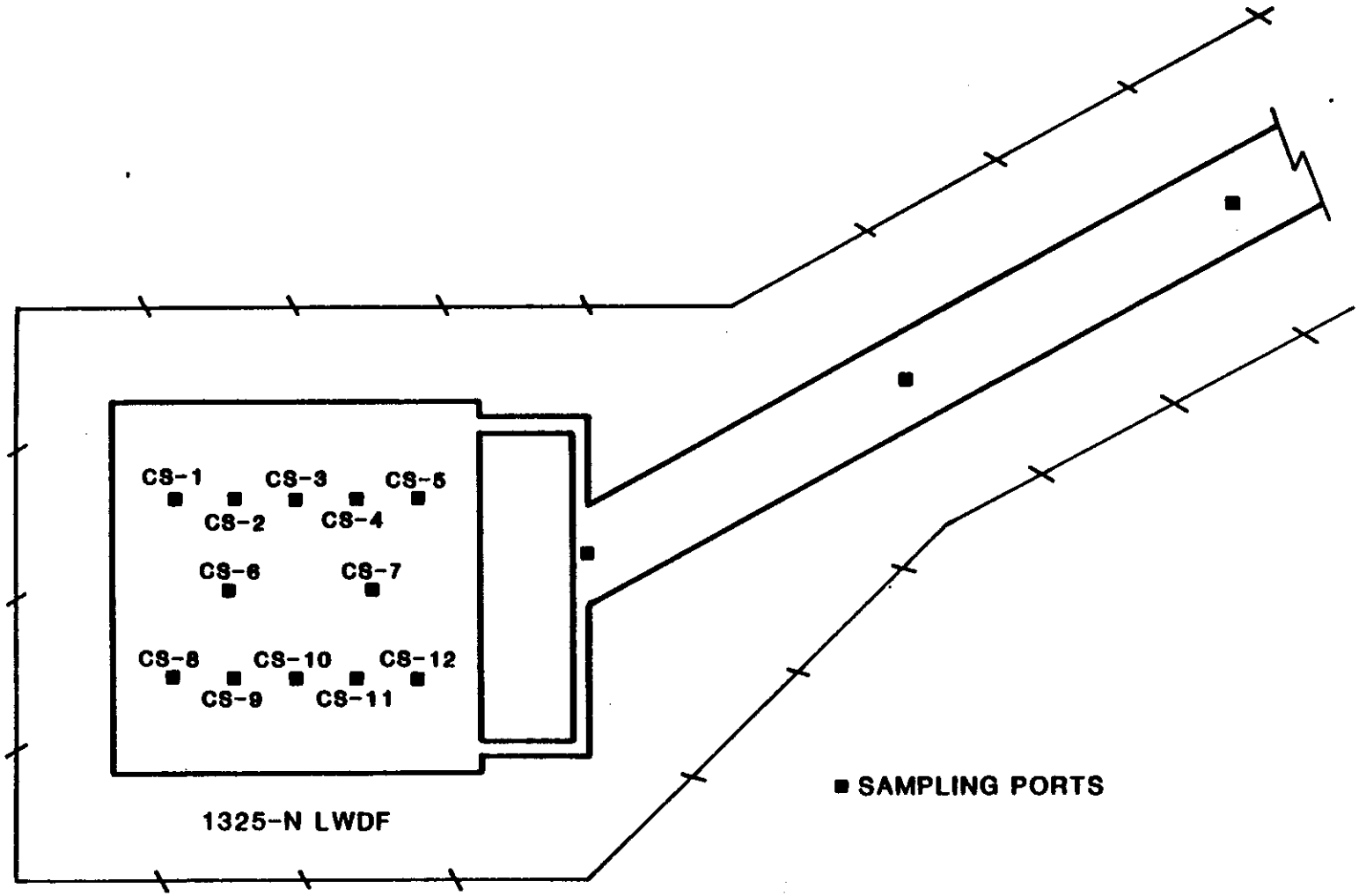

Figure 6-1. Sediment Sampling Locations for the 1325-N Liquid Waste Disposal Facility.

7.0 RADIOLOGICAL SURVEYS

7.1 INTRODUCTION

Direct radiation levels are measured annually along the 100-N Area portion of the Columbia River shoreline. Annual environmental radiation surveys are also conducted at intersecting points of survey grids established around the 1301-N and 1325-N LWDFs to monitor direct radiation levels associated with the disposal facilities.

Each of the surveys relied on the use of a Bicron Model 5050 portable micro-R meter. The meter was calibrated by PNL to a ^{137}Cs source and the readings were taken at a height of 1 m at 50-ft intervals. The micro-R readings obtained for these surveys reflect relative (to each other) dose rates only, and do not indicate actual whole body penetrating dose rates, as this type of instrument is overly sensitive to nonpenetrating radiation sources.

7.2 COLUMBIA RIVER SHORELINE SURVEY

On July 8, 1987, relative dose rates were measured along the Columbia River shoreline starting near the 005 outfall and proceeding downstream past the N Springs (refer to Figure 5-1). A graphic representation of the shoreline survey data is presented in Figure 7-1. The locations of the 100-N Area facilities that potentially contribute to dose rates measured near the river shoreline are shown. At the time of the survey, N Reactor was shut down. The 1304-N Emergency Dump Tank contained low-level activity, quench water. A rail car containing radioactive liquid decontamination waste was located at the 1314-N Facility. Flow to the 1325-N LWDF was about 200 gal/min. The 1310-N Radioactive Chemical Waste Storage Facility contained about 10,000 gal of liquid waste generated from the N Reactor internal decontamination operation conducted in February 1987.

Relative environmental dose rates detected along the Columbia River Shoreline opposite the 1301-N LWDF were similar to 1986. As of September 19, 1985, this facility was no longer used and no longer contained water which, during operation, shielded direct radiation levels. Relative dose rates detected opposite the 1314-N Facility were approximately 50% higher than the 1986 levels. This is attributable to the waste solution contained in the nearby railcar. The readings at each location obtained during this survey are presented in Table H-1.

7.3 LIQUID WASTE DISPOSAL FACILITY RADIATION SURVEYS

7.3.1 Introduction

The 1301-N and 1325-N LWDFs are secured facilities posted as radiation zones. Due to the potential for radionuclide contamination and direct radiation exposure, the facilities are surrounded by a security fence. Only trained personnel are allowed access to the disposal facilities. Even then, workers do not spend large amounts of time in these areas.

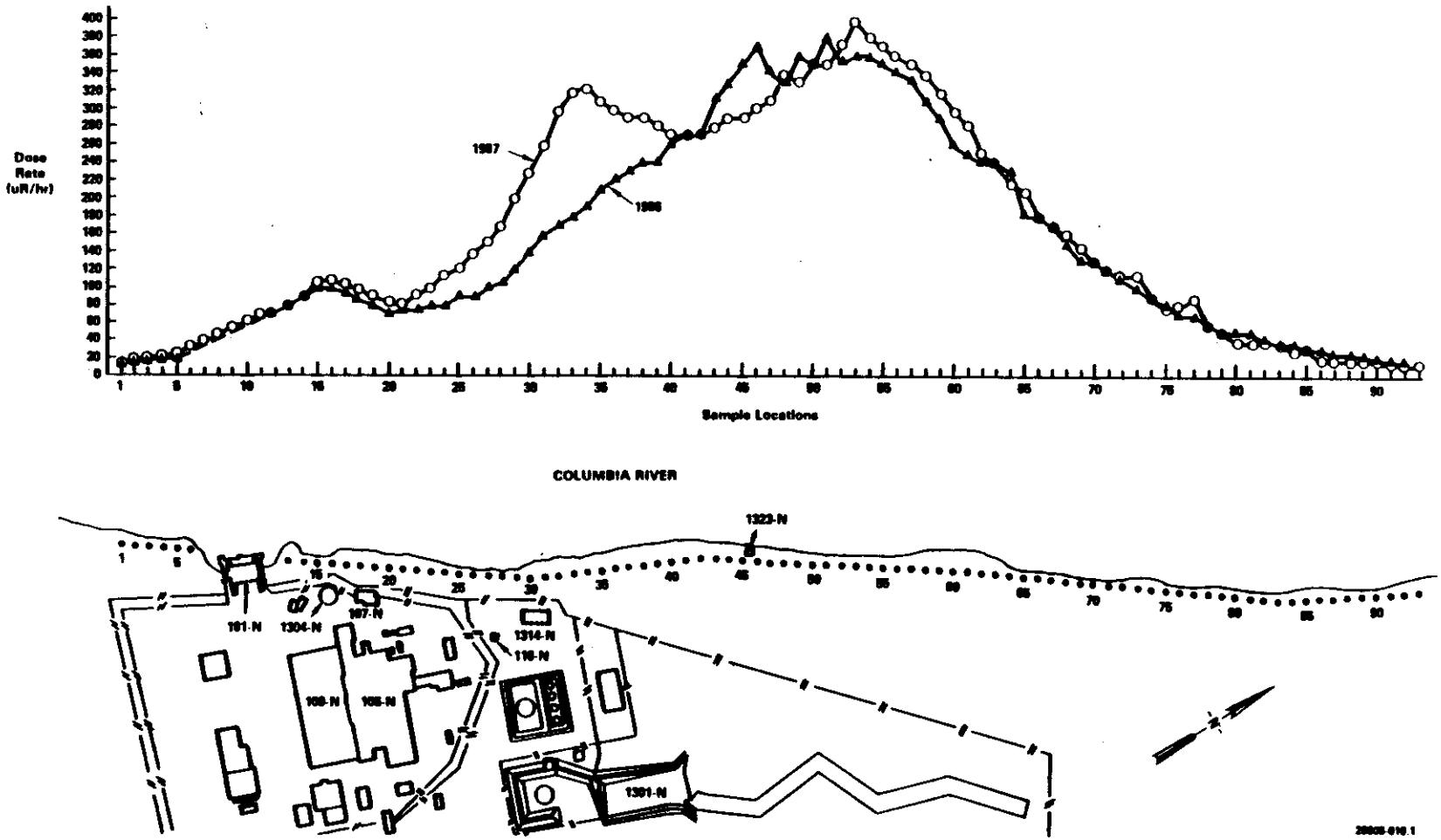

Figure 7-1. Environmental Dose Rate (μR/h) Detected at Survey Points along the Columbia River Shoreline. (The distance between survey points is about 50 ft.)

Construction of new facilities at 100-N Area led to the inaccessibility of a few of the grid points normally surveyed during the 1301-N and 1325-N LWDF surveys. Based on historical data and field measurements taken at the time (but not included in this report because of the uncertainty of exact location), the relative dose rates for the omitted 1301-N LWDF locations would approximate the 1986 measurements. The relative dose rates for the omitted locations at the 1325-N LWDF would more closely approximate the measurements obtained at the relative position opposite the facility (east) in the 1987 survey.

For convenience of reference, the 1986 LWDF survey results are included in Figures H-1 and H-2. The methods and equipment used for the annual dose rate surveys conducted at the 1301-N and 1325-N LWDFs were identical to those described for the annual Columbia River shoreline survey.

7.3.2 1301-N Liquid Waste Disposal Facility Survey Results

Figure 7-2 shows the relative environmental dose rates detected around the 1301-N LWDF on June 24, 1987. N Reactor was not operating at the time of the survey. The 1325-N LWDF was receiving liquid effluent from the N Reactor at a rate of about 350 gal/min. The 1310-N Radioactive Chemical Treatment Facility contained about 100,000 gal of waste solution from the February 1987 internal decontamination of N Reactor. A full rail car, containing liquid waste, was located at the 1314-N Facility. For both the 1310-N and 1314-N, the presence of fairly substantial amounts of liquid results in an overall decrease in environmental dose rates detectable at the 1301-N LWDF, due to the shielding effect of the contained liquid. The 1301-N LWDF did not contain liquid effluent.

The data indicate that the areas near the "box weir" (inlet) portion of the 1301-N LWDF and the first leg of the 1301-N trench have the highest background dose rates. The absence of water from the LWDF is the major factor contributing to the dose rates. During operation, water levels in the crib shielded much of the radiation emitted by the contaminated sediments.

Survey locations away from the inlet portion of the 1301-N showed mostly a slightly reduced dose rate in the 1987 measurements.

7.3.3 Liquid Waste Disposal Facility

The relative environmental dose rates detected around the 1325-N LWDF on July 8, 1987 are presented in Figure 7-3. The N Reactor was not operating at the time and the 1325-N was receiving about 200 gal/min of liquid effluent from N Reactor. The 1310-N Radioactive Chemical Waste Storage Facility contained about 10,000 gal of waste solution from the February 1987, N Reactor internal decontamination operation. The 1301-N LWDF did not contain liquid effluent.

Overall, the 1325-N LWDF showed an ~180% increase in relative dose rates for the 1987 survey. Radionuclide inventory in the 1325-N LWDF increased during CY 1986 after the 1301-N LWDF was retired. Liquid effluent discharged to the facility after standdown was initiated, decreased significantly. This effluent would normally provide some degree of shielding from direct radiation. The increased radionuclide loading and subsequent reduction of shielding liquid led to the increased relative environmental dose rates observed at 1325-N LWDF during the time of the survey.

