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EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD FOR 1962

THE ENVIRONMENTAL STUDIES AND EVALUATION STAFF

FEBRUARY 25, 1963

HANFORD LABORATORIES

HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD FOR 1962

By

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Radiation Protection Operation
Hanford Laboratories

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HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

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SUMMARY STATEMENT

An evaluation of results obtained from the Hanford environmental surveillance program for 1962 indicates that most of the environmental radiation exposure for the majority of persons in the neighborhood of the Hanford project was due to natural sources and world-wide fallout rather than to Hanford operations.

Of the low level wastes released to the environment from the Hanford plants, the neutron-induced radionuclides present in reactor cooling water discharged to the Columbia River continued to be the source of greatest potential exposure to the people in the environs. The primary mechanisms of exposure from this source are drinking of sanitary water derived from the river and the consumption of fish and waterfowl which inhabit the river.

For residents of Pasco and Kennewick, the potential exposure from municipal drinking water was estimated as about 2.5% and 1% respectively, of the nationally recommended limit for the gastrointestinal tract as the limiting organ. For the most ardent fishermen who consume at least one meal per week of local fish, the potential exposure from bone-seeking radionuclides was estimated to be about 25% of the appropriate bone limit. Over 100 ducks, collected by hunters in the environs surrounding Hanford, were analyzed and about 5% contained concentrations of bone-seeking radionuclides at or above the detectable level. Sampling of waterfowl residing within the plant boundaries on swamp and water areas indicated about 30% contained detectable levels of bone-seeking radionuclides. If a person consumed about 1 pound of duck containing P^{32} in the maximum concentration detected, he would ingest approximately 5% of the permissible limit.

The dose to the thyroid gland from ingesting I^{131} in milk from local farms consumed at the rate of 1 quart per day was estimated at 20% of the FRC Radiation Protection Guide. A major portion of the thyroid dose from I^{131} is due to fallout rather than Hanford releases. Composite annual exposures for 1962 were somewhat lower than for 1961, exlusive of that portion contributed by fallout. The reduction resulted primarily from additional treatment of cooling water circulated through the reactors. Of most significance was a reduction by a factor of 2 in the GI tract dose from drinking water for Pasco residents and a reduction of P^{32} concentration in fish.

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I. INTRODUCTION

The Hanford project* (Figure 1) is located in southeastern Washington, a semiarid region having an average annual rainfall of about 7 inches. Natural vegetation in this section of the state is sparse, primarily suited for grazing although considerable area has recently been put under irrigation. The plant site, shown in Figure 2, comprises an area of about 500 square miles. The Columbia River flows through the project and forms part of the eastern boundary. The meteorology of the region is typical of a desert area with frequent strong inversions occurring at night and breaking during the day to provide unstable and turbulent conditions. Near the plant production sites the prevailing winds are from the northwest with strong drainage and cross winds causing distorted flow patterns.

During the course of operation, various radioactive wastes are generated by the several plant facilities. High level wastes are concentrated and retained in storage within the project area. Controlled releases of low level wastes, for which concentration and retention are not feasible, are made to the atmosphere, to the Columbia River (from the reactors), and to the ground. The Hanford practices governing radioactive waste disposal are described in the Hearings on Industrial Radioactive Waste Disposal held by the Joint Congressional Committee on Atomic Energy in 1959.[1]

The populated areas of primary interest are Richland, Pasco, and Kennewick. Other communities in the vicinity are Benton City, Mesa, and Othello. All together, about 80,000 people live in the vicinity of the project. The protection of these persons from undue radiation exposure attributable to Hanford sources is one of the attendant responsibilities in the operation of the Hanford facilities.

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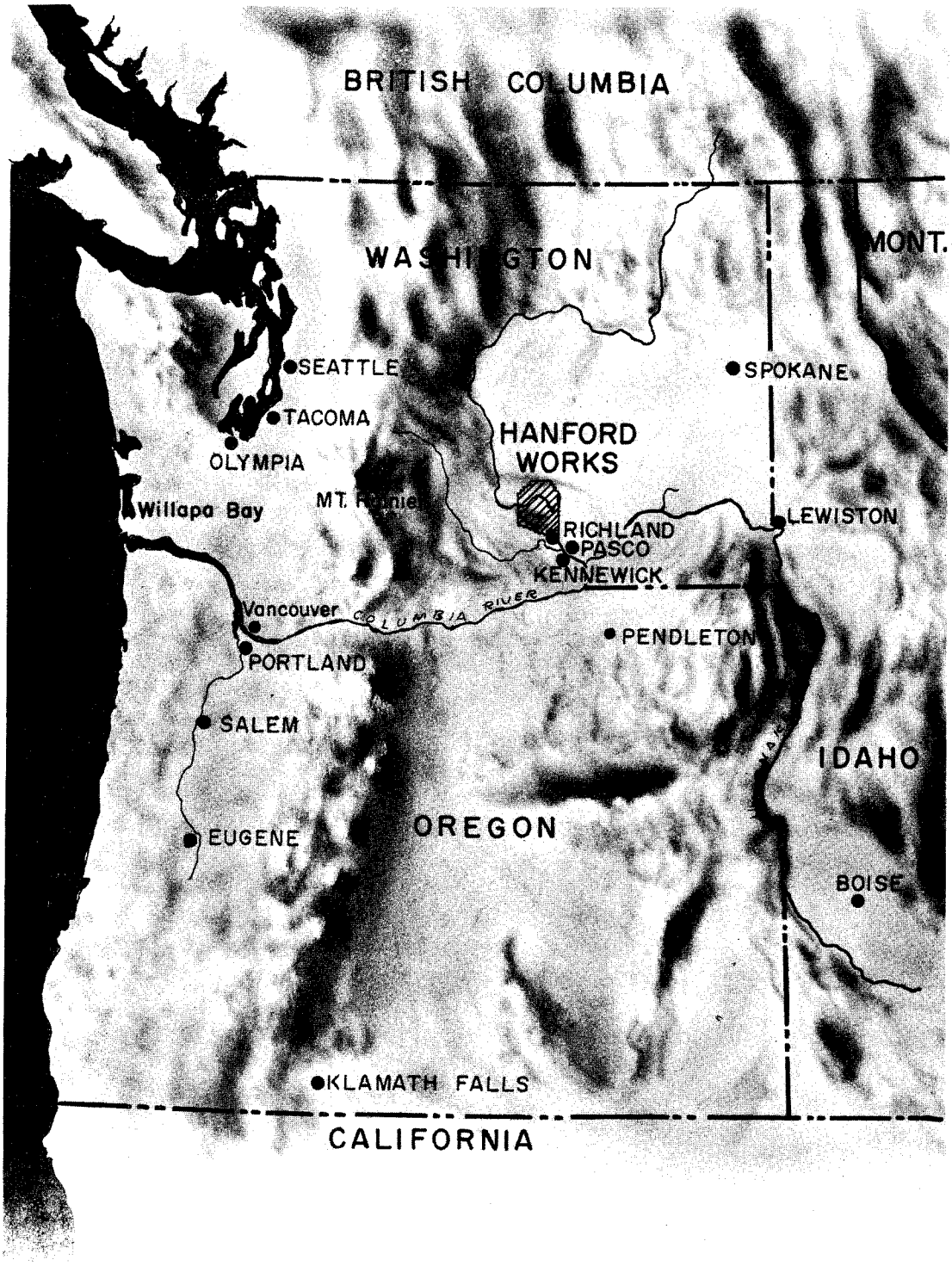