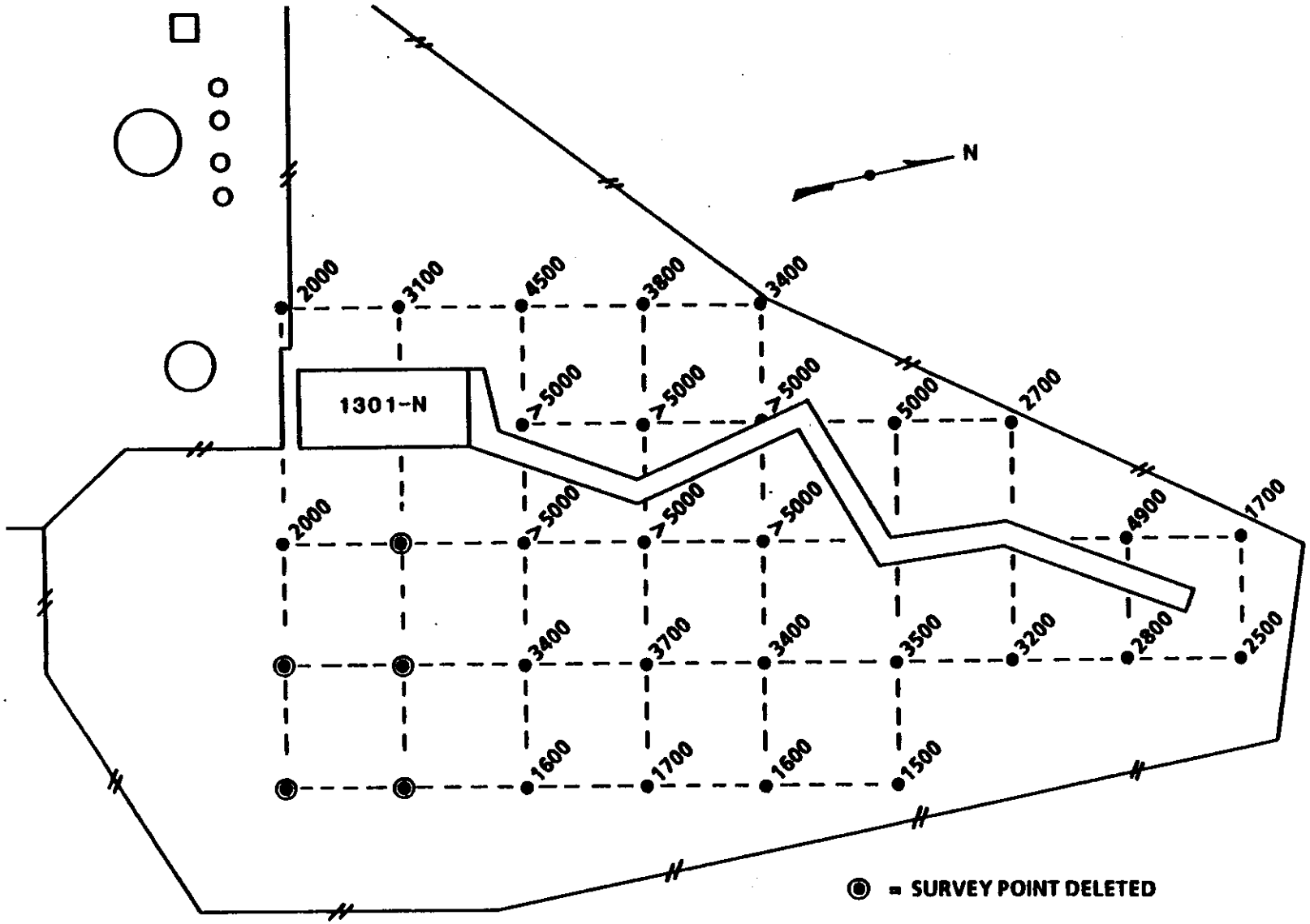

Figure 7-2. Environmental Dose Rates (μR/h) Measured at Survey Points Around the 1301-N Liquid Waste Disposal Facility in 1987.

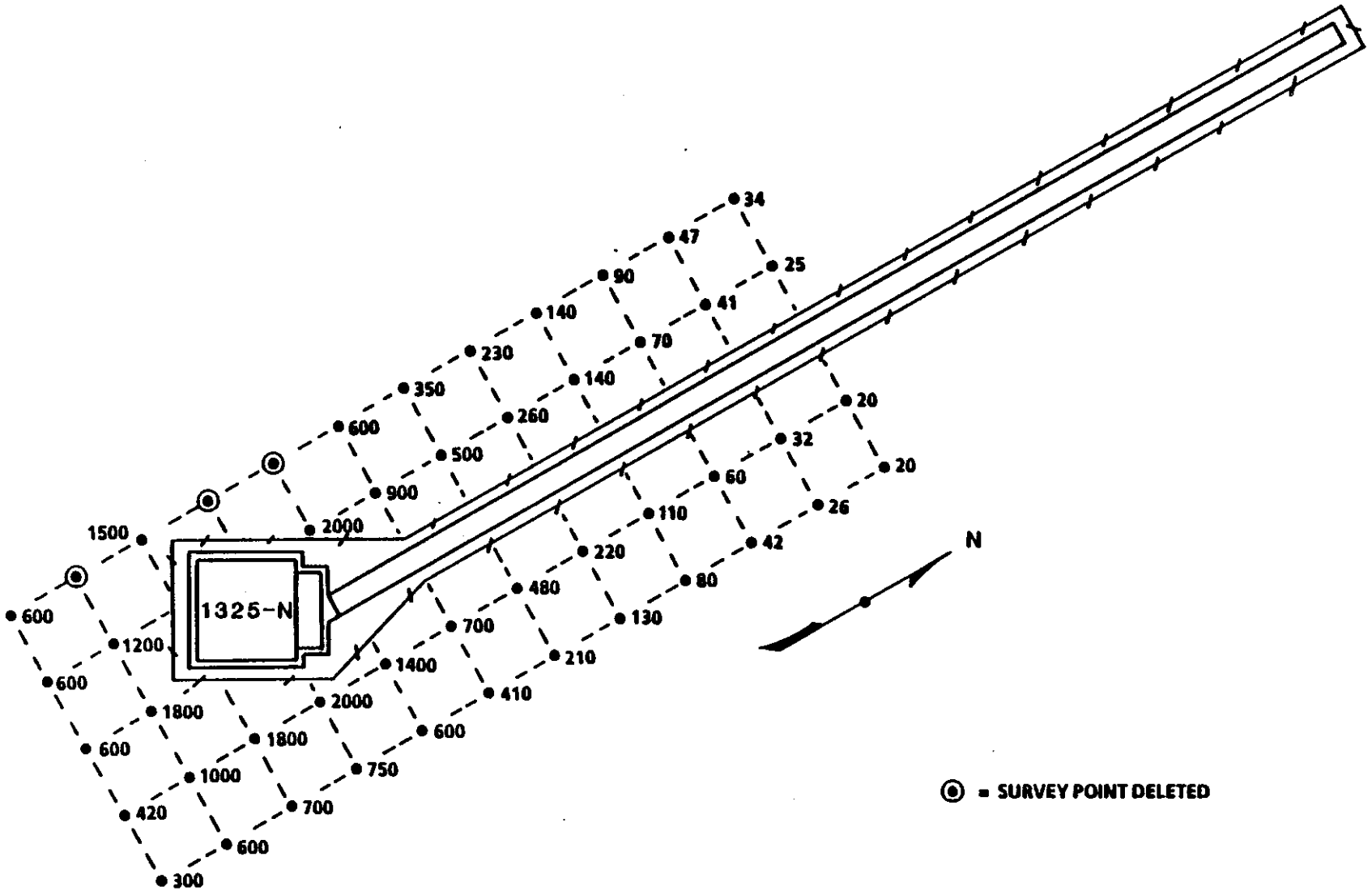

Figure 7-3. Environmental Dose Rates (μR/h) Measured at Survey Points Around the 1325-N Liquid Waste Disposal Facility in 1987.

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APPENDIX A
QUALITY ASSURANCE

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INTRODUCTION

The Westinghouse Hanford Surveillance Program for the 100 Areas provides monitoring to assist in evaluating the environmental impact of N Reactor facilities, the retired reactor facilities, and burial grounds in the retired 100 Areas. The major objectives of the program are to monitor radionuclide concentrations in radiological release pathways, maintain a database for trend analyses, provide data for accidental release analyses, and demonstrate compliance with applicable regulations.

At 100-N Area, samples of ambient air, groundwater, vegetation, soil, and sediment are collected and analyzed along with direct radiation measurements around the 1301-N and 1325-N Liquid Waste Disposal Facilities (LWDF) and along the river shoreline. At the retired 100 Areas, soil, vegetation, and groundwater samples are collected and analyzed. Special samples to monitor the potential biotransport of radionuclides may also be included in the surveillance program.

Procedures and guidelines to ensure that near-field environmental monitoring techniques and analyses are conducted within established limits of acceptance are provided in UNI-M-76 REV 2, Effluent Radioanalytical Program Manual, and UNI-M-31, Environmental Control Manual. The essential components of these manuals as they apply to the 100 Areas environmental surveillance Quality Assurance (QA) program are briefly outlined.

DOCUMENTATION

Record keeping is a vital requirement of the 100 Areas near-field environmental monitoring program. Each phase of the program is documented to ensure regulatory compliance, accurate trend analysis, and optimal monitoring procedures. Pertinent documentation includes the following:

- Sampling Logs--Records of all environmental samples collected by Operational Health Physics (OHP) and N Reactor Operations (NRO) personnel are kept in these log books.
- Data Records--All analytical data received by 100 Areas Environmental Protection (EP) from the radioanalytical laboratories are recorded on magnetic media and on hard-copy printouts.
- Environmental Surveillance Requirements--The procedures and reporting guidelines for these requirements are provided in UNI-M-31 and UNI-M-76.
- Chain of Custody Log--This log records custody of the environmental samples from collection through disposal.

Various reports are generated to document, control, and report the condition of, and impact to, the near-field environment. These reports include the following.

- Annual Environmental Release Report--This report covers atmospheric and liquid releases of radionuclides and chemical from the 100 and 300 Areas facilities.
- Environmental Surveillance Report for the 100 Areas--This annual report summarizes sampling and monitoring completed during the previous year to fulfill the requirements

of the Westinghouse Hanford Company (Westinghouse Hanford) 100 Areas, Environmental Surveillance Program.

- N Area Radioactive Release Summary Report--This monthly report shows the total amounts of "indicator" radionuclides released to the environment for both the current month and calendar year to date.

- Westinghouse Hanford Release Report for the Hanford Site--This monthly report shows the total amounts of potentially hazardous materials released from Westinghouse Hanford facilities for the previous month. Unplanned releases and spills to the environment are included in this report.

- NPDES Effluent Monitoring Report--The National Pollutant Discharge Elimination System (NPDES) Effluent Monitoring Report summarizes the sampling data required by the NPDES Permit. The U.S. Department of Energy (DOE) transmits the report to the Environmental Protection Agency as required by NPDES regulations.

- Annual 100 Area Inactive Burial Site and Retention Basin Surveillance and Maintenance Report--The report summarizes maintenance and surveillance activities conducted for the retired 100 Areas burial sites and retention basins. The report allows Environmental Protection to evaluate the effectiveness of the surveillance and maintenance effort.

DATA ANALYSIS

Environmental data are reviewed to determine compliance with applicable Federal, State, local, and Westinghouse Hanford guides. The data are analyzed both graphically and by standard statistical tests to determine trends and impacts on the environment. Newly acquired data are compared with historical data and natural background levels. Routine environmental data are stored on both magnetic media (i.e., in a microcomputer environment) and on hard-copy printouts.

TRAINING

To ensure quality and consistency in sample collection and handling, all personnel performing such work receive formal training. The OHP personnel involved in sample analyses receive formal initial, and annual followup training in the operation of the radioanalytical laboratory equipment located in the 105-N Building.

SAMPLE FREQUENCY

The sampling schedules and types are established by 100 Areas Environmental Protection on the basis of detailed review of each effluent stream to ensure that all samples accurately represent the types and concentrations of radionuclides that are being discharged in that effluent stream. The

routine monitoring schedule is provided in UNI-M-76 REV 2. A brief description of the sampling program is presented below.

1. Ambient air sample filters are collected weekly.

2. Liquid effluent samples are composited and collected weekly.

3. Environmental TLDs are exchanged monthly.

4. Groundwater samples for radiological analysis are collected quarterly. Samples from oil and grease monitoring wells are collected on a location-dependent frequency.

5. Radiological surveys of the LWDFs and Columbia River shoreline are performed annually.

6. The soil, vegetation and 1325-N LWDF sediment samples are collected annually.

ANALYTICAL PROCEDURES

Three laboratories provide analytical support to the 100 Areas Environmental Surveillance Program: the UST, the Radiation Standards and Engineering Laboratory at PNL, and the 100-N, Westinghouse Hanford Analytical Laboratory. The environmental samples are analyzed in accordance with prescribed procedures and quality control guides.

Radioanalyses conducted at the 100-N, Westinghouse Hanford radioanalytical laboratory are limited to the detection of gamma-emitting radionuclides. Other analyses, such as gross alpha-beta, tritium, strontium, and plutonium determinations are performed by either UST or PNL, depending on sample type. The PNL also provides TLD calibration, annealing and analyses.

Historically, the radioanalytical program at 105-N has provided reliable and accurate analyses of gamma-emitting radionuclides. The laboratory has consistently performed well on Environmental Protection Agency inter-laboratory comparisons. The quality control program for the laboratory is documented in UNI-M-76 REV 2. Quality control for the UST laboratory is overseen by PNL.

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APPENDIX B
GLOSSARY OF TERMS

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ACRONYMS

ALARA	as low as reasonably achievable
DCG	derived concentration guideline
DOE	U.S. Department of Energy
EDB	emergency dump basin
EDT	emergency dump tank
HEHF	Hanford Environmental Health Foundation
LWDF	liquid waste disposal facility
PNL	Pacific Northwest Laboratory
PUREX	Plutonium Uranium Reduction Extraction (Plant)
Supply System	Washington Public Power Supply System
TLD	thermoluminescent dosimeter
UST	U.S. Testing Company, Inc.
Westinghouse Hanford	Westinghouse Hanford Company

DEFINITIONS

Biological transport--Concerns one or more of the following processes:

- Movement of subsurface radioactivity to the surface by physiological plant processes
- Dispersion of such plants by the wind
- Contaminated urine and feces deposited by animals that have gained access to and ingested radioactivity
- Contaminated animals themselves that have ingested radioactivity directly or ingested other contaminated animals or plants
- Physical displacement of radioactivity by burrowing animals
- Nests built using contaminated materials.

Background radiation--Refers to regional levels of radioactivity produced by sources other than those of specific interest (e.g., the nuclear activities at the Hanford Site).

Biota--The plant and animal life of a specific region.

Chemical processing--Chemical treatment of material to selectively separate desired components. At the Hanford Site, plutonium, uranium, and fission products are chemically separated from irradiated fuels.

Controlled area--An area where access is controlled to protect individuals from extra exposure to radiation and radioactive materials.

Crib--A subsurface low-level liquid-waste disposal site that allows liquid waste to percolate into surrounding soil.

Decommissioning--The process of removing a facility or area from operation, often involving decontamination and/or disposal, plus incorporating appropriate controls and safeguards.

Decontamination--The removal of radioactivity from a surface or from within another material.

Environmental surveillance--A survey and sampling program designed to determine radiological impact due to site operations.

Groundwater--Water that exists below ground surface (i.e., within the zone of saturation).

Less than detectable--An analytical term for a radionuclide concentration in a sample that is lower than the minimum detection capabilities of that analytical equipment or process.

Quality assurance--A program designed to maintain the quality of the results of a program within established limits of acceptance.

Radiation survey--Evaluation of an area or object with portable instruments to identify radioactive materials and radiation fields present.

Radiological Control Area--An area where access is controlled to protect individuals from exposure to radiation and/or radioactive materials. In the Separations Area, control areas include, but are not limited to, areas posted as Radiation Area, Surface Contamination, and Underground Radioactive Materials--all describing the radiological condition of the area within.

Retired waste site--A waste site that is isolated and no longer available to receive waste in any form.

Surface contamination--A radiological control status that refers to radioactivity on the surface of the ground that exceeds the Soil Contamination Standard.

Thermoluminescent dosimeter--A chip or series of chips used for measuring external gamma radiation. It consists of a material capable of absorbing energy imparted by ionizing radiation, then emitting light as a result of thermal stimulation. A measure of that light is proportional to the radioactivity absorbed.

Water table--The upper boundary of an unconfined aquifer below which saturated groundwater occurs.

APPENDIX C

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Table C-1. Concentrations of Radionuclides Detected in 100-N Area Air Samples (pCi/m^3).

Sample Location*	No. of Samples		Mn-54	Co-60	Ru-103	I-131	Cs-137
A-1	15	Maximum	4.1E-1	6.2E+0	<8.4E-2	<8.4E-2	8.4E-2
		Minimum	<1.1E-2	<7.0E-3	<7.0E-3	<1.0E-2	<1.0E-2
		Average	5.2E-2	2.8E-1	<2.7E-2	<3.1E-2	2.6E-2
		Stan. Dev.	9.9E-2	1.1E+0	1.5E-2	1.7E-2	1.8E-2
		D.C.G. **	2.0E+3	8.0E+1	2.0E+3	4.0E+2	4.0E+2
A-2	15	Maximum	<4.5E-2	7.5E-1	<3.7E-2	<6.2E-2	<4.3E-2
		Minimum	<7.1E-3	<2.1E-2	<5.8E-3	<1.2E-2	<7.8E-3
		Average	<2.0E-2	1.3E-1	<1.7E-2	<2.9E-2	<2.0E-2
		Stan. Dev.	9.4E-3	2.1E-1	7.1E-3	1.4E-2	8.7E-3
		D.C.G. **	2.0E+3	8.0E+1	2.0E+3	4.0E+2	4.0E+2
A-3	17	Maximum	<5.1E-2	4.8E-1	<4.4E-2	<7.3E-2	<6.9E-2
		Minimum	<6.8E-3	1.4E-2	<5.8E-3	<2.2E-2	<1.4E-2
		Average	<2.5E-2	1.0E-1	<2.2E-2	<3.7E-2	<2.6E-2
		Stan. Dev.	1.2E-2	1.1E-1	1.0E-2	1.4E-2	1.3E-2
		D.C.G. **	2.0E+3	8.0E+1	2.0E+3	4.0E+2	4.0E+2
A-4	18	Maximum	<5.9E-2	3.9E-1	<5.2E-2	<1.0E-1	6.9E-2
		Minimum	<7.7E-3	3.2E-2	<6.5E-3	<1.2E-2	<6.8E-3
		Average	<2.3E-2	1.2E-1	<2.2E-2	<3.8E-2	2.4E-2
		Stan. Dev.	1.2E-2	9.7E-2	1.1E-2	2.3E-2	1.6E-2
		D.C.G. **	2.0E+3	8.0E+1	2.0E+3	4.0E+2	4.0E+2

* - Locations identified in Figure 2.1.
** - D.C.G. = U.S. Department of Energy (DOE) Derived Concentration Guides (DCG)

Table C-2. Concentrations of Radionuclides Detected in 100-N Area Air Samples (pCi/m^3).

Sample Location*	Date	Mn-54	Co-60	Ru-103	I-131	Cs-137
A-1	10-17-86	4.0E-2	1.7E-1	<2.1E-2	<6.2E-2	<2.4E-2
	11-14-86	<2.5E-2	1.4E-1	<1.2E-2	<2.5E-2	<1.8E-2
	12-12-86	<3.4E-2	1.8E-1	<2.4E-2	<3.9E-2	<2.5E-2
	02-06-87	3.8E-2	2.4E-1	<1.4E-2	<2.3E-2	<1.6E-2
	03-05-87	2.4E-2	1.7E-1	<2.1E-2	<2.9E-2	<2.4E-2
	04-03-87	<1.3E-2	2.4E-2	<1.0E-2	<2.1E-2	<1.3E-2
	05-07-87	<1.1E-2	5.0E-2	<7.0E-3	<1.6E-2	<1.0E-2
	06-01-87	<1.6E-2	<4.8E-2	<2.2E-2	<4.2E-2	<2.2E-2
	06-26-87	<1.7E-2	4.7E-2	<2.2E-2	<2.9E-2	<1.7E-2
	07-07-87	<2.7E-2	6.7E-2	<2.6E-2	<6.6E-2	<3.4E-2
	07-24-87	3.8E-2	3.2E-1	<1.9E-2	<4.2E-2	<2.5E-2
	08-24-87	2.9E-2	2.0E-2	<1.8E-2	<4.2E-2	2.3E-2
	10-01-87	3.0E-2	2.5E-1	<1.5E-2	<2.0E-2	<1.7E-2
	10-16-87	<3.5E-2	1.1E-1	<3.7E-2	<5.1E-2	<4.0E-2
	12-11-87	4.1E-1	6.2E+0	<2.3E-2	<2.2E-2	8.4E-2

* - Location identified in Figure 2.1.

Table C-3. Concentrations of Radionuclides Detected in 100-N Area Air Samples (pCi/m³).

Sample Location*	Date	Mn-54	Co-60	Ru-103	I-131	Cs-137
A-2	10-17-86	<1.8E-2	4.1E-2	<1.4E-2	<2.6E-2	<1.5E-2
	11-14-86	<1.6E-2	4.2E-2	<1.8E-2	<2.7E-2	<2.2E-2
	12-12-86	<2.5E-2	2.6E-2	<1.7E-2	<2.8E-2	<2.1E-2
	01-09-87	<1.6E-2	<2.1E-2	<1.2E-2	<6.2E-2	<1.1E-2
	02-06-87	<1.6E-2	3.4E-2	<1.3E-2	<1.9E-2	<1.4E-2
	03-05-87	<1.7E-2	3.6E-2	<1.4E-2	<2.4E-2	<1.9E-2
	04-03-87	<1.9E-2	<2.6E-2	<1.9E-2	<2.9E-2	<2.1E-2
	05-01-87	<1.7E-2	6.2E-2	<1.8E-2	<2.7E-2	<1.7E-2
	06-10-87	<9.1E-3	3.1E-2	<7.9E-3	<1.9E-2	<1.0E-2
	07-24-87	<3.4E-2	4.7E-1	<2.1E-2	<2.1E-2	<3.1E-2
	08-21-87	<1.5E-2	3.1E-2	<1.6E-2	<2.7E-2	<2.1E-2
	09-18-87	<2.3E-2	1.3E-1	<2.1E-2	<2.8E-2	<2.2E-2
	10-01-87	<4.5E-2	1.9E-1	<3.7E-2	<6.0E-2	<4.3E-2
	10-16-87	<1.8E-2	7.5E-1	<1.7E-2	<2.9E-2	<1.9E-2
	12-11-87	<7.1E-3	2.3E-2	<5.8E-3	<1.2E-2	<7.8E-3

* - Location identified in Figure 2.1.

Table C-4. Concentrations of Radionuclides Detected in 100-N Area Air Samples (pCi/m³).

Sample Location*	Date	Mn-54	Co-60	Ru-103	I-131	Cs-137
A-3	10-17-86	<1.9E-2	7.2E-2	<1.3E-2	<2.5E-2	<1.4E-2
	11-14-86	<1.9E-2	9.1E-2	<1.9E-2	<3.0E-2	<1.9E-2
	12-12-86	<3.3E-2	4.8E-1	<1.8E-2	<3.0E-2	<2.5E-2
	01-08-87	<2.1E-2	3.8E-2	<2.1E-2	<3.4E-2	<2.1E-2
	02-06-87	<2.0E-2	<1.6E-2	<1.9E-2	<3.1E-2	<1.9E-2
	03-05-87	<2.0E-2	3.6E-2	<2.1E-2	<3.2E-2	<1.9E-2
	04-03-87	<1.8E-2	7.7E-2	<1.8E-2	<2.7E-2	<1.9E-2
	05-01-87	1.3E-2	<3.9E-2	<1.2E-2	<2.2E-2	<1.6E-2
	06-01-87	<1.4E-2	5.2E-2	<1.3E-2	<2.5E-2	<1.5E-2
	06-26-87	<1.8E-2	5.3E-2	<2.2E-2	<3.0E-2	<2.0E-2
	07-07-87	<5.1E-2	3.2E-2	<3.9E-2	<7.3E-2	<3.8E-2
	07-24-87	<3.0E-2	7.3E-2	<3.2E-2	<4.7E-2	<2.8E-2
	08-21-87	3.5E-2	1.9E-1	<2.4E-2	<3.2E-2	<2.2E-2
	09-18-87	<2.2E-2	1.0E-1	<2.2E-2	<4.9E-2	<2.3E-2
	10-01-87	<4.5E-2	2.4E-1	<4.4E-2	<6.0E-2	<3.6E-2
	10-19-87	3.7E-2	1.1E-1	<3.4E-2	<4.5E-2	<3.2E-2
	12-11-87	<6.8E-3	1.4E-2	<5.8E-3	<4.2E-2	<6.9E-2

* - Location identified in Figure 2.1.

Table C-5. Concentrations of Radionuclides Detected in 100-N Area Air Samples (pCi/m³).

Sample Location*	Date	Mn-54	Co-60	Ru-103	I-131	Cs-137
A-4	10-17-86	<1.5E-2	4.1E-2	<2.1E-2	<2.9E-2	<1.8E-2
	11-14-86	<1.6E-2	3.2E-2	<1.2E-2	<2.5E-2	<1.1E-2
	12-12-86	<2.6E-2	1.2E-1	<2.5E-2	<3.5E-2	<2.3E-2
	01-09-87	<2.1E-2	6.1E-2	<2.0E-2	<8.2E-2	<2.0E-2
	02-06-87	<1.8E-2	3.9E-2	<2.0E-2	<3.0E-2	<1.8E-2
	03-05-87	<1.8E-2	3.9E-2	<1.6E-2	<2.6E-2	<1.5E-2
	04-03-87	<1.3E-2	3.9E-2	<1.3E-2	<2.4E-2	<1.2E-2
	05-01-87	<3.2E-2	3.9E-1	<1.9E-2	<2.9E-2	6.9E-2
	06-01-87	1.5E-2	1.4E-1	<1.9E-2	<2.7E-2	<2.0E-2
	06-26-87	<2.1E-2	5.6E-2	<2.2E-2	<3.2E-2	<2.3E-2
	07-07-87	<4.4E-2	1.1E-1	<4.1E-2	<7.0E-2	<4.9E-2
	07-24-87	<2.5E-2	1.6E-1	<1.9E-2	<3.9E-2	<2.3E-2
	08-24-87	<1.5E-2	9.3E-2	<1.2E-2	<2.0E-2	<1.2E-2
	09-18-87	<2.3E-2	1.3E-1	<2.1E-2	<2.8E-2	<2.2E-2
	09-22-87	<1.7E-2	6.7E-2	<1.8E-2	<2.8E-2	<1.8E-2
	10-01-87	<5.9E-2	<2.4E-1	<5.2E-2	<1.0E-1	<5.3E-2
	10-19-87	<3.0E-2	1.0E-1	<3.4E-2	<4.8E-2	<2.8E-2
	12-11-87	<7.7E-3	<2.8E-1	<6.5E-3	<1.2E-2	<6.8E-3

* - Location identified in Figure 2.1.

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APPENDIX D

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Table D-1. Concentrations of ^{3}H Detected in 100-Area Groundwater (pCi/L).