FIGURE 1

Geographical Relationship
of Hanford Works to Pacific Northwest

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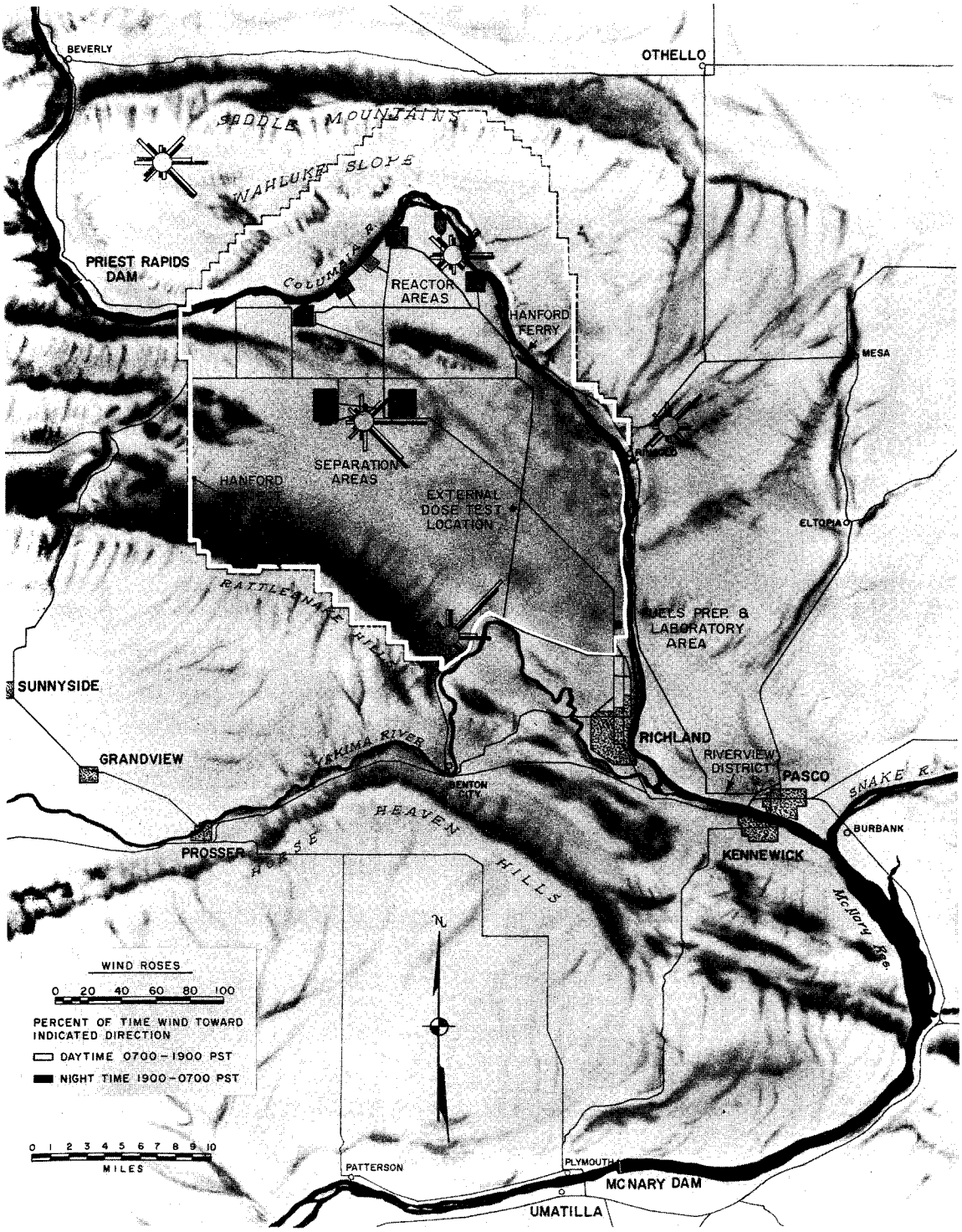

FIGURE 2

Features of Hanford Project and Vicinity

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The AEC Manual Chapters[2] and the recommendations of the National Committee on Radiation Protection and Measurement (NCRP),[3] the International Commission on Radiological Protection (ICRP).[4] The Federal Radiation Council (FRC),[5] and the results of Hanford research programs form the basis of radiation protection practices at Hanford. The recommendations of these organizations in the form of permissible limits and guides for radiation exposure constitute criteria against which radiation exposures estimated from the findings of the Hanford environmental surveillance program are compared. The results of this comparison indicate the effectiveness of Hanford waste control and radiation protection practices and point out any conditions requiring attention.

This report estimates the annual exposure received by individuals in the neighborhood of the controlled area from environmental sources and compares these exposures with the recommendations of the NCRP and FRC. The NCRP recommendations, in the form of maximum permissible limits to individuals, are 1500 mrem per year to the GI Tract, 500 mrem per year to the total body, 3000 mrem to the thyroid, and 100% of the maximum permissible rate of intake (MPRI) in the case of bone seekers.* Similar evaluations for previous years have also been reported.[1, 6, 7]

The exposure estimates can also be compared with recently published FRC guides. This guidance, in the form of annual exposures averaged for suitable samples of an exposed population is 170 mrem per year to the total body, 500 mrem per year to the thyroid, and 500 mrem per year to bone. In the case of P^{32}, the bone seeker of major interest at Hanford, the historical approach to the maximum permissible quantity in bone precludes direct comparison of the MPRI to the FRC bone dose guide.

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* The MPRI is taken as the maximum permissible concentration in water for a given radionuclide, as recommended by the NCRP for persons in the neighborhood of controlled areas, multiplied by the rate of water intake as defined for the standard man. This amounts to one-tenth of the MPC's for continuous exposure of occupational workers multiplied by 2200 cc per day, or by 800 l/yr in the case of annual estimates.

II. SUMMARY

Natural background and world-wide fallout are the primary sources of environmental radiation exposure for most persons in the neighborhood of the Hanford controlled area. The Hanford contribution of greatest potential significance results from neutron induced radionuclides present in reactor cooling water discharged to the Columbia River. The primary mechanisms of exposure from this source are the drinking of sanitary water derived from the river and the consumption of fish and waterfowl which inhabit the river. Hanford's contribution to environmental exposure through other mechanisms is small.

Uncertainties in multiple sources, paths of intake, and individual dietary habits prevent stating precise individual exposure evaluations. However, useful exposure estimates may be made assuming parameters for various groups of residents.

The annual exposure can be estimated by postulating a hypothetical individual whose habits include consumption of locally caught fish at a rate of about one meal per week, consumption of milk and other products from farms irrigated with Columbia River water, consumption of water from the Pasco sanitary system and swimming and boating on the river. This maximum composite exposure is estimated at 150 mrem to the GI tract, 70 mrem to the total body and 30% of the NCRP maximum permissible rate of intake for bone-seeking radionuclides. In addition it is estimated that I^{131} from these sources would deliver about 170 mrem to the thyroids of small children and about 25 mrem to adult thyroids.

The resident of Pasco of average dietary habits who drank water from the municipal water system and consumed milk and other foods obtained from local stores would likely have received an annual exposure on the order of 50 mrem to the GI tract, 14 mrem to the total body, 7% of the NCRP MPRI for bone and about 125 mrem to the thyroids of small children and about 20 mrem to adult thyroids. In this case the organs of major interest are the thyroid for small children and bone for adults. World-wide fallout accounts for a major portion of the exposure to the thyroid.

The residents of Richland and other communities who made no use of the Columbia River or products derived therefrom would have likely received an annual exposure of about 5 mrem or less to the GI tract and total body, 4% of the MPRI for bone and about 85 mrem to the thyroids of small children and about 10 mrem to adult thyroids. The primary environmental source of exposure for these individuals was from world-wide fallout.

Persons consuming 1 liter of local milk per day would have likely taken in (primarily from fallout) about 20% of the quantity of I^{131} recommended by the FRC in their report of September 1961[5] as a guide for average rates of intake by a suitable sample of an exposed population group. FRC guidance is for normal peacetime operations and was established with the assumption that infants would be the limiting group.

The downward trend noted in exposure from some sources during 1961 continued during 1962. The reduction was most significant in the cases of GI dose and bone dose contributed by river water. There was a significant increase in exposure from world-wide fallout during 1962 over the previous year.