Well*	No. of samples	Maximum	Minimum	Average	Std. Dev.
N-2	4	9.0E+4	5.7E+4	7.0E+4	1.3E+4
N-3	2	6.0E+4	5.6E+4	5.8E+4	2.0E+3
N-4	3	1.1E+5	8.3E+4	9.8E+4	1.1E+4
N-5	3	6.3E+4	5.1E+4	5.7E+4	4.9E+3
N-7	1	1.6E+5	1.6E+5	1.6E+5	0.0E+0
N-8T	60	4.6E+5	6.3E+4	9.5E+4	4.9E+4
N-14	3	1.2E+5	9.3E+4	1.1E+5	1.3E+4
N-15	3	7.8E+4	3.9E+4	5.8E+4	1.6E+4
N-16	2	< 3.0E+2	< 2.6E+2	< 2.8E+2	2.0E+1
N-18	3	3.3E+4	4.3E+3	2.3E+4	1.4E+4
N-19	3	1.5E+4	5.8E+3	9.6E+3	3.9E+3
N-20	3	1.1E+4	3.2E+3	6.0E+3	3.5E+3
N-21	3	5.0E+3	2.2E+3	3.2E+3	1.3E+3
N-22	3	4.1E+3	6.0E+2	2.0E+3	1.5E+3
N-23	3	6.0E+3	1.3E+3	3.1E+3	2.1E+3
N-24	2	4.3E+2	2.6E+2	3.5E+2	8.5E+1
N-25	3	2.8E+2	2.5E+2	2.7E+2	1.2E+1
N-27	1	1.3E+5	1.3E+5	1.3E+5	0.0E+0
N-28	3	1.8E+5	9.3E+4	1.3E+5	3.8E+4
N-29	3	1.1E+5	8.8E+4	1.0E+5	1.0E+4
N-30	5	1.9E+5	8.9E+4	1.3E+5	3.6E+4
N-31	4	1.4E+5	5.7E+4	9.6E+4	3.4E+4
N-32	5	8.7E+4	2.2E+5	1.4E+5	5.4E+4
N-33	5	2.2E+5	8.9E+4	1.5E+5	5.4E+4
N-36	3	1.4E+5	8.7E+4	1.2E+5	2.3E+4
N-37	2	1.8E+5	7.3E+4	1.3E+5	5.4E+4
N-39	2	1.3E+5	1.2E+5	1.3E+5	5.0E+3
N-45	3	1.5E+5	8.4E+4	1.2E+5	2.7E+4
N-49	2	2.0E+5	1.9E+5	2.0E+5	5.0E+3
N-50	2	9.6E+4	8.1E+4	8.9E+4	7.5E+3
N-51	2	7.1E+4	5.9E+4	6.5E+4	6.0E+3
N-52	2	1.2E+5	1.0E+5	1.1E+5	1.0E+4
K-27	5	1.9E+3	7.1E+2	1.5E+3	4.2E+2
K-28	5	5.2E+3	3.0E+3	4.2E+3	7.1E+2
K-29	5	1.6E+4	5.7E+3	9.9E+3	3.7E+3
K-30	5	1.3E+6	6.0E+5	8.3E+5	2.6E+5

D.C.G. : 2.0E+6 pCi/L

* - Locations identified in Figures 3.1 and 3.2.

Table D-2. Concentrations of ^{60}Co Detected in 100-Area Groundwater (pCi/L).

Well*	No. of samples	Maximum	Minimum	Average	Std.Dev.
N-2	4	5.5E+2	1.2E+2	2.6E+2	1.7E+2
N-3	5	2.8E+2	2.5E+1	1.1E+2	9.2E+1
N-4	3	4.4E+2	2.4E+2	3.4E+2	8.2E+1
N-5	4	1.3E+2	8.0E+1	1.0E+2	1.8E+1
N-7	2	3.3E+2	1.9E+2	2.6E+2	7.0E+1
N-8T	66	1.9E+2	7.1E+1	1.2E+2	3.0E+1
N-14	5	1.3E+2	6.9E+1	9.6E+1	2.8E+1
N-15	5	9.4E+1	2.2E+1	5.1E+1	2.5E+1
N-16	2	8.9E+0	5.2E+0	7.1E+0	1.5E+0
N-18	3	1.7E+2	3.4E+1	1.1E+2	4.7E+1
N-19	5	3.2E+2	8.6E+1	2.0E+2	8.8E+1
N-20	5	7.0E+1	1.3E+1	4.5E+1	2.0E+1
N-21	3	1.7E+1	< 2.9E+0	1.2E+1	6.6E+0
N-22	4	1.9E+1	7.7E+0	1.4E+1	4.1E+0
N-23	5	1.1E+2	1.1E+1	4.9E+1	3.5E+1
N-24	4	2.6E+1	1.2E+1	1.8E+1	5.8E+0
N-25	5	1.2E+1	5.9E+0	9.5E+0	2.1E+0
N-27	4	3.8E+2	1.7E+2	3.0E+2	7.9E+1
N-28	5	2.7E+2	1.8E+2	2.2E+2	2.9E+1
N-29	6	3.4E+2	6.8E+0	1.5E+2	1.2E+2
N-30	5	2.2E+2	1.1E+2	1.6E+2	4.1E+1
N-31	4	2.0E+2	1.4E+2	1.7E+2	2.2E+1
N-32	5	6.3E+2	1.4E+2	3.2E+2	1.7E+2
N-33	4	2.7E+2	1.5E+2	2.1E+2	4.3E+1
N-36	3	2.8E+2	1.8E+2	2.2E+2	4.2E+1
N-37	2	2.2E+2	2.0E+2	2.1E+2	1.0E+1
N-39	3	2.1E+2	1.3E+2	1.8E+2	3.6E+1
N-45	3	2.8E+2	1.3E+2	1.8E+2	6.8E+1
N-47	6	3.2E+1	8.5E+0	1.8E+1	8.5E+0
N-48	6	1.5E+1	4.2E+0	9.5E+0	4.5E+0
N-52	1	3.5E+2	3.5E+2	3.5E+2	0.0E+0
K-27	5	9.1E+0	< 1.1E+0	5.0E+0	2.8E+0
K-28	5	7.4E+0	< 3.0E+0	6.0E+0	1.6E+0
K-29	5	7.6E+0	< 2.0E+0	5.6E+0	2.0E+0
K-30	5	1.9E+1	< 5.6E+0	1.2E+1	4.6E+0

D.C.G. : 5.0E+3 pCi/L

* - Locations identified in Figures 3.1 and 3.2

Table D-3. Concentrations of ^{90}Sr Detected in 100-Area Groundwater (pCi/L).

Well*	No. of Samples	Maximum	Minimum	Average	Std.Dev.
N-2	3	4.4E+3	1.3E+3	3.1E+3	1.3E+3
N-3	2	1.4E+3	1.2E+3	1.3E+3	1.0E+2
N-4	2	1.3E+1	1.1E+1	1.2E+1	1.0E+0
N-5	3	8.7E+2	2.5E+2	5.1E+2	2.6E+2
N-7	1	2.8E+0	2.8E+0	2.8E+0	0.0E+0
N-8T	65	7.4E+3	4.4E+3	6.2E+3	7.1E+2
N-14	2	1.2E+3	9.6E+2	1.1E+3	1.2E+2
N-15	3	2.1E+0	< 7.8E-1	1.5E+0	5.4E-1
N-16	2	2.5E+0	< 1.7E-1	1.3E+0	1.2E+0
N-18	3	4.1E+2	2.6E+2	3.1E+2	7.1E+1
N-19	3	1.3E+2	8.7E+1	1.1E+2	1.8E+1
N-20	3	4.6E+1	1.4E+1	3.4E+1	1.4E+1
N-21	3	8.7E+0	2.9E+0	6.7E+0	2.7E+0
N-22	3	1.5E+0	< 1.2E-1	8.7E-1	5.7E-1
N-23	3	4.0E+0	2.3E+0	3.0E+0	7.1E-1
N-24	2	6.6E+0	6.4E+0	6.5E+0	1.0E-1
N-25	3	1.2E+0	< 3.7E-1	7.0E-1	3.6E-1
N-27	2	1.5E+2	9.4E+1	1.2E+2	2.8E+1
N-28	2	1.5E+1	1.6E+0	8.3E+0	6.7E+0
N-29	2	6.7E+2	4.4E+2	5.6E+2	1.2E+2
N-30	4	6.2E+0	4.6E+0	5.1E+0	6.4E-1
N-31	2	2.2E+1	1.5E+1	1.9E+1	3.5E+0
N-32	4	7.1E+0	2.9E+0	5.0E+0	1.5E+0
N-33	4	6.6E+2	4.5E+2	5.7E+2	8.6E+1
N-36	3	1.2E+2	7.3E+1	1.0E+2	2.0E+1
N-37	2	3.2E+1	3.2E+1	3.2E+1	0.0E+0
N-39	2	1.0E+4	8.6E+2	5.4E+3	4.6E+3
N-45	3	2.8E+3	2.6E+2	1.3E+3	1.1E+3
N-49	2	1.4E+0	1.0E+0	1.2E+0	2.0E-1
N-50	2	< 5.8E-2	< 2.7E-2	< 4.3E-2	1.6E-2
N-51	2	< 2.9E-1	< 4.9E-2	< 1.7E-1	1.2E-1
N-52	2	< 4.3E-1	< 3.8E-2	< 1.6E-1	1.9E-1

D.C.G. : 1.0E+3 pCi/L

* - Locations identified in Figures 3.1 and 3.2.

Table D-4. Concentrations of ^{103}Ru Detected in 100-Area Groundwater (pCi/L).

Well*	No. of Samples	Maximum	Minimum	Average	Std.Dev.
N-2	4	5.3E+1	< 1.3E+1	3.1E+1	1.8E+1
N-3	5	6.2E+1	< 6.2E+0	2.5E+1	2.0E+1
N-4	4	1.3E+2	< 1.1E+1	4.7E+1	4.9E+1
N-5	4	5.3E+1	< 6.5E+0	2.2E+1	1.8E+1
N-7	2	2.2E+2	< 8.6E+1	1.5E+2	6.8E+1
N-8T	66	1.2E+2	< 4.3E+0	3.2E+1	3.3E+1
N-14	5	1.3E+2	< 8.7E+0	4.6E+1	4.7E+1
N-15	5	1.3E+2	< 7.4E+0	4.1E+1	4.7E+1
N-16	3	8.2E+0	< 6.6E+0	7.1E+0	7.5E-1
N-18	5	< 6.2E+1	< 7.5E+0	< 1.9E+1	2.1E+1
N-19	5	< 6.4E+1	< 6.6E+0	< 2.5E+1	2.1E+1
N-20	5	< 6.0E+1	< 7.3E+0	< 2.6E+1	2.2E+1
N-21	3	< 1.3E+1	< 6.1E+0	< 8.5E+0	3.2E+0
N-22	4	< 1.6E+1	< 6.3E+0	< 1.0E+1	3.7E+0
N-23	5	4.8E+1	< 8.6E+0	2.4E+1	1.5E+1
N-24	4	< 1.4E+1	< 6.9E+0	< 1.0E+1	3.2E+0
N-25	5	< 1.1E+1	< 6.3E+0	< 8.0E+0	1.7E+0
N-27	4	4.4E+3	< 1.5E+1	1.1E+3	1.9E+3
N-28	5	5.7E+2	< 1.1E+1	1.7E+2	2.1E+2
N-29	6	8.3E+2	< 9.5E+0	1.8E+2	2.9E+2
N-30	5	3.0E+2	< 1.4E+1	1.0E+2	1.0E+2
N-31	3	7.6E+2	< 8.3E+0	2.8E+2	3.4E+2
N-32	5	7.7E+2	< 1.2E+1	2.0E+2	2.9E+2
N-33	4	4.0E+2	< 2.4E+1	1.4E+2	1.5E+2
N-36	3	8.7E+1	7.1E+1	7.9E+1	6.5E+0
N-37	2	8.8E+1	7.9E+1	8.4E+1	4.5E+0
N-39	2	1.1E+2	5.0E+1	8.0E+1	3.0E+1
N-45	3	1.5E+2	2.8E+1	8.0E+1	5.1E+1
N-47	6	2.1E+1	< 5.4E+0	9.1E+0	5.8E+0
N-48	6	7.7E+0	< 4.4E+0	6.4E+0	1.1E+0
N-52	1	6.8E+1	6.8E+1	6.8E+1	0.0E+0
K-27	4	< 9.8E+0	< 5.8E+0	< 8.0E+0	1.5E+0
K-28	3	< 1.1E+1	< 7.8E+0	< 9.6E+0	1.3E+0
K-29	3	< 9.8E+0	< 8.2E+0	< 8.8E+0	7.1E-1
K-30	4	< 1.4E+1	< 7.1E+0	< 9.8E+0	2.6E+0

D.C.G. : 5.0E+4 pCi/L

* - Locations identified in Figures 3.1 and 3.2.

Table D-5. Concentrations of ^{106}Ru Detected in 100-Area Groundwater (pCi/L).

Well*	No. of Samples	Maximum	Minimum	Average	Std.Dev.
N-2	4	1.4E+2	< 6.4E+1	1.1E+2	2.8E+1
N-3	5	1.2E+2	< 4.0E+1	7.5E+1	3.0E+1
N-4	4	1.6E+2	2.8E+1	9.7E+1	4.7E+1
N-5	4	9.5E+1	4.5E+1	7.7E+1	1.9E+1
N-7	2	2.2E+2	1.9E+2	2.1E+2	1.6E+1
N-8T	66	1.8E+2	2.9E+1	9.9E+1	3.7E+1
N-14	5	1.4E+2	7.3E+1	9.9E+1	2.6E+1
N-15	5	9.6E+1	4.6E+1	6.2E+1	1.8E+1
N-16	3	< 4.6E+1	< 1.6E+1	< 3.3E+1	1.3E+1
N-18	5	9.9E+1	< 4.4E+1	6.3E+1	1.9E+1
N-19	5	8.1E+1	< 4.2E+1	6.1E+1	1.3E+1
N-20	5	9.8E+1	< 4.1E+1	6.3E+1	2.0E+1
N-21	3	< 5.6E+1	< 4.2E+1	< 4.8E+1	6.0E+0
N-22	4	< 5.8E+1	< 4.6E+1	< 5.0E+1	4.7E+0
N-23	5	1.1E+2	< 3.8E+1	6.4E+1	2.4E+1
N-24	4	< 6.2E+1	< 4.2E+1	< 5.0E+1	8.1E+0
N-25	5	< 5.2E+1	< 3.8E+1	< 4.7E+1	5.0E+0
N-27	4	9.6E+2	1.3E+2	3.8E+2	3.4E+2
N-28	5	3.1E+2	9.2E+1	2.1E+2	7.0E+1
N-29	6	3.3E+2	< 3.8E+1	1.5E+2	1.0E+2
N-30	5	2.4E+2	1.0E+2	1.7E+2	4.5E+1
N-31	4	3.5E+2	8.7E+1	1.8E+2	1.0E+2
N-32	5	3.8E+2	1.3E+2	2.1E+2	8.8E+1
N-33	4	2.5E+2	< 8.4E+1	1.6E+2	6.3E+1
N-36	3	1.8E+2	1.2E+2	1.5E+2	2.4E+1
N-37	2	1.7E+2	9.2E+1	1.3E+2	3.9E+1
N-39	3	1.8E+2	9.7E+1	1.3E+2	3.6E+1
N-45	3	1.4E+2	< 6.4E+1	1.0E+2	3.1E+1
N-47	6	< 6.0E+1	< 4.7E+1	< 5.3E+1	5.0E+0
N-48	6	< 5.3E+1	< 3.9E+1	< 4.9E+1	5.7E+0
N-52	1	1.5E+2	1.5E+2	1.5E+2	0.0E+0
K-27	5	< 5.4E+1	< 3.6E+1	< 4.4E+1	6.4E+0
K-28	5	< 5.6E+1	< 2.5E+1	< 4.4E+1	1.3E+1
K-29	5	< 6.2E+1	< 8.4E+0	< 3.6E+1	2.2E+1
K-30	5	6.0E+1	< 8.8E+0	3.8E+1	1.9E+1

D.C.G. : 6.0E+3 pCi/L

* - Locations identified in Figures 3.1 and 3.2.

Table D-6. Concentrations of ^{124}Sb Detected in 100-Area Groundwater (pCi/L).

Well*	No. of Samples	Maximum	Minimum	Average	Std.Dev.
N-2	4	< 1.2E+1	< 8.8E+0	< 1.1E+1	1.4E+0
N-3	5	< 2.8E+1	< 5.9E+0	< 1.3E+1	7.9E+0
N-4	4	< 1.2E+1	< 6.8E+0	< 9.2E+0	1.9E+0
N-5	4	< 1.3E+1	< 5.9E+0	< 9.0E+0	2.8E+0
N-7	2	< 1.4E+1	< 5.8E+0	< 9.9E+0	4.1E+0
N-14	5	< 1.7E+1	< 7.7E+0	< 1.0E+1	3.4E+0
N-15	5	< 1.8E+1	< 6.6E+0	< 1.1E+1	3.9E+0
N-16	3	< 9.6E+0	< 7.9E+0	< 8.8E+0	7.0E-1
N-18	5	< 3.1E+1	< 6.9E+0	< 1.3E+1	9.1E+0
N-19	5	< 3.4E+1	< 8.3E+0	< 1.5E+1	9.6E+0
N-20	5	< 3.0E+1	< 9.8E+0	< 1.4E+1	7.9E+0
N-21	3	< 1.0E+1	< 7.4E+0	< 8.4E+0	1.1E+0
N-22	4	< 1.5E+1	< 8.6E+0	< 1.1E+1	2.3E+0
N-23	5	< 1.3E+1	< 9.8E+0	< 1.1E+1	1.2E+0
N-24	4	< 1.2E+1	< 7.5E+0	< 1.0E+1	1.9E+0
N-25	5	< 1.2E+1	< 7.6E+0	< 9.0E+0	1.5E+0
N-27	4	7.3E+1	< 9.6E+0	2.9E+1	2.6E+1
N-28	5	< 3.3E+1	< 1.2E+1	< 1.7E+1	8.0E+0
N-29	6	< 3.8E+1	< 1.0E+1	< 2.1E+1	1.0E+1
N-30	5	< 1.3E+1	< 8.5E+0	< 1.2E+1	1.7E+0
N-31	4	1.5E+1	< 9.6E+0	1.2E+1	2.0E+0
N-32	5	2.9E+1	< 1.1E+1	1.6E+1	6.7E+0
N-33	3	< 1.5E+1	< 8.7E+0	< 1.1E+1	2.8E+0
N-47	6	< 1.1E+1	< 7.6E+0	< 9.3E+0	1.3E+0
N-48	6	< 9.9E+0	< 6.7E+0	< 8.3E+0	1.1E+0
N-52	1	< 6.3E+0	< 6.3E+0	< 6.3E+0	0.0E+0
K-27	4	< 1.1E+1	< 7.5E+0	< 8.8E+0	1.4E+0
K-28	3	< 1.2E+1	< 9.3E+0	< 1.1E+1	1.1E+0
K-29	3	< 1.2E+1	< 8.0E+0	< 9.6E+0	1.7E+0
K-30	4	< 1.6E+1	< 7.8E+0	< 1.0E+1	3.4E+0

D.C.G. : 2.0E+4 pCi/L

* - Locations identified in Figures 3.1 and 3.2.

Table D-7. Concentrations of ^{125}Sb Detected in 100-Area Groundwater (pCi/L).

Well*	No. of Samples	Maximum	Minimum	Average	Std.Dev.
N-2	4	6.5E+2	1.1E+2	3.5E+2	2.0E+2
N-3	5	5.0E+2	2.4E+1	1.9E+2	1.7E+2
N-4	4	1.0E+2	5.6E+1	7.4E+1	1.8E+1
N-5	4	1.5E+2	3.3E+1	9.6E+1	4.4E+1
N-7	2	2.9E+2	1.2E+2	2.1E+2	8.5E+1
N-8T	66	2.1E+2	4.4E+1	1.1E+2	2.8E+1
N-14	5	1.5E+2	6.4E+1	1.1E+2	2.9E+1
N-15	5	4.3E+1	1.3E+1	2.6E+1	1.2E+1
N-16	3	< 1.9E+1	< 1.2E+1	< 1.6E+1	3.1E+0
N-18	5	1.4E+2	1.6E+1	8.7E+1	5.4E+1
N-19	5	1.1E+2	1.9E+1	6.2E+1	3.5E+1
N-20	5	< 2.8E+1	< 1.3E+1	< 2.1E+1	6.6E+0
N-21	3	< 2.1E+1	< 1.8E+1	< 1.9E+1	1.2E+0
N-22	4	< 2.2E+1	< 1.8E+1	< 2.0E+1	1.5E+0
N-23	5	< 2.6E+1	< 1.4E+1	< 2.1E+1	4.1E+0
N-24	4	5.8E+1	1.3E+1	3.2E+1	1.7E+1
N-25	5	< 2.1E+1	< 1.3E+1	< 1.8E+1	2.7E+0
N-27	4	3.6E+2	1.9E+2	2.8E+2	7.2E+1
N-28	5	4.1E+2	1.6E+2	3.1E+2	9.2E+1
N-29	6	5.4E+2	< 1.2E+1	3.1E+2	2.2E+2
N-30	5	1.8E+2	1.1E+2	1.4E+2	2.7E+1
N-31	4	3.6E+2	1.6E+2	2.5E+2	7.2E+1
N-32	5	3.2E+2	1.6E+2	2.3E+2	5.7E+1
N-33	5	2.4E+2	1.1E+2	1.9E+2	5.8E+1
N-36	3	2.1E+2	1.1E+2	1.6E+2	4.1E+1
N-39	3	1.2E+2	7.3E+1	1.0E+2	2.0E+1
N-45	3	2.1E+2	5.6E+1	1.6E+2	7.0E+1
N-47	6	< 2.6E+1	< 1.5E+1	< 2.1E+1	3.7E+0
N-48	6	< 2.3E+1	< 1.4E+1	< 2.0E+1	3.3E+0
N-52	1	9.4E+1	9.4E+1	9.4E+1	0.0E+0
K-27	4	6.0E+2	2.2E+2	4.2E+2	1.4E+2
K-28	3	1.2E+2	5.8E+1	9.0E+1	2.5E+1
K-29	3	< 2.2E+1	< 1.8E+1	< 2.0E+1	1.6E+0
K-30	4	< 3.1E+1	< 1.8E+1	< 2.2E+1	5.2E+0

D.C.G. : 6.0E+4 pCi/L

* - Locations identified in Figures 3.1 and 3.2.

Table D-8. Concentrations of ^{131}I Detected in 100-Area Groundwater (pCi/L).

Well*	No. of Samples	Maximum	Minimum	Average	Std.Dev.
N-2	4	< 1.4E+1	< 1.0E+1	< 1.2E+1	1.5E+0
N-3	5	< 4.6E+1	< 1.1E+1	< 2.6E+1	1.4E+1
N-4	4	1.9E+2	< 1.3E+1	1.3E+2	7.2E+1
N-5	4	< 1.6E+1	< 1.1E+1	< 1.4E+1	2.0E+0
N-7	2	2.8E+3	3.6E+2	1.6E+3	1.2E+3
N-8T	66	6.5E+1	< 9.5E+0	9.0E+0	1.6E+1
N-14	5	1.7E+2	< 1.0E+1	6.0E+1	5.9E+1
N-15	5	9.5E+1	< 9.7E+0	3.8E+1	3.1E+1
N-16	3	2.0E+1	< 1.1E+1	< 1.5E+1	3.7E+0
N-18	5	5.3E+1	< 1.7E+1	< 2.9E+1	1.3E+1
N-19	5	< 4.0E+1	< 1.6E+1	< 3.2E+1	8.4E+0
N-20	5	< 3.4E+1	< 1.2E+1	< 2.3E+1	9.2E+0
N-21	3	< 1.7E+1	< 1.2E+1	< 1.4E+1	2.2E+0
N-22	4	< 1.5E+1	< 1.2E+1	< 1.4E+1	1.5E+0
N-23	5	< 3.2E+1	< 1.8E+1	< 2.3E+1	4.7E+0
N-24	4	< 1.8E+1	< 7.9E+0	< 1.4E+1	3.9E+0
N-25	5	< 3.3E+1	< 1.3E+1	< 2.0E+1	7.3E+0
N-27	4	1.3E+4	< 8.4E+0	3.3E+3	5.6E+3
N-28	5	1.1E+4	< 1.6E+1	2.2E+3	4.4E+3
N-29	6	7.0E+3	< 2.2E+1	1.2E+3	2.6E+3
N-30	5	9.3E+3	< 7.8E+0	2.0E+3	3.7E+3
N-31	3	2.7E+3	< 2.1E+1	9.2E+2	1.3E+3
N-32	5	1.3E+4	< 1.8E+1	5.2E+3	6.4E+3
N-33	4	5.2E+3	< 1.8E+1	1.6E+3	2.1E+3
N-36	3	1.1E+4	< 3.2E+3	6.4E+3	3.3E+3
N-37	2	4.4E+3	< 4.6E+2	2.4E+3	2.0E+3
N-39	3	5.3E+3	3.1E+2	3.2E+3	2.1E+3
N-45	3	4.1E+3	3.1E+2	2.7E+3	1.7E+3
N-47	6	< 9.0E+0	< 5.5E+0	< 7.7E+0	1.2E+0
N-48	6	< 8.5E+0	< 5.2E+0	< 7.3E+0	1.1E+0
N-52	1	< 1.2E+1	< 1.2E+1	< 1.2E+1	0.0E+0

D.C.G.: 3.0E+3 pCi/L

* - Locations identified in Figures 3.1 and 3.2.

Table D-9. Concentrations of Oil and Grease Detected in 100-Area Groundwater (mg/L).

Date	N-16	N-17	N-18	N-19	N-20	N-21	N-22	N-23	N-24	N-25	N-26
10-07-86	586									< 1.0	
10-14-86	4061	15	< 1.0						1.1		
10-21-86				< 1.0	< 1.0					< 1.0	
10-28-86	148					< 1.0	< 1.0		< 1.0		
11-04-86	8750							1.1		< 1.0	
11-11-86	652							1.2		1.4	
11-18-86		< 1.0	1.2						< 1.0		
11-25-86				< 1.0	< 1.0					< 1.0	
12-02-86	17308						6.7		3.3		
12-09-86	2880							1.1		< 1.0	
12-16-86	9338							< 1.0		< 1.0	
01-06-87		< 1.0	1.9						< 1.0		
01-13-87	378			< 1.0	< 1.0					< 1.0	
01-20-87	3447					2.2	< 1.0		< 1.0		
01-27-87	5356							< 1.0		2.6	1.8
02-03-87	2810										
02-10-87	1633	< 1.0	1.4						< 1.0		
02-17-87	916			< 1.0	< 1.0					< 1.0	
02-24-87	747					< 1.0	< 1.0		< 1.0		
03-03-87	77							< 1.0		< 1.0	1.9
03-10-87	165							< 1.0		< 1.0	< 1.0
03-17-87	2.1	< 1.0	2.3						< 1.0		
03-24-87	595			1.1	< 1.0					< 1.0	
03-31-87	88					< 1.0	< 1.0		< 1.0		
04-07-87	99							< 1.0		< 1.0	< 1.0
04-14-87	6.7							1.9		< 1.0	< 1.0
04-21-87		< 1.0	2.8						< 1.0		
04-28-87				< 1.0	< 1.0					< 1.0	
05-05-87							< 1.0		< 1.0		
05-12-87								< 1.0		< 1.0	< 1.0
05-19-87								< 1.0		< 1.0	< 1.0
05-26-87	24	< 1.0	< 1.0						< 1.0		
06-02-87	3.0			< 1.0	< 1.0					< 1.0	
06-09-87	7.3					1.1	< 1.0		1.7		
06-16-87	3.4							< 1.0		< 1.0	< 1.0
06-23-87	3.0							< 1.0		< 1.0	< 1.0
06-30-87	4.4	< 1.0	1.9						< 1.0		
07-07-87				< 1.0	< 1.0					1.4	
07-21-87	< 1.0							< 1.0		< 1.0	< 1.0
07-28-87	3.0							1.4		< 1.0	< 1.0
08-04-87	3.4	< 1.0	< 1.0						< 1.0		
08-11-87	1.2			< 1.0	< 1.0					< 1.0	
08-18-87	< 1.0					< 1.0	< 1.0		< 1.0		
08-25-87	1.3							< 1.0		1.1	< 1.0
09-01-87	< 1.0							< 1.0		< 1.0	< 1.0
09-08-87		< 1.0	1.0						< 1.0		
09-15-87	1.3			1.0	< 1.0					< 1.0	
09-22-87						< 1.0	< 1.0		< 1.0		
09-29-87		1.6	< 1.0	< 1.0	< 1.0			< 1.0		1.3	1.3
10-06-87	1.5							< 1.0		< 1.0	< 1.0
10-13-87	2.7	< 1.0	< 1.0						< 1.0		
10-20-87	3.5			< 1.0	1.2					1.6	
10-27-87	2.7					< 1.0	< 1.0		1.2		
11-03-87								< 1.0		< 1.0	< 1.0
11-10-87	2.8							< 1.0		< 1.0	< 1.0
11-17-87		< 1.0	1.0						< 1.0		
11-24-87				< 1.0	< 1.0					< 1.0	
12-01-87	3.1					< 1.0	< 1.0		< 1.0		
12-08-87	2.8							< 1.0		1.0	< 1.0
12-15-87	2.1							1.2		< 1.0	< 1.0
12-22-87	2.0	1.1	< 1.0						< 1.0		
12-29-87				< 1.0	< 1.0					< 1.0	
# of Samples	45	14	14	14	14	9	11	23	24	37	19
Maximum	17308	15	2.8	1.1	1.2	2.2	6.7	1.9	3.3	2.6	1.9
Minimum	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Average	1336	2.1	1.4	1.0	1.0	1.1	1.5	1.1	1.1	1.1	1.1
Stan.Dev.	3203	3.6	0.6	0.0	0.1	0.4	1.6	0.2	0.5	0.3	0.3

* - Locations identified in Figure 3.1.