III. ENVIRONMENTAL SURVEILLANCE PROGRAM RESULTS AND INTERPRETATION

Discussion and interpretation of the results of the various Hanford environmental sampling programs are presented in the following text and figures. The raw data for many of the programs and brief descriptions of several of the analytical methods used in determining the amounts of radionuclides in various samples are presented in the appendices.

A. Results Associated with the Columbia River

1. Radioactive Materials in the Columbia River

Columbia River water is used to cool each of Hanford's eight production reactors. This water goes through filtration processes and then passes once through the reactors as coolant before being returned to the river. A fraction of the impurities remaining after treatment are transformed into radioactive elements during passage through the reactor.

The relative abundance of the radionuclides found in cooling water, as adjusted to 4 hours postirradiation, is shown in Table I.

TABLE I

RELATIVE ABUNDANCE OF REACTOR EFFLUENT RADIONUCLIDES

Reference Time - 4 Hours Postirradiation

Major, 90%	Minor, 8%	Trace, 2%		
Na^{24}	P^{32}	H^{3}	Ru^{103}	Nd^{147}
Si^{31}	Zn^{65}	C^{14}	Ag^{111}	Pm^{147}
Cr^{51}	Zn^{69}	S^{35}	Cd^{115}	Nd^{149}
Mn^{56}	Ga^{72}	Ca^{45}	I^{131}	Pm^{149}
Cu^{64}	Y^{90}	Sc^{46}	I^{132}	Pm^{151}
As^{76}	Sr^{91}	Sc^{47}	Cs^{137}	Eu^{152}
Np^{239}	Sr^{92}	Mn^{54}	Ba^{140}	Sm^{153}
	Y^{92}	Fe^{59}	La^{140}	Eu^{156}
	Y^{93}	Co^{60}	Ce^{141}	Sm^{156}
	Nb^{97}	Sr^{85}	La^{141}	Eu^{157}
	I^{133}	Sr^{90}	Pr^{142}	Tb^{160}
	I^{135}	Sr^{90}	Ce^{143}	W^{187}
	U^{239}	Y^{91}	Pr^{143}	Po^{210}
		Zr^{95}	$Ce\text{-}Pr^{144}$	Ac^{227}
		Mo^{99}	Pr^{145}	U^{238}
				Pu^{239}

Many of the radionuclides formed in reactor cooling water are short-lived and decay rapidly after formation. In addition to radioactive decay, some portion of the radionuclides are removed from the water by such mechanisms as silting and uptake by river biota.

The radionuclides in the river also include some contribution of "fallout" from weapons tests.

There are several ways by which the presence of radionuclides in the Columbia River water may lead to radiation exposure to humans. Among these paths of exposure are ingestion of Columbia River water, ingestion of sanitary water derived from the river, ingestion of fish and waterfowl which inhabit the river, consumption of agricultural and dairy products derived from land irrigated with water drawn from the river, consumption of certain marine organisms, and external exposure from swimming or boating on the river.

Samples of river water were obtained weekly from the inlet of the Pasco municipal water pumping plant and 300 Area, and fortnightly at the Vernita Ferry, Hanford Ferry, and Vancouver monitoring stations. These samples were analyzed for several radionuclides and the results of the analyses are presented in Appendix A, Tables 1, 2, and 3.

The relative abundance of the significant radionuclides at Hanford Ferry, Pasco, and Vancouver is illustrated in Figure 3. The areas of the circles are proportional to the total activity measured at the three locations. The average concentrations of radionuclides measured routinely at the three river sampling stations are shown in Table II.

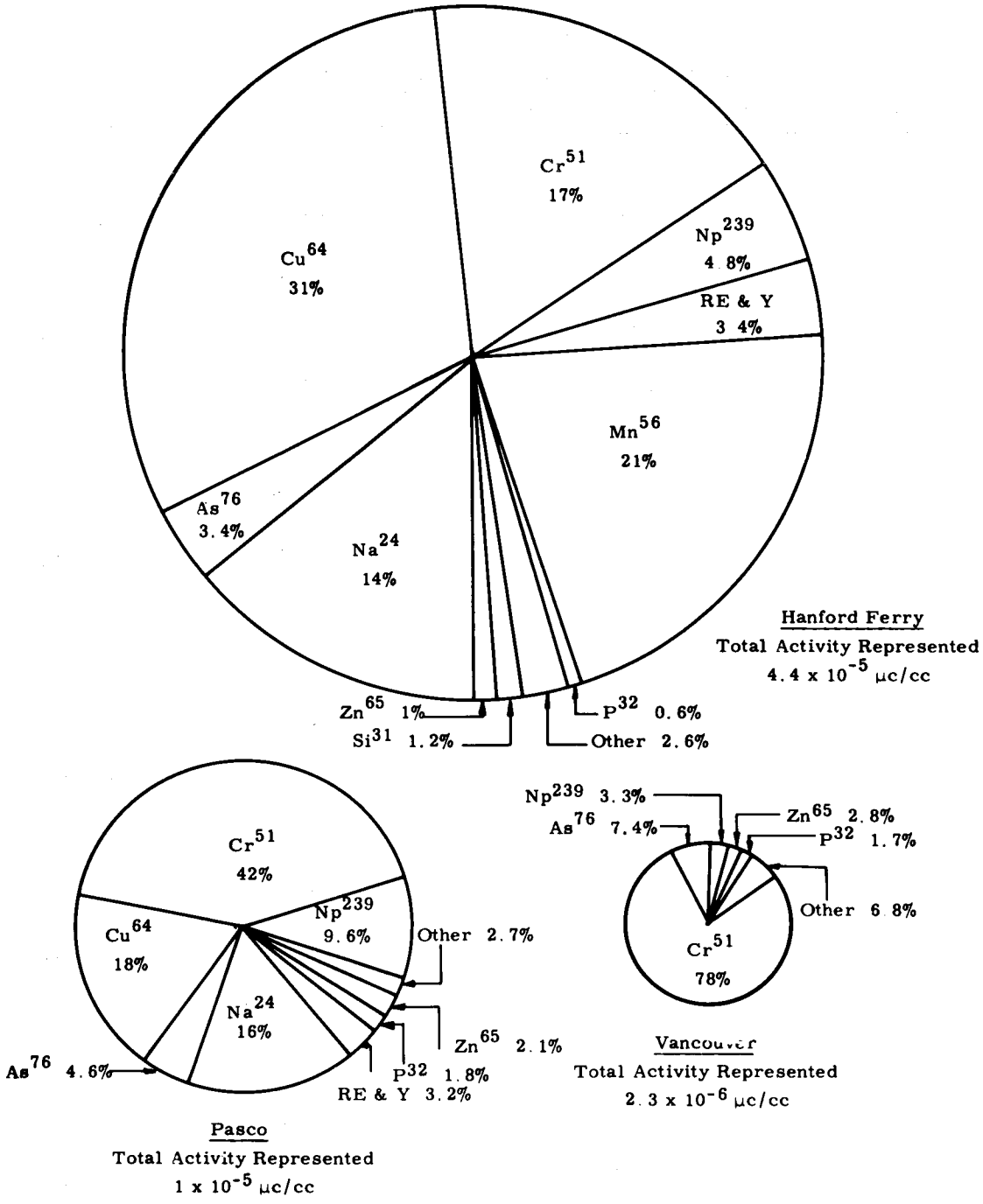

FIGURE 3

Relative Abundance of Radionuclides in Columbia River Water at Several Locations. Annual Averages 1962

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TABLE II

ANNUAL AVERAGE CONCENTRATION
OF SEVERAL RADIONUCLIDES IN COLUMBIA RIVER WATER - 1962

Units of 10^{-9} μc/cc

Radionuclide	Hanford Ferry	Pasco	Vancouver
Total Beta	37 000	7 500	400
RE+Y	1 500	330	10*
Na^{24}	6 100	1 600	ND**
Si^{31}	540	40*	ND
P^{32}	260	180	38
Sc^{46}	60	30*	20*
Cr^{51}	7 600	4 300	1 800
Mn^{56}	9 000	87	ND
Cu^{64}	13 500	1 800	ND
Zn^{65}	420	220	64
Zn^{69m}	500	80	ND
Ga^{72}	640	120	ND
As^{76}	1 500	470	ND
Sr^{89-90}	11	7.3	5.0
Sr^{90}	0.7*	0.7	0.4*
I^{131}	12	6*	3*
Np^{239}	2 100	980	77

* Not greater than

** Not detected

The Hanford Ferry monitoring station is about 7 miles downstream from the closest production reactor and about 6 miles upstream from the point where the project boundary crosses the Columbia River. Measurement results indicate the effluent from the reactors is not uniformly distributed across the river at this location.