Table D-10. Concentrations of Average Radionuclides Detected in Well K-27* from 1982 through 1987 (pCi/L).

YEAR	Co-60	Ru-103	Sb-124	Sb-125
1982	1.4E+0	NR	1.1E+2	1.0E+2
1983	7.3E+0	NR	NR	6.4E+2
1984	9.7E+0	NR	NR	5.2E+2
1985	1.4E+1	3.1E+0	NR	4.0E+2
1986	6.6E+0	6.8E+0	< 8.7E+0	3.3E+2
1987	5.0E+0	< 8.0E+0	< 8.8E+0	4.2E+2
D.C.G.	5.0E+3	5.0E+4	2.0E+4	6.0E+4

* - Location identified in Figure 3.5.
NR - Not Reported

APPENDIX E

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Table E-1. Concentrations of Radionuclides Detected in Surface Soil Samples Near the 1301-N Liquid Waste Disposal Facility (pCi/g, dry weight).

Sample Location*	Sample Type	Mn-54	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
N-2	S	2.2E-1	7.9E+0	5.3E-1	2.3E+0	4.5E-3	3.1E-2
N-3	S	8.7E-1	1.1E+1	5.9E-1	2.2E+0	7.5E-3	4.5E-2
N-4	S	<9.9E-2	1.0E+0	1.6E-1	1.3E+0	3.7E-3	7.8E-3
N-5	S	<1.0E-1	5.2E-1	6.9E-2	5.4E-1	6.0E-3	3.6E-3
Average		3.2E-1	5.1E+0	3.4E-1	1.6E+0	5.4E-3	2.2E-2
Std.Dev.		3.2E-1	4.5E+0	2.3E-1	7.2E-1	1.5E-3	1.7E-2
Hanford Site**		NR	NR	3.1E-1	1.5E+0	NR	3.8E-2
Off Site**		NR	NR	1.8E-1	8.0E-1	NR	9.0E-3

* - Locations identified in Figure 4.1.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-2. Concentrations of Radionuclides Detected in 100-N Surface Soil Samples (pCi/g, dry weight)

Sample Location*	Sample Type	Mn-54	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
N-6	S	<8.6E-2	5.2E-1	1.2E-1	3.1E-1	2.1E-3	5.3E-3
N-7	S	<8.9E-2	4.4E-1	1.9E-1	<9.3E-1	1.2E-3	1.6E-2
N-9	S	<7.5E-2	2.1E-1	5.3E-2	1.1E-1	3.5E-4	1.1E-3
N-10	S	<1.0E-1	5.4E-1	1.1E-1	3.0E-1	4.8E-4	7.0E-3
N-11	S	<9.4E-2	4.0E-1	1.5E-1	6.2E-1	2.1E-3	1.0E-2
N-12	S	<1.0E-1	3.4E-1	3.0E-2	8.4E-2	1.1E-4	5.0E-4
Average		9.1E-2	4.1E-1	1.1E-1	3.9E-1	1.1E-3	6.7E-3
Std.Dev.		8.7E-3	1.1E-1	5.4E-2	3.0E-1	8.1E-4	5.3E-3
Hanford Site**		NR	NR	3.1E-1	1.5E+0	NR	3.8E-2
Off Site**		NR	NR	1.8E-1	8.0E-1	NR	9.0E-3

* - Locations identified in Figure 4.1.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-3. Concentrations of Radionuclides Detected in 100-B/C Area Surface Soil Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
B-1	S	1.7E-1	1.9E-2	1.0E-1	<2.3E-4	1.1E-3
B-2	S	2.5E-1	3.9E-2	1.4E-1	<5.6E-5	1.5E-3
C-1	S	4.1E-1	3.3E-1	2.9E+0	2.0E-3	4.7E-2
C-2	S	1.9E-1	5.8E-2	5.4E-1	<2.0E-4	7.1E-3
Average		2.6E-1	1.1E-1	9.2E-1	6.2E-4	1.4E-2
Std.Dev.		9.4E-2	1.3E-1	1.2E+0	8.0E-4	1.9E-2
Hanford Site**		NR	3.1E-1	1.5E+0	NR	3.8E-2
Off Site**		NR	1.8E-1	8.0E-1	NR	9.0E-3

* - Locations identified in Figure 4.2.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-4. Concentrations of Radionuclides Detected in 100-D/DR Area Surface Soil Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
D-1	S	1.6E-1	1.2E-1	7.0E-1	6.2E-4	1.0E-2
D-2	S	3.1E-1	4.2E-1	1.5E+0	1.5E-3	4.6E-2
D-3	S	4.9E-1	9.5E-2	5.1E-1	4.1E-3	1.2E-2
D-4	S	1.4E-1	1.5E-1	1.7E+0	<3.2E-4	5.2E-3
Average		2.8E-1	2.0E-1	1.1E+0	1.6E-3	1.8E-2
Std.Dev.		1.4E-1	1.3E-1	5.1E-1	1.5E-3	1.6E-2
Hanford Site**		NR	3.1E-1	1.5E+0	NR	3.8E-2
Off Site**		NR	1.8E-1	8.0E-1	NR	9.0E-3

* - Locations identified in Figure 4.3.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-5. Concentrations of Radionuclides Detected in 100-F Area Surface Soil Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
F-1	S	2.8E-1	5.3E-1	3.5E-1	<3.0E-4	8.4E-3
F-2	S	2.7E-1	2.8E-1	7.5E-1	1.4E-3	1.1E-2
F-3	S	1.7E-1	9.2E-2	<2.4E-1	1.1E-4	2.8E-3
F-4	S	<1.0E-1	4.3E-2	1.3E-1	<1.1E-4	2.5E-3
F-5	S	<1.1E-1	2.7E-1	1.3E+0	1.3E-3	2.2E-2
Average		1.9E-1	2.4E-1	5.5E-1	6.4E-4	9.3E-3
Std.Dev.		7.7E-2	1.7E-1	4.3E-1	5.8E-4	7.1E-3
Hanford Site**		NR	3.1E-1	1.5E+0	NR	3.8E-2
Off Site**		NR	1.8E-1	8.0E-1	NR	9.0E-3

* - Locations identified in Figure 4.4.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-6. Concentrations of Radionuclides Detected in 100-H Area Surface Soil Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
H-1	S	1.6E-1	4.8E-2	< 3.0E-1	3.0E-4	4.2E-3
H-2	S	3.9E-1	3.3E-1	3.7E+0	1.4E-3	5.7E-2
Average		2.8E-1	1.9E-1	2.0E+0	8.5E-4	3.1E-2
Std.Dev.		1.2E-1	1.4E-1	1.7E+0	5.5E-4	2.6E-2
Hanford Site**		NR	3.1E-1	1.5E+0	NR	3.8E-2
Off Site**		NR	1.8E-1	8.0E-1	NR	9.0E-3

* - Locations identified in Figure 4.5.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-7. Concentrations of Radionuclides Detected in 100-K Area Surface Soil Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
K-1	S	4.5E+0	6.5E-1	2.7E+0	9.4E-3	2.2E-1
K-2	S	5.5E-1	1.4E-1	8.0E-1	< 5.4E-4	9.3E-3
K-3	S	3.5E-1	2.8E-1	9.8E-1	< 4.7E-4	6.7E-3
K-4	S	2.0E-1	1.0E-1	5.2E-1	< 1.1E-4	1.0E-2
K-5	S	3.7E-1	9.8E-1	1.3E+0	2.9E-3	3.0E-2
Average		1.2E+0	4.3E-1	1.3E+0	2.7E-3	5.5E-2
Std.Dev.		1.7E+0	3.4E-1	7.6E-1	3.5E-3	8.3E-2
Hanford Site**		NR	3.1E-1	1.5E+0	NR	3.8E-2
Off Site**		NR	1.8E-1	8.0E-1	NR	9.0E-3

* - Locations identified in Figure 4.6.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-8. Concentrations of Radionuclides Detected in Vegetation Samples Near the 1301-N Liquid Waste Disposal Facility (pCi/g, dry weight).

Sample Location*	Sample Type	Mn-54	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
N-2	V	5.4E-1	6.3E+0	1.4E-1	2.5E-1	1.0E-3	6.7E-3
N-3	V	3.0E-1	< 3.5E-1	6.6E-2	1.0E-1	6.0E-4	5.3E-3
N-4	V	1.9E-1	1.7E+0	< 8.3E-3	2.8E-1	4.0E-4	6.2E-4
N-5	V	9.2E-1	2.7E+0	3.7E-2	1.6E-1	2.6E-3	9.8E-3
Average		4.9E-1	2.8E+0	6.3E-2	2.0E-1	1.2E-3	5.6E-3
Std.Dev.		2.8E-1	2.2E+0	4.9E-2	7.2E-2	8.6E-4	3.3E-3
Hanford Site**		NR	NR	1.1E+0	7.1E-2	NR	1.4E-3
Off Site**		NR	NR	8.0E-2	6.4E-1	NR	4.7E-4

* - Locations identified in Figure
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-9. Concentrations of Radionuclides Detected in 100-N Vegetation Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Mn-54	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
N-6	V	< 7.8E-2	2.8E-1	2.9E-1	< 5.8E-2	9.8E-5	< 3.1E-4
N-7	V	< 1.2E-1	3.8E-1	3.4E-2	< 8.3E-2	9.5E-5	< 2.1E-4
N-9	V	< 8.2E-2	7.4E-1	8.9E-1	1.0E-1	5.2E-5	6.2E-4
N-10	V	< 8.5E-2	6.9E-1	6.8E-2	8.4E-2	7.2E-5	6.3E-4
N-11	V	2.1E-1	1.5E+0	6.0E-2	1.8E-1	3.8E-4	1.2E-3
N-12	V	< 1.0E-1	6.2E-1	2.0E-1	5.7E-2	5.4E-5	4.8E-4
Average		1.1E-1	7.0E-1	2.6E-1	9.4E-2	1.3E-4	5.8E-4
Std.Dev.		4.6E-2	3.9E-1	3.0E-1	4.1E-2	1.2E-4	3.2E-4
Hanford Site**		NR	NR	1.1E+0	7.1E-2	NR	1.4E-3
Off Site**		NR	NR	8.0E-2	6.4E-1	NR	4.7E-4

* - Locations identified in Figure 4.1.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-10. Concentrations of Radionuclides Detected in N-Springs Vegetation Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Mn-54	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
NS-1	V	< 1.7E-1	4.9E-1	2.2E+1	6.9E-2	< 5.5E-5	1.5E-4
NS-2	V	< 2.3E-1	8.2E-1	2.3E+2	< 1.6E-1	< 2.6E-4	2.0E-3
NS-3	V	1.9E-1	1.4E+0	6.2E+2	< 8.8E-2	< 8.0E-5	1.4E-4
Average		2.0E-1	9.0E-1	2.9E+2	1.1E-1	< 1.3E-4	7.6E-4
Std.Dev.		2.5E-2	3.8E-1	2.5E+2	3.9E-2	9.1E-5	8.7E-4
Hanford Site**		NR	NR	1.1E+0	7.1E-2	NR	1.4E-3
Off Site**		NR	NR	8.0E-2	6.4E-1	NR	4.7E-4

* - Locations identified in Figure 4.7.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-11. Concentrations of Radionuclides Detected in 100-B/C Area Vegetation Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
B-1	V	1.6E-1	5.1E-2	< 6.4E-2	1.7E-3	< 1.7E-4
B-2	V	1.3E-1	2.1E-2	< 8.4E-2	< 6.7E-5	5.7E-4
C-1	V	2.0E-1	7.0E-1	1.4E-1	< 1.5E-6	< 5.7E-5
C-2	V	1.0E-1	1.3E-1	1.3E-1	< 6.3E-5	1.8E-3
Average		1.5E-1	2.3E-1	1.0E-1	4.6E-4	6.5E-4
Std.Dev.		3.7E-2	2.8E-1	3.2E-2	7.2E-4	6.9E-4
Hanford Site**		NR	1.1E+0	7.1E-2	NR	1.4E-3
Off Site**		NR	8.0E-2	6.4E-1	NR	4.7E-4

* - Locations identified in Figure 4.2.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-12. Concentrations of Radionuclides Detected in 100-D/DR Area Vegetation Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
D-1	V	3.2E-1	2.2E-2	2.0E-1	< 4.9E-5	2.8E-4
D-2	V	2.9E-1	3.1E-2	< 8.2E-2	< 4.4E-5	< 1.2E-4
D-3	V	2.3E-1	1.7E-2	3.2E-2	< 1.5E-6	3.1E-4
D-4	V	1.7E-1	3.1E-1	2.2E+0	< 5.6E-4	< 3.9E-4
Average		2.5E-1	9.5E-2	6.3E-1	< 1.6E-4	2.8E-4
Std.Dev.		5.8E-2	1.2E-1	9.1E-1	2.3E-4	9.8E-5
Hanford Site**		NR	1.1E+0	7.1E-2	NR	1.4E-3
Off Site**		NR	8.0E-2	6.4E-1	NR	4.7E-4

* - Locations identified in Figure 4.3.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-13. Concentrations of Radionuclides Detected in 100-F Area Vegetation Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
F-1	V	2.9E-1	2.9E-1	1.1E-1	< 6.8E-4	< 1.3E-4
F-2	V	2.2E-1	2.1E-1	5.5E-1	< 3.1E-4	< 2.1E-4
F-3	V	1.9E-1	3.7E-1	7.8E-2	< 4.4E-4	< 4.2E-4
F-4	V	2.1E-1	1.7E-2	7.7E-2	< 2.2E-4	< 8.7E-5
F-5	V	3.0E-1	1.1E-2	< 1.1E-1	< 2.5E-4	< 2.1E-5
Average		2.4E-1	1.8E-1	1.9E-1	3.8E-4	1.7E-4
Std.Dev.		4.4E-2	1.4E-1	1.8E-1	1.7E-4	1.4E-4
Hanford Site**		NR	1.1E+0	7.1E-2	NR	1.4E-3
Off Site**		NR	8.0E-2	6.4E-1	NR	4.7E-4

* - Locations identified in Figure 4.4.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-14. Concentrations of Radionuclides Detected in 100-H Area Vegetation Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
H-1	V	1.7E-1	5.0E-1	1.2E-1	< 6.9E-5	4.5E-4
H-2	V	3.4E-1	1.9E-2	< 8.6E-2	< 1.5E-6	< 9.0E-5
Average		2.6E-1	2.6E-1	1.0E-1	3.5E-5	2.7E-4
Std.Dev.		8.5E-2	2.4E-1	1.7E-2	3.4E-5	1.8E-4
Hanford Site**		NR	1.1E+0	7.1E-2	NR	1.4E-3
Off Site**		NR	8.0E-2	6.4E-1	NR	4.7E-4

* - Locations identified in Figure 4.5.
** - Average values obtained from PNL-6120
NR - Not Reported

Table E-15. Concentrations of Radionuclides Detected in 100-K Area Vegetation Samples (pCi/g, dry weight).

Sample Location*	Sample Type	Co-60	Sr-90	Cs-137	Pu-238	Pu-239/240
K-1	V	2.0E-1	3.0E-1	1.4E-1	< 7.0E-5	3.4E-4
K-2	V	1.8E-1	2.9E+0	8.1E-2	< 8.8E-5	< 1.6E-4
K-3	V	1.9E-1	9.9E-1	6.2E-2	< 1.7E-4	< 3.6E-4
K-4	V	1.5E-1	8.2E-1	1.2E-1	< 5.1E-4	< 1.2E-4
K-5	V	4.3E-1	1.6E+0	< 1.4E-1	< 1.1E-4	< 9.5E-5
Average		2.3E-1	1.3E+0	1.1E-1	< 1.9E-4	2.2E-4
Std.Dev.		1.0E-1	8.9E-1	3.2E-2	1.6E-4	1.1E-4
Hanford Site**		NR	1.1E+0	7.1E-2	NR	1.4E-3
Off Site**		NR	8.0E-2	6.4E-1	NR	4.7E-4

* - Locations identified in Figure 4.6.
** - Average values obtained from PNL-6120
NR - Not Reported

APPENDIX F

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Table F-1. The 1987 Thermoluminescent Dosimeter Results from 100-N Area.

Location *	No. of Samples	DOSE RATE mrem/hr ** Maximum	Minimum	Average	mrem/work year ***
1 RZ	16	0.158	0.045	0.087	181
2 RZ	17	0.186	0.098	0.133	277
3 RZ	17	0.090	0.046	0.070	145
4 RZ	17	0.406	0.203	0.323	672
5 RZ	17	0.138	0.012	0.100	207
6 RZ	17	0.100	0.038	0.063	132
7 RZ	17	0.229	0.089	0.151	315
8	17	0.011	0.006	0.007	15
9	16	0.009	0.004	0.006	13
10	17	0.011	0.004	0.007	14
11	17	0.013	0.001	0.008	17
12	17	0.014	0.004	0.008	16
13	17	0.020	0.011	0.015	31
14	17	0.117	0.052	0.074	155
15 RZ	17	0.153	0.079	0.126	262
16	17	0.091	0.043	0.061	127
17	17	0.009	0.003	0.005	11
18 RZ	17	0.174	0.064	0.094	196
19	17	0.066	0.004	0.009	18
20	17	0.008	0.003	0.005	10
21	17	0.106	0.018	0.066	137
22 RZ	17	0.107	0.056	0.085	178
23	17	0.007	0.004	0.005	10
24	17	0.005	0.003	0.004	9
25	17	0.010	0.005	0.007	15
26	17	0.041	0.019	0.031	65
27	17	0.010	0.006	0.008	16
28 RZ	17	0.107	0.008	0.071	148
29 RZ	17	0.903	0.297	0.482	1003
30 RZ	17	0.827	0.063	0.284	592
31	17	0.080	0.033	0.048	100
32	17	0.116	0.064	0.091	189
33	17	0.076	0.038	0.062	129
34 RZ	17	1.393	0.064	0.596	1240
35 RZ	17	1.174	0.125	0.514	1069
36 RZ	17	0.059	0.027	0.042	87
37	17	0.106	0.011	0.059	123
38	16	0.105	0.032	0.066	137
39	16	0.092	0.031	0.057	119
40	16	0.062	0.030	0.046	96
41	16	0.089	0.047	0.066	136
	ALARA guideline for occupational exposure to non-radiation zone workers.				240

* - Locations identified in Figure 5.1.

** - Monthly, integrated readings in mR were converted to hourly dose equivalent rates.

*** - Monthly, integrated readings in mR were converted to work year dose equivalent rates.

RZ - Area controlled as a radiation zone.

Table F-2. The 1987 Monthly Thermoluminescent Dosimeter Results from 100-N Area. (sheet 1 of 3)

TLD Location*	mrem/hour													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Date														
09-19 to 10-17-86	0.057	0.150	0.082	0.396	0.125	0.050	0.157	0.007	0.006	0.006	0.001	0.008	0.014	0.062
10-17 to 11-14-86	0.050	0.143	0.080	0.406	0.138	0.060	0.181	0.008	0.006	0.006	0.007	0.007	0.012	0.055
11-14 to 12-12-86	0.053	0.140	0.077	0.383	0.118	0.061	0.129	0.009	0.008	0.009	0.011	0.011	0.017	0.057
12-12 to 01-09-87	0.054	0.138	0.083	0.377	0.117	0.067	0.129	0.011	0.009	0.011	0.013	0.014	0.020	0.066
01-09 to 02-06-87	0.053	0.135	0.090	0.367	0.134	0.053	0.128	0.007	0.006	0.006	0.007	0.008	0.013	0.052
02-06 to 03-06-87	0.056	0.114	0.059	0.333	0.012	0.082	0.128	0.006	0.004	0.007	0.009	0.009	0.015	0.117
03-06 to 04-03-87	0.045	0.128	0.074	0.338	0.103	0.098	0.229	0.009	0.009	0.007	0.011	0.010	0.018	0.117
04-03 to 05-01-87	0.067	0.147	0.080	0.354	0.129	0.089	0.217	0.009	NR	0.007	0.010	0.009	0.017	0.099
05-01 to 05-29-87	NR	0.117	0.048	0.203	0.077	0.038	0.165	0.008	0.006	0.005	0.007	0.006	0.011	0.057
05-29 to 06-26-87	0.122	0.141	0.073	0.381	0.062	0.100	0.163	0.007	0.009	0.006	0.007	0.008	0.015	0.076
06-26 to 07-24-87	0.101	0.106	0.055	0.223	0.099	0.054	0.096	0.007	0.007	0.006	0.007	0.006	0.012	0.064
07-24 to 08-21-87	0.158	0.186	0.084	0.357	0.104	0.065	0.102	0.006	0.005	0.008	0.009	0.007	0.017	0.094
08-21 to 09-18-87	0.095	0.114	0.053	0.224	0.082	0.043	0.089	0.006	0.006	0.007	0.007	0.005	0.014	0.060
09-18 to 10-16-87	0.150	0.156	0.064	0.308	0.106	0.056	0.181	0.006	0.005	0.006	0.008	0.007	0.015	0.085
10-16 to 11-13-87	0.131	0.146	0.072	0.335	0.117	0.062	0.202	0.007	0.006	0.007	0.009	0.007	0.015	0.078
11-13 to 12-11-87	0.096	0.098	0.046	0.211	0.075	0.039	0.146	0.006	0.005	0.006	0.007	0.005	0.013	0.055
12-11 to 01-08-88	0.103	0.109	0.063	0.295	0.096	0.062	0.131	0.006	0.004	0.004	0.006	0.004	0.013	0.071
No. of samples	16	17	17	17	17	17	17	17	16	17	17	17	17	17
Maximum	0.158	0.186	0.090	0.406	0.138	0.100	0.229	0.011	0.009	0.011	0.013	0.014	0.020	0.117
Minimum	0.045	0.098	0.046	0.203	0.012	0.038	0.089	0.006	0.004	0.004	0.001	0.004	0.011	0.052
Average	0.087	0.133	0.070	0.323	0.100	0.063	0.151	0.007	0.006	0.007	0.008	0.008	0.015	0.074

* - Locations identified in Figure 5.1.
NR - Not Reported

Table F-2. The 1987 Monthly Thermoluminescent Dosimeter Results from 100-N Area. (sheet 2 of 3)

TLD Location*	mrem/hour													
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Date														
09-19 to 10-17-86	0.153	0.050	0.005	0.071	0.004	0.003	0.018	0.099	0.004	0.003	0.005	0.035	0.008	0.074
10-17 to 11-14-86	0.147	0.047	0.004	0.064	0.006	0.004	0.049	0.100	0.004	0.004	0.005	0.035	0.006	0.008
11-14 to 12-12-86	0.144	0.064	0.008	0.074	0.005	0.007	0.045	0.107	0.006	0.005	0.008	0.040	0.008	0.098
12-12 to 01-09-87	0.140	0.073	0.009	0.077	0.005	0.008	0.058	0.102	0.007	0.005	0.009	0.041	0.008	0.089
01-09 to 02-06-87	0.144	0.043	0.005	0.065	0.006	0.006	0.040	0.100	0.005	0.004	0.005	0.029	0.008	0.087
02-06 to 03-06-87	0.118	0.079	0.005	0.174	0.004	0.004	0.097	0.081	0.004	0.004	0.006	0.033	0.008	0.058
03-06 to 04-03-87	0.131	0.091	0.007	0.151	0.006	0.005	0.106	0.080	0.006	0.005	0.007	0.038	0.010	0.092
04-03 to 05-01-87	0.144	0.083	0.005	0.121	0.005	0.005	0.088	0.094	0.006	0.004	0.007	0.037	0.009	0.092
05-01 to 05-29-87	0.079	0.047	0.004	0.076	0.005	0.004	0.055	0.066	0.005	0.004	0.005	0.021	0.007	0.086
05-29 to 06-26-87	0.136	0.069	0.005	0.099	0.005	0.005	0.084	0.098	0.005	0.005	0.006	0.034	0.008	0.083
06-26 to 07-24-87	0.092	0.052	0.005	0.079	0.066	0.005	0.067	0.056	0.005	0.004	0.008	0.020	0.007	0.059
07-24 to 08-21-87	0.147	0.067	0.005	0.120	0.006	0.005	0.080	0.095	0.005	0.005	0.010	0.032	0.008	0.088
08-21 to 09-18-87	0.094	0.045	0.005	0.078	0.004	0.005	0.063	0.064	0.005	0.004	0.008	0.019	0.007	0.049
09-18 to 10-16-87	0.131	0.061	0.004	0.103	0.005	0.005	0.077	0.091	0.005	0.005	0.009	0.034	0.008	0.072
10-16 to 11-13-87	0.141	0.061	0.005	0.092	0.006	0.005	0.065	0.089	0.005	0.005	0.009	0.034	0.009	0.107
11-13 to 12-11-87	0.088	0.048	0.004	0.077	0.005	0.004	0.057	0.058	0.004	0.004	0.008	0.020	0.008	0.009
12-11 to 01-08-88	0.109	0.056	0.003	0.085	0.004	0.004	0.067	0.071	0.004	0.004	0.007	0.027	0.007	0.058
No. of samples	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Maximum	0.153	0.091	0.009	0.174	0.066	0.008	0.106	0.107	0.007	0.005	0.010	0.041	0.010	0.107
Minimum	0.079	0.043	0.003	0.064	0.004	0.003	0.018	0.056	0.004	0.003	0.005	0.019	0.006	0.008
Average	0.126	0.061	0.005	0.094	0.009	0.005	0.066	0.085	0.005	0.004	0.007	0.031	0.008	0.071

* - Locations identified in Figure 5.1.
NR - Not Reported

Table F-2. The 1987 Monthly Thermoluminescent Dosimeter Results from 100-N Area. (sheet 3 of 3)