The Pasco water plant monitoring station is at the point of first municipal usage of the Columbia River and is about 40 miles downstream from the reactors. The distribution of radioactive material in the river is not quite uniform in this section due in part, to the entry of the Yakima River some 10 miles upstream.

Vanvouver is the farthest downstream location where river water is routinely sampled and is about 260 miles from the reactors. Further downstream the intrusion of sea water complicates quantitative measurement of the radionuclides because the salt content and tidal movement increases variability of results.

The seasonal variation in flow rate of the Columbia River markedly affects the dilution of the reactor effluent. Also affected is the time taken for a given volume of water to move from one location to another, which in turn affects depletion. The flow rate of the Columbia River at Pasco and Vancouver for 1958 through 1962 is shown in Figure 4. The variation in concentration of several radionuclides in the Columbia River water at Pasco, Washington, for 1958 through 1962 is illustrated in Figure 5. The rate of transport of these same radionuclides past Pasco is shown in Figure 6 and tabulated in Appendix A, Table 6.

Although there is no known routine human consumption of untreated water, the potential radiation exposure from such a source may be of interest.

The calculated annual dose to the GI tract and total body and the combined percentages of MPRI for bone seekers are presented in Table III.

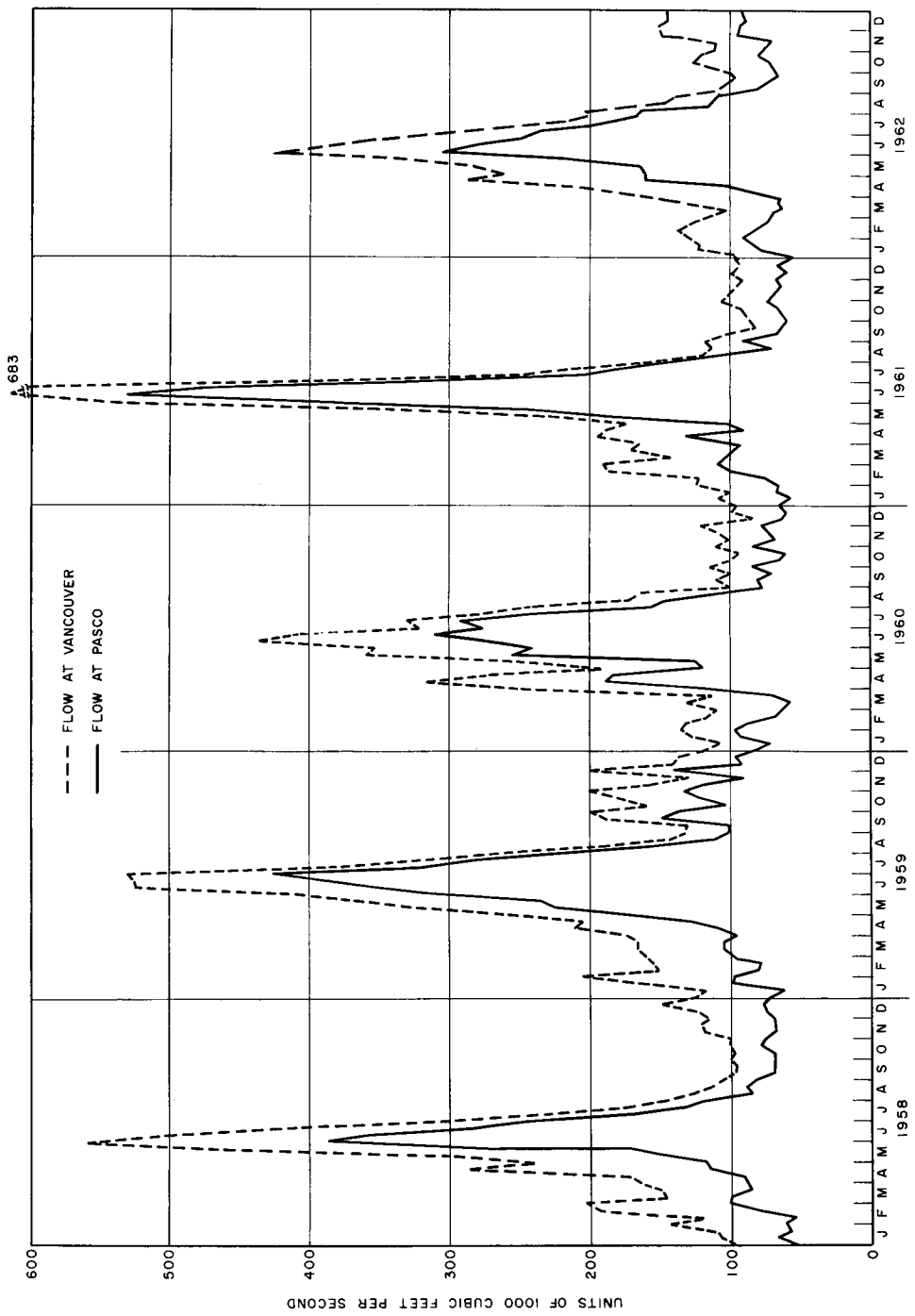

FIGURE 4

Columbia River Flow at Pasco and Vancouver
(Data Furnished by the U. S. Geological Survey)

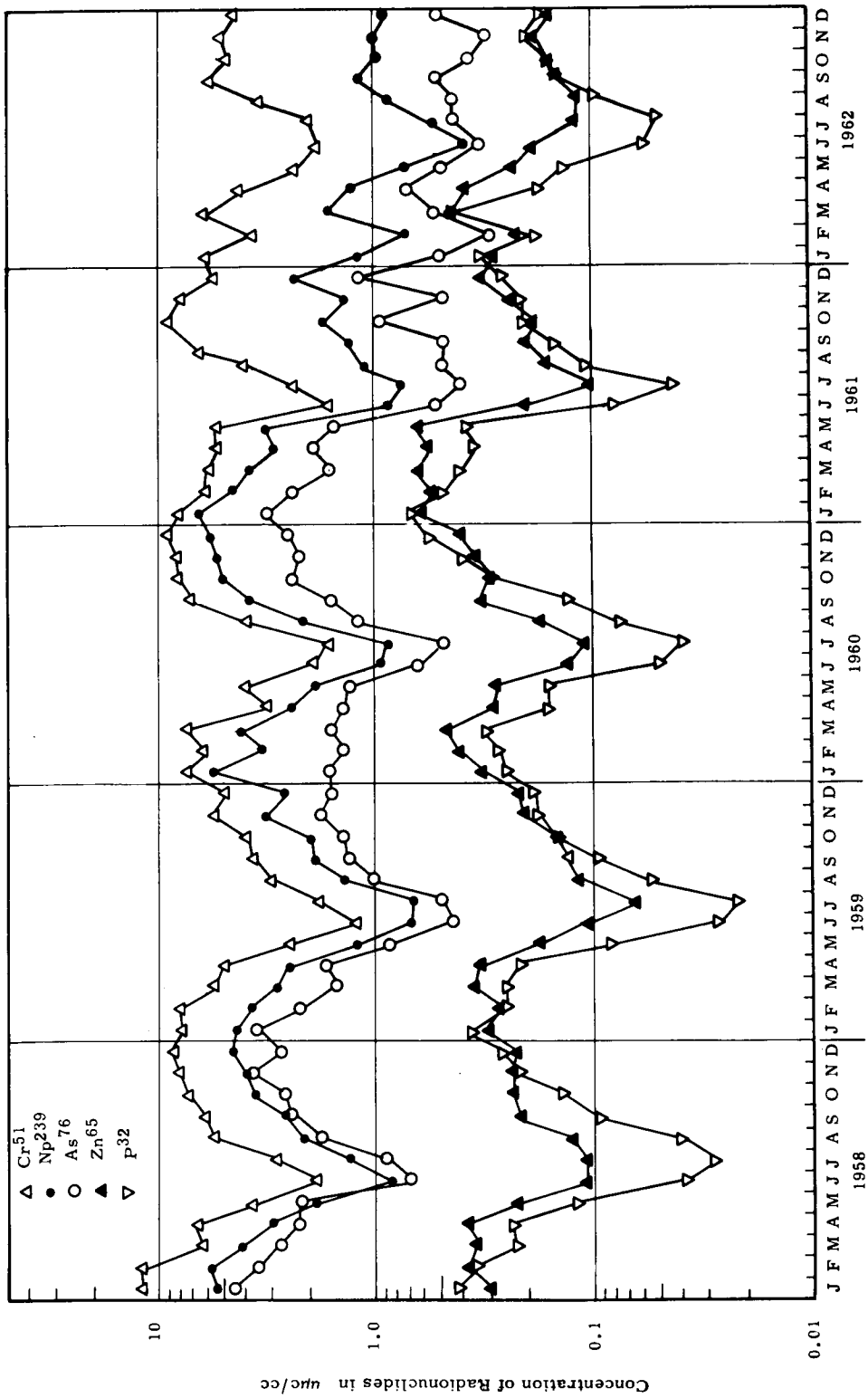

FIGURE 5

Concentration of Radionuclides in Columbia River Water at Pasco, Washington

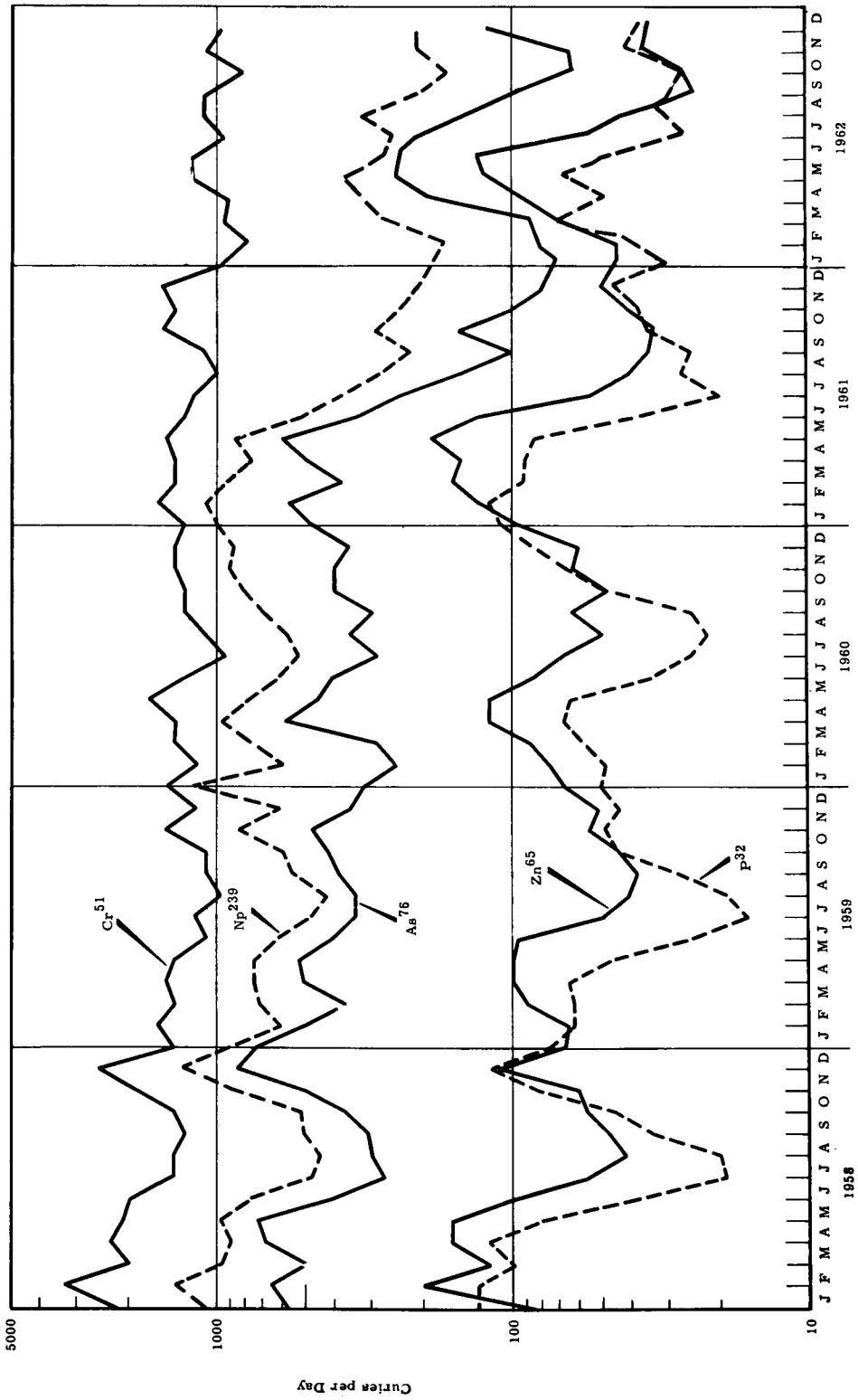

FIGURE 6

Rate of Transport of Radionuclides at Pasco, Washington

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TABLE III

POTENTIAL ANNUAL DOSE TO SELECTED ORGANS FROM ROUTINE INGESTION OF COLUMBIA RIVER WATER AT SEVERAL LOCATIONS - 1962*

	Total Body, mrem	GI Tract, mrem	Bone, % MPRI
Columbia River Water at Hanford Ferry	13	360	2.1
Columbia River Water at Pasco	5.2	98	1.7
Columbia River Water at Vancouver	1.1	4.3	0.7

* Here and elsewhere in this report where the dose to particular body organs is expressed in rem units the determination starts with a calculation of the fraction of MPRI. One hundred percent of the MPRI for the total body is considered to result in 0.5 rem per year to the total body. One hundred percent of the MPRI for the GI Tract is considered to expose the GI Tract to 1.5 rem per year. The derived fraction of MPRI of one or more modes of exposure are compared to these equivalent rem exposures to estimate the organ dose.

2. Radionuclides in Sanitary Water

Pasco and Kennewick are the nearest of the few cities downstream from the plant which treat the Columbia River water for use as domestic water. Sanitary water from the Pasco water treatment plant was analyzed for several radionuclides each week. Similar analyses were made on Kennewick water each month. The results of radioanalysis of water from these plants are presented in Appendix A, Tables 4 and 5, and are summarized in Table IV.

TABLE IV

ANNUAL AVERAGE CONCENTRATION OF SEVERAL RADIONUCLIDES MEASURED IN SANITARY WATER - 1962

Units of 10^{-9} μc/cc

Radionuclide	Pasco, Sanitary	Kennewick, Sanitary
Total Beta	2900	530
RE+Y	58	8.5
Na^{24}	600	70
Si^{31}	30	40*
P^{32}	44	10*
Sc^{46}	20*	20*
Cr^{51}	3500	2000
Mn^{56}	71	50*
Cu^{64}	330	57
Zn^{65}	95	20*
Zn^{69m}	20*	20*
Ga^{72}	40*	20*
As^{76}	200*	100*
Sr^{89-90}	7.2	0.9*
Sr^{90}	0.6*	0.3*
I^{131}	6*	3*
Np^{239}	550	70*

* Not greater than

In both cities, the sanitary water samples were collected at or near the water treatment plants. Because there is a significant flow time between the point of sampling and most consumers, the concentrations of short-lived nuclides in the water at the time it is consumed is less than that shown. The decay time may vary from hours to days depending upon water usage rates and location of the consumer in the distribution system.

Table V shows the apparent efficiency of the water treatment plant at Pasco for the removal of various radionuclides.

TABLE V

DEPLETION OF SEVERAL RADIONUCLIDES IN COLUMBIA RIVER WATER BY TREATMENT AT THE PASCO WATER PLANT (1962 AVERAGES)

	Percent Depletion
RE+Y	82
Cu^{64}	82
P^{32}	76
As^{76}	64
Na^{24}	62
Zn^{65}	57
Np^{239}	44
Cr^{51}	19

These data include the radioactive decay of the radionuclides during travel through the water treatment plant. The calculated annual average dose to the GI tract and total body and the percentage MPRI for bone from sustained consumption of sanitary water at Pasco and Kennewick is presented in Table VI.

TABLE VI

CALCULATED ANNUAL DOSE FOR SELECTED ORGANS FROM ROUTINE INGESTION OF SANITARY WATER - 1962

	Total Body, mrem	GI Tract, mrem	Bone, % MPRI	Thyroid (Small Child), mrem
Pasco	2	36	0.9	40
Kennewick	<1	13	0.4	13

The relative contribution of several radionuclides in Pasco sanitary water to the calculated annual dose to the GI tract is illustrated in Figure 7. Short term variations and long term trends in GI tract dose at Pasco are shown in Figure 8.

The sharp reduction in the dose rate to the GI tract at Pasco in 1962 was due to a decrease in the concentrations of As^{76} and Np^{239} which resulted from modification of the reactor water treatment process. This modification consisted mainly of increased addition of alum in the clarifying process which reduced tha amount of parent materials from which the As^{76} and Np^{239} are formed. P^{32} and Zn^{65} were also reduced to a smaller degree. The reduced output is expected to prevail as long as the high alum feed is continued and reactor operating practices remain unchanged.

3. Radionuclides in Fish and Waterfowl

Species of fish which feed in the Columbia River downstream from the reactors acquire some of the radionuclides present in reactor effluent water. Except for suckers, whitefish usually have the greatest concentration of radioactive materials. The bulk of this material is P^{32} which deposits principally in the bone but some is found in the flesh. The concentrations of several radionuclides in different kinds of fish from different localities are reported in Appendix A, Table 8. The concentrations of P^{32} in whitefish caught between Ringold and Richland are shown in Figure 9. The seasonal variation is affected by the amount of P^{32} released from the reactors, the feeding habits and metabolism of the fish, and flow rate of the river which

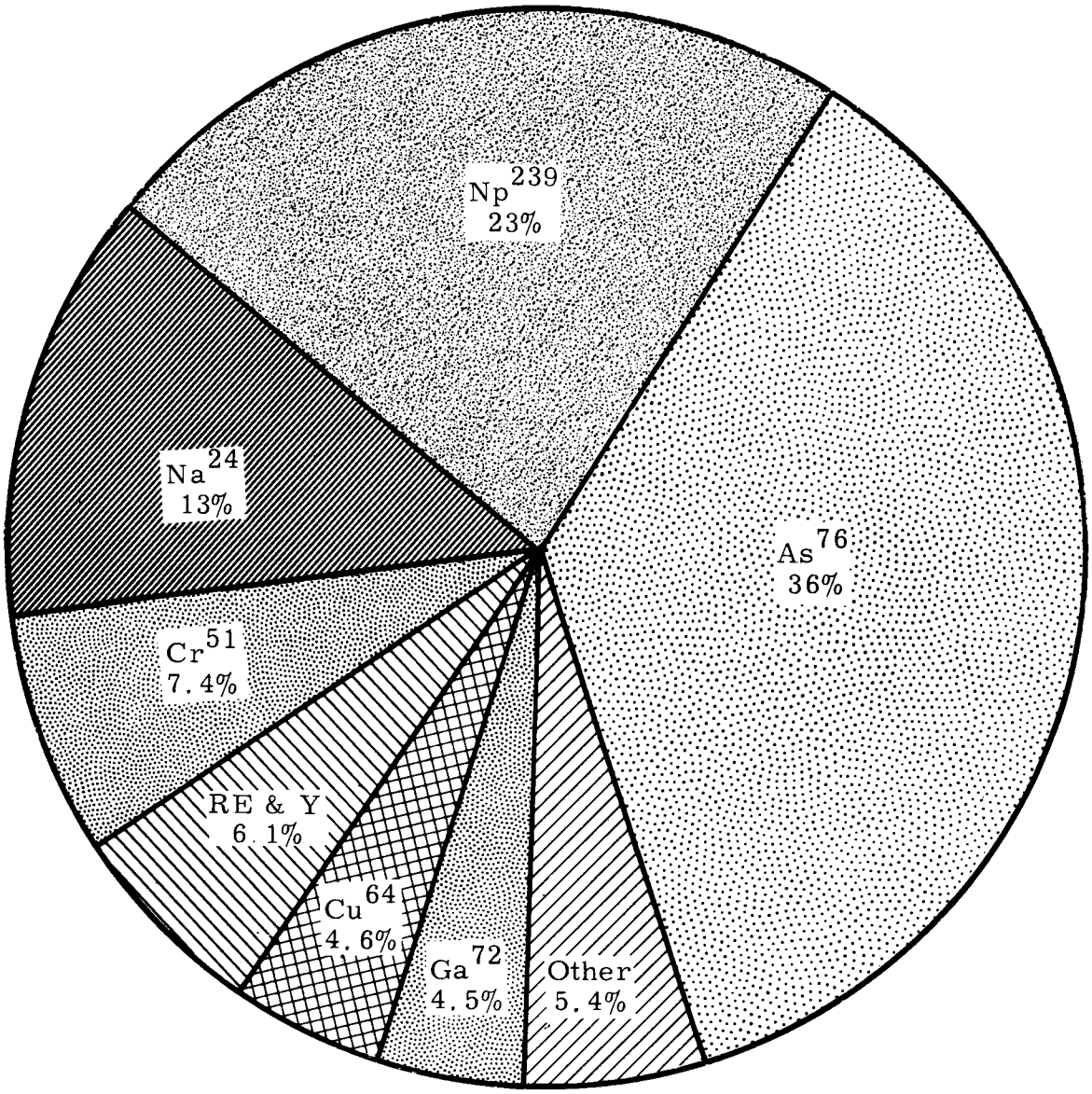

FIGURE 7

Relative Contribution of Radionuclides to GI Tract Dose
Pasco Sanitary Water - 1962

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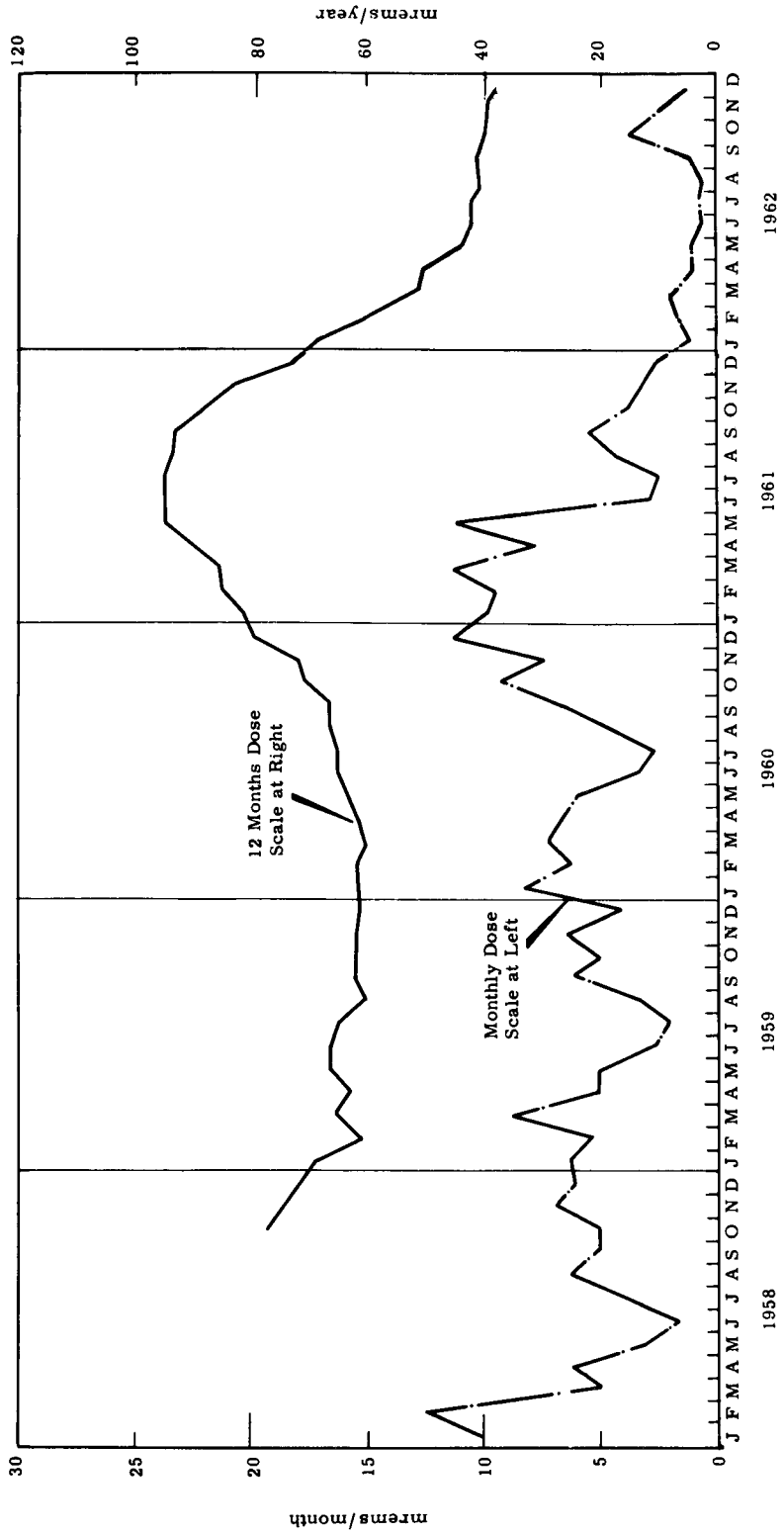

FIGURE 8

Calculated Dose to GI Tract from Pasco Sanitary Water

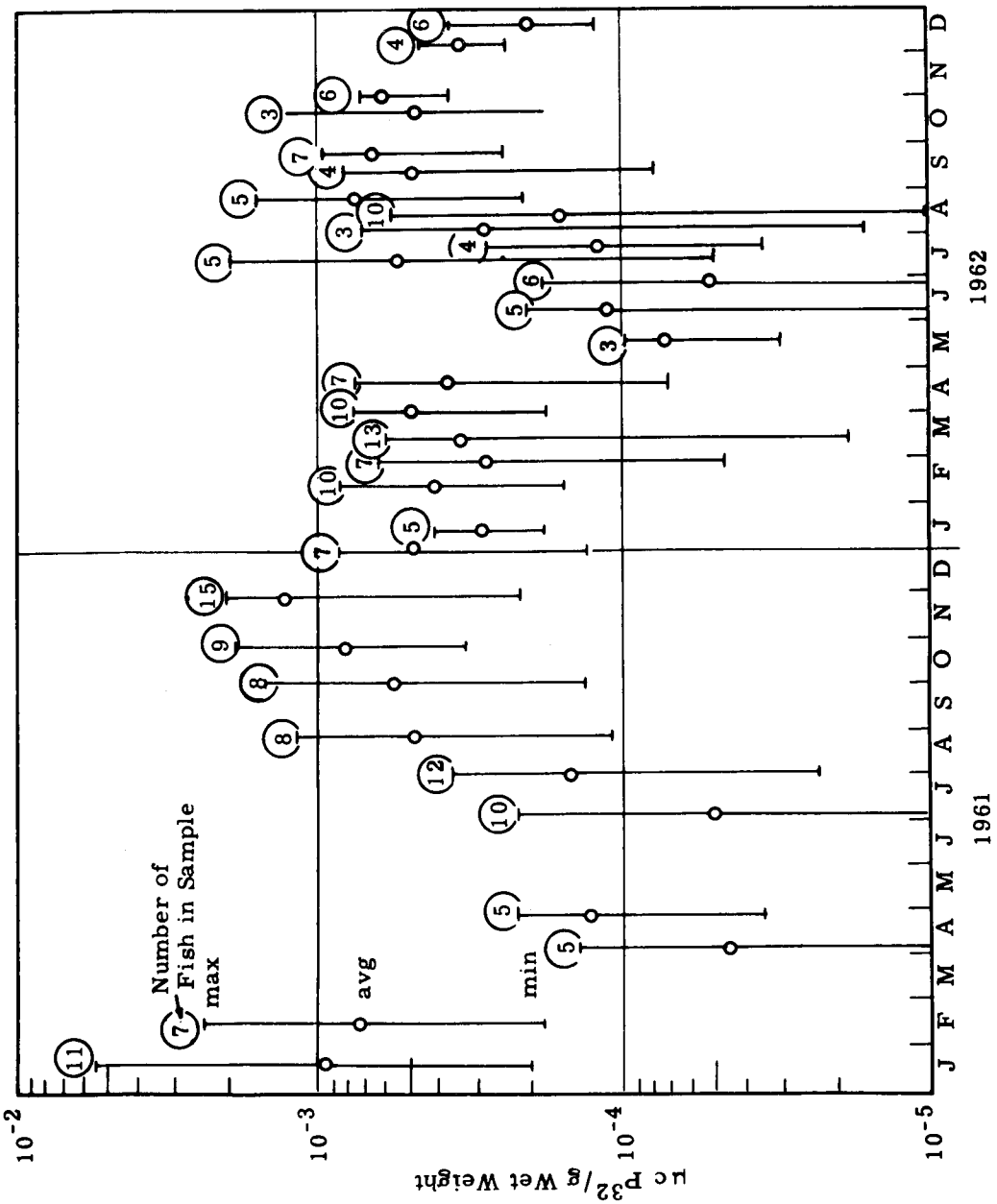

FIGURE 9

P^{32} in Whitefish Caught in Columbia River Between Ringold and Richland

determines the effective dilution of the reactor effluent. Assuming a constant release of P^{32} in reactor effluent water, the level for whitefish starts to decrease late in the year and, due to cold water and limited feeding, continues to decrease until spring at which time increased feeding on contaminated food organisms starts to increase the P^{32} content. The trend is reversed in mid-spring by the high flow rates of the Columbia which affords greater dilution of effluent. As the high flows recede in early summer and as water temperatures rise, the P^{32} content again increases and a maximum is reached in late fall. The annual average concentration of P^{32} in whitefish was 3.5×10^{-4} μc/g, somewhat lower than in 1961 (5.3×10^{-4} μc/g).

The season for most popular whitefish fishing is during the fall and winter months and Ringold is the closest fishing area available to the public downstream from the reactors. For this evaluation it was assumed that whitefish caught at Ringold were eaten at the rate of one meal per week, not only during the fall and winter, but throughout the entire year. This would result in an intake of about 4 μc annually, which could provide exposures of approximately 80 mrem to the GI tract, 30 mrem to the total body, and 25% of the MPRI for bone. The annual average concentration of Zn^{65} in whitefish from the same locality was 6×10^{-5} μc/g which could result in a total body exposure of 4 mrem and 7 mrem to the GI tract.

Migratory waterfowl, such as mallard ducks, Canada geese, etc., which have utilized the Hanford section of the river may contain radionuclides and may be harvested by hunters at a number of places. During the 1962 waterfowl season, samples from about 102 ducks bagged by hunters from Washington and Oregon were submitted for radioassay. Individual data obtained from radioassay of these samples are included in Appendix A, Table 9. The data show that about 1 out of every 17 ducks contained concentrations of P^{32} greater than the detectable level of 5×10^{-5} μc/g (wet weight). There were 88 ducks collected from swamp and pond areas within the project boundaries. The data obtained from these ducks, listed in Appendix A, Table 10, indicates that about 1/3 of them contained concentrations of P^{32} greater than 5×10^{-5} μc/g. Four ducks contained greater than

5×10^{-4} μc P^{32}/g while the highest concentration was 1.8×10^{-3} μc P^{32}/g. The probability of obtaining a duck with the maximum concentration of P^{32} is remote; however, if a person consumed about 1 pound of such a duck he would ingest about 0.8 μc or about 5% of the MPRI for bone.

4. Radionuclides Entering the Pacific Ocean

The rate of transport of radionuclides past Vancouver may be used as an index of the quantities of certain radionuclides entering the Pacific Ocean from the Columbia River. The annual average rate of transport of selected radionuclides is given in Table VII and detailed estimates are tabulated in Appendix A, Table 7.

TABLE VII

ANNUAL AVERAGE RATE OF TRANSPORT
OF SELECTED RADIONUCLIDES PAST VANCOUVER

curies per day

Radionuclides	1962	1961	1960
P^{32}	13	29	17
Cr^{51}	650	840	850
Zn^{65}	29	44	38
Np^{239}	31	67	72

An inventory of each of these nuclides exists in the ocean which represents an equilibrium between the rate of addition through the river system and the rate of decay of the radionuclides which have previously entered the ocean. If a constant rate of entry into the ocean equivalent to that indicated by the 1962 Vancouver data is assumed, then the inventories would amount to about 250 curies of P^{32}, 100 curies of Np^{239}, 25,000 curies of Cr^{51}, and 9000 curies of Zn^{65}.

5. Radionuclides in Marine Organisms

Zn^{65} and P^{32} are the only radionuclides of reactor effluent origin which have been found in sufficient abundance beyond the mouth of the Columbia to be of radiological interest. Oysters have been found to contain higher concentrations of Zn^{65} than other common sea food organisms,[6] and oysters grown in Willapa Bay were regularly sampled and analyzed for Zn^{65} and other radionuclides. Concentrations of Zn^{65} and P^{32} in oysters are shown in Figure 10, and the analytical results are tabulated in Appendix C, Table 7. The average concentration of 27 samples involving 54 pounds of oysters taken periodically during the year was 9.4×10^{-5} μc Zn^{65}/g. Consumption of oysters containing this amount of Zn^{65} at a sustained rate of one meal each week would lead to an annual exposure of about 7 mrem to the total body and 11 mrem to the GI tract. The average concentration of P^{32} in oysters was 2.9×10^{-6} μc/g and would result in less than 1% of the MPRI for bone; total body and GI tract doses from this amount of P^{32} are also negligible.

B. Results Associated with Radioactive Materials in the Atmosphere

1. Hanford Releases to the Atmosphere

Airborne radionuclides at Hanford are primarily associated with process vessel off-gases from the chemical separations facilities. This gaseous waste is released to the atmosphere through 200-foot high stacks after removal of some 99% of the radioactive materials present. Under normal operating conditions the ventilation air from reactor and laboratory buildings contains comparatively minor amounts of radioactive materials.

Airborne radioactive material can contribute to human exposure through such pathways as inhalation, ingestion of leafy vegetables upon which the material has deposited, and milk from cows which have grazed on affected pasture.

Continuous measurements are made of the release of several radionuclides from the separations facilities. The radionuclide of principal interest in these process off-gases is I^{131}. The results of measurements

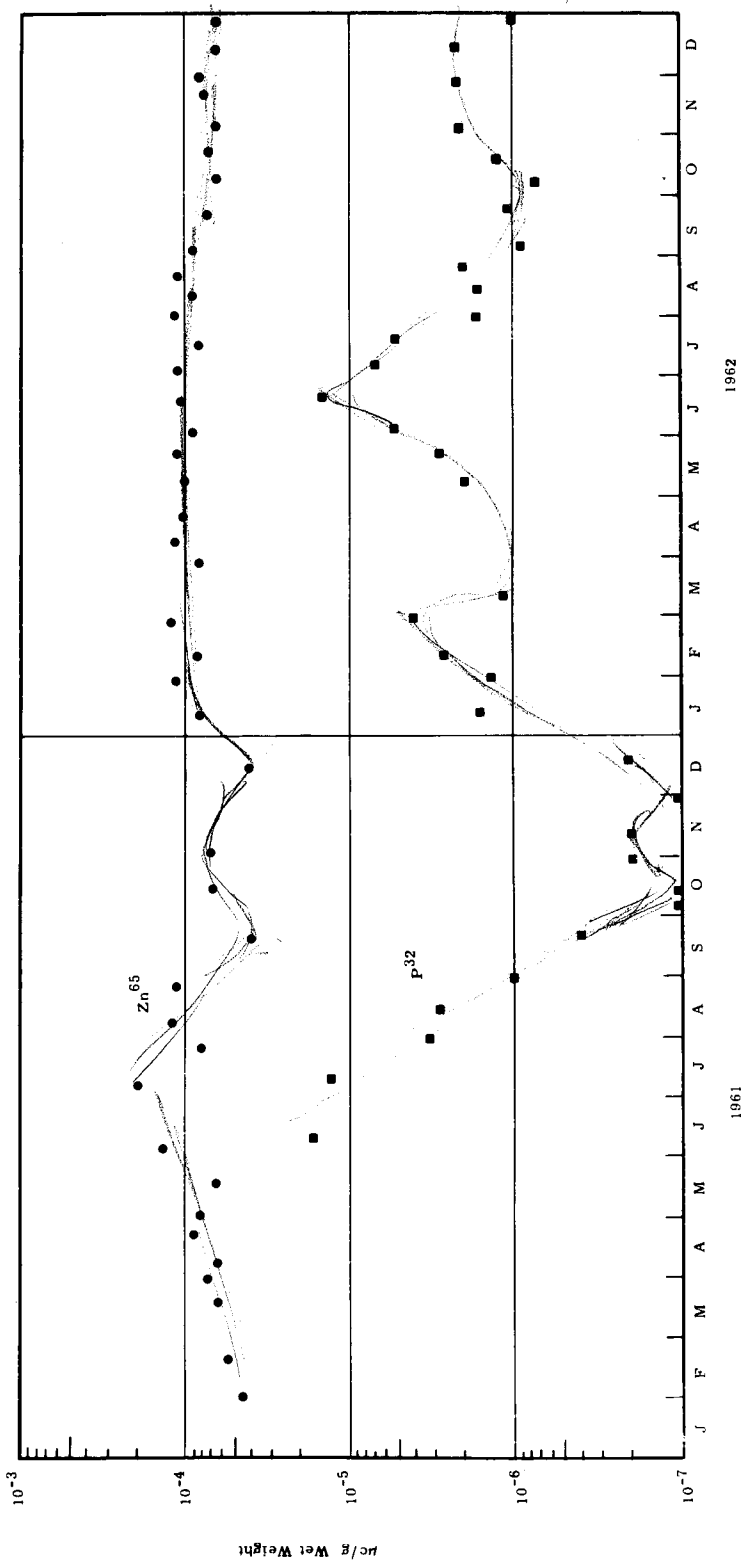

FIGURE 10

Zn^{65} and P^{32} in Willapa Bay Oysters

for this nuclide are presented in Appendix B, Table 3 and monthly average releases are shown in Figure 11. As can be seen by the 12 months average, there was a downward trend of I^{131} release toward the local operational control level of two curies per week first established in the fall of 1961. The average daily emission rates of several radionuclides are shown for 1961 and 1962 in Table VIII