TLD Location*	mrem/hour												
	29	30	31	32	33	34	35	36	37	38	39	40	41
Date													
09-19 to 10-17-86	0.297	0.063	0.040	0.099	0.071	0.064	0.132	0.035	0.011				
10-17 to 11-14-86	0.594	0.070	0.039	0.084	0.061	0.065	0.141	0.039	0.038	0.040	0.035	0.042	0.055
11-14 to 12-12-86	0.435	0.076	0.044	0.098	0.073	0.093	0.167	0.041	0.048	0.048	0.043	0.045	0.056
12-12 to 01-09-87	0.398	0.084	0.038	0.095	0.070	0.114	0.178	0.043	0.055	0.059	0.049	0.046	0.055
01-09 to 02-06-87	0.470	0.172	0.043	0.102	0.067	0.355	0.331	0.049	0.039	0.032	0.031	0.030	0.047
02-06 to 03-06-87	0.428	0.079	0.067	0.095	0.069	0.120	0.125	0.027	0.072	0.079	0.060	0.049	0.062
03-06 to 04-03-87	0.840	0.077	0.080	0.111	0.076	0.113	0.173	0.039	0.106	0.105	0.092	0.058	0.086
04-03 to 05-01-87	0.903	0.264	0.066	0.116	0.075	0.557	0.504	0.045	0.086	0.081	0.071	0.050	0.079
05-01 to 05-29-87	0.722	0.282	0.046	0.071	0.046	0.768	0.604	0.038	0.054	0.058	0.048	0.041	0.066
05-29 to 06-26-87	0.612	0.304	0.063	0.106	0.069	0.695	0.554	0.045	0.069	0.087	0.076	0.049	0.073
06-26 to 07-24-87	0.303	0.305	0.047	0.065	0.047	0.870	0.693	0.037	0.057	0.057	0.054	0.035	0.062
07-24 to 08-21-87	0.329	0.827	0.050	0.104	0.068	1.368	1.174	0.059	0.069	0.090	0.076	0.062	0.089
08-21 to 09-18-87	0.351	0.470	0.035	0.069	0.047	1.088	0.917	0.041	0.053	0.060	0.053	0.042	0.059
09-18 to 10-16-87	0.353	0.652	0.049	0.090	0.063	1.393	1.145	0.055	0.068	0.071	0.063	0.052	0.071
10-16 to 11-13-87	0.419	0.388	0.042	0.090	0.060	0.912	0.726	0.046	0.068	0.066	0.063	0.052	0.075
11-13 to 12-11-87	0.400	0.329	0.033	0.064	0.038	0.793	0.578	0.031	0.052	0.057	0.047	0.040	0.054
12-11 to 01-08-88	0.337	0.394	0.037	0.084	0.052	0.763	0.598	0.038	0.063	0.064	0.052	0.048	0.060
No. of samples	17	17	17	17	17	17	17	17	17	16	16	16	16
Maximum	0.903	0.827	0.080	0.116	0.076	1.393	1.174	0.059	0.106	0.105	0.092	0.062	0.089
Minimum	0.297	0.063	0.033	0.064	0.038	0.064	0.125	0.027	0.011	0.032	0.031	0.030	0.047
Average	0.482	0.284	0.048	0.091	0.062	0.596	0.514	0.042	0.059	0.066	0.057	0.046	0.066

* - Locations identified in Figure 5.1.
NR - Not Reported

APPENDIX G

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Table G-1. Concentrations of Radionuclides Detected in 1325-N Liquid Waste Disposal Facility Sediment Samples (pCi/g) (wet weight concentration except where noted).

Sample Location*	Mn-54	Co-60	Sr-90**	Cs-137	Ce-144	Pu-238**	Pu 239/240**
CS-1	1.3E+5	8.2E+5	1.4E+4	3.2E+4	< 6.0E+4	1.1E+3	5.2E+3
CS-2	2.0E+5	1.4E+6	4.0E+4	< 1.7E+4	< 9.1E+4	6.7E+3	4.9E+4
CS-3	9.7E+4	6.3E+5	5.9E+3	1.8E+4	< 3.5E+4	2.5E+2	1.6E+3
CS-4	9.6E+4	6.3E+5	4.3E+3	2.9E+4	< 5.3E+4	1.4E+3	9.9E+3
CS-5	1.0E+5	6.8E+5	1.0E+4	3.0E+4	< 5.8E+4	1.3E+3	8.5E+3
CS-7	2.7E+5	1.3E+6	6.3E+5	4.8E+4	< 9.8E+4	1.7E+4	9.8E+4
CS-8	1.2E+5	1.1E+6	2.7E+5	1.5E+4	< 8.1E+4	2.1E+4	1.2E+5
CS-9	1.2E+5	8.2E+5	1.0E+4	1.7E+4	< 4.6E+4	1.3E+3	8.3E+3
CS-10	3.1E+4	1.4E+5	1.4E+4	2.1E+4	< 1.6E+4	2.3E+3	1.4E+3
CS-11	1.3E+5	8.4E+5	2.9E+4	1.3E+4	< 7.3E+4	3.1E+3	2.0E+4
CS-12	1.4E+5	1.2E+6	3.5E+4	1.3E+4	< 8.3E+4	6.0E+3	3.9E+4
Maximum	2.7E+5	1.4E+6	6.3E+5	4.8E+4	< 9.8E+4	2.1E+4	1.2E+5
Minimum	3.1E+4	1.4E+5	4.3E+3	1.3E+4	< 1.6E+4	2.5E+2	1.4E+3
Average	1.3E+5	8.7E+5	9.7E+4	2.3E+4	< 6.3E+4	5.6E+3	3.3E+4
Stan. Dev.	6.1E+4	3.6E+5	1.9E+5	1.1E+4	2.5E+4	7.0E+3	4.1E+4

* - Locations identified in Figure 6.1.

** - Dry weight concentration.

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APPENDIX H

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Table H-1. Environmental Dose Rates (relative uR/h) Measured at the 100-N Area Shoreline.

Location*	Relative Dose	Location*	Relative Dose	Location*	Relative Dose
1	16	32	300	63	240
2	18	33	320	64	220
3	20	34	325	65	210
4	21	35	310	66	180
5	26	36	300	67	170
6	30	37	290	68	160
7	38	38	290	69	140
8	46	39	280	70	130
9	55	40	270	71	120
10	60	41	270	72	110
11	70	42	270	73	110
12	75	43	280	74	90
13	80	44	290	75	80
14	90	45	290	76	70
15	110	46	300	77	70
16	110	47	310	78	60
17	105	48	340	79	50
18	100	49	330	80	40
19	90	50	350	81	40
20	85	51	350	82	40
21	80	52	370	83	35
22	95	53	400	84	30
23	100	54	380	85	30
24	115	55	370	86	20
25	120	56	360	87	20
26	140	57	350	88	20
27	150	58	340	89	20
28	170	59	320	90	18
29	200	60	300	91	18
30	230	61	280	92	15
31	260	62	250	93	12

* - Locations identified in Figure 7.1.

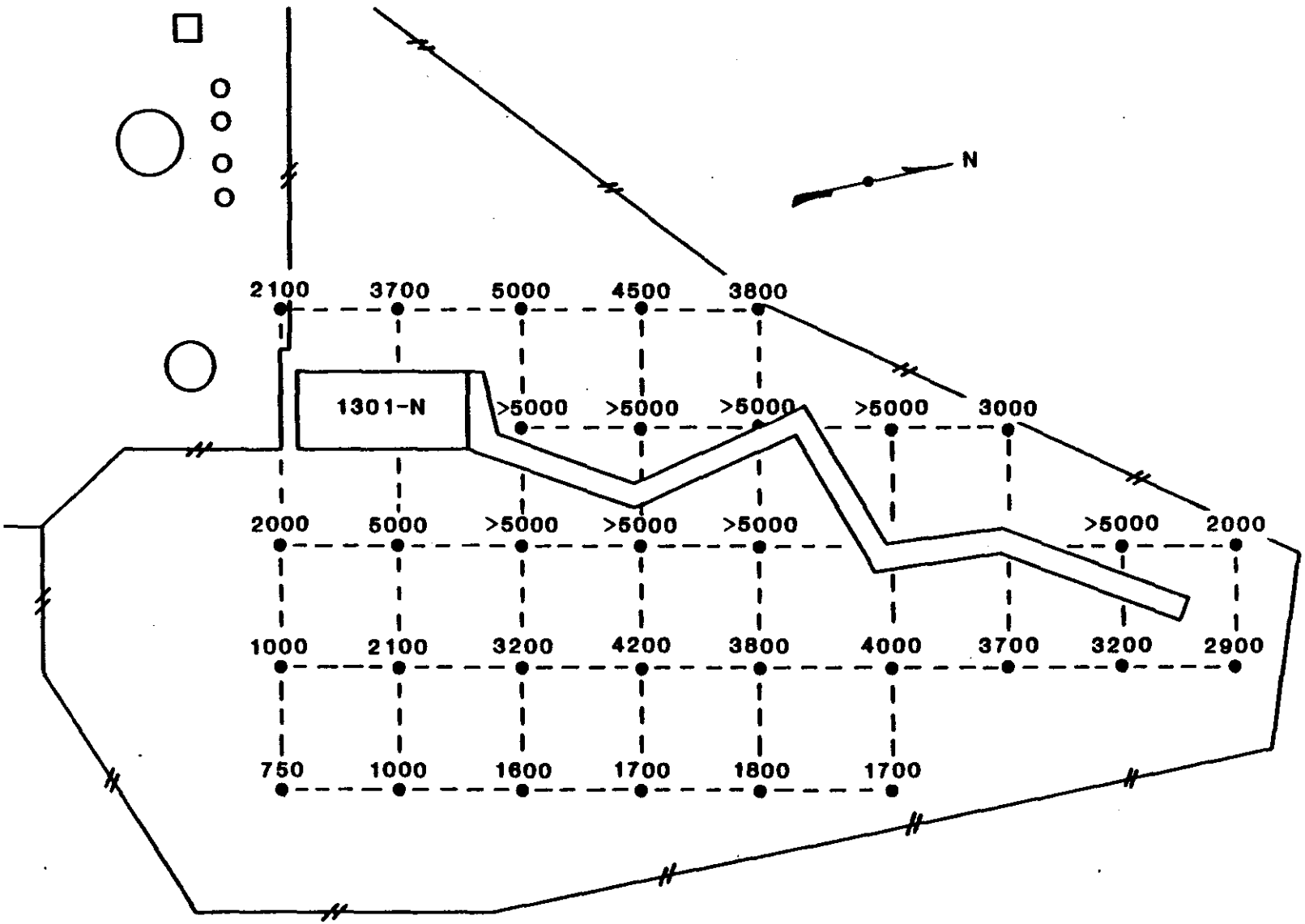

Figure H-1. Environmental Dose Rates (μR/h) Measured at Survey Points Around the 1301-N Liquid Waste Disposal Facility in 1986.

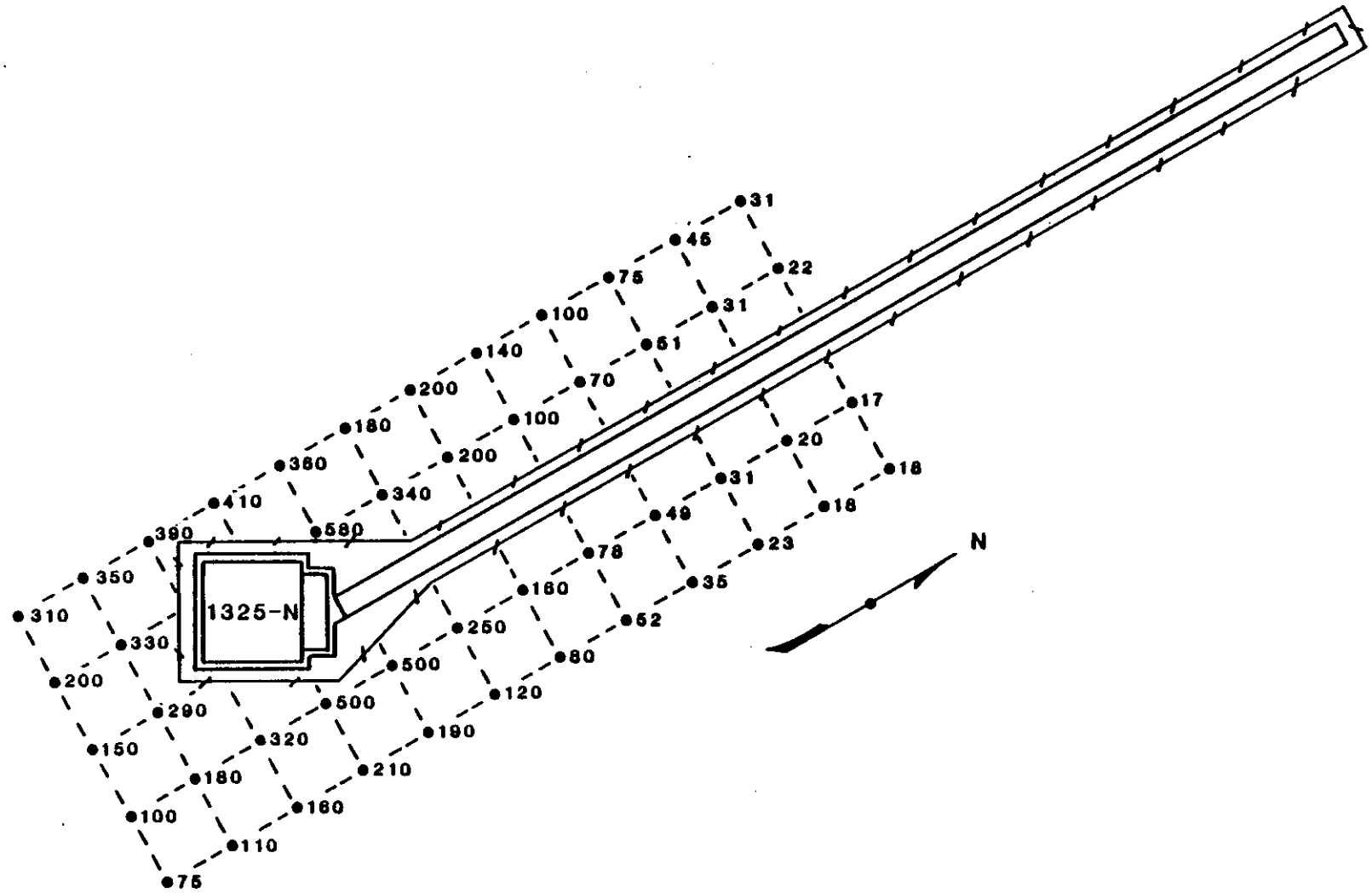

Figure H-2. Environmental Dose Rates (μR/h) Measured at Survey Points Around the 1325-N Liquid Waste Disposal Facility in 1986.

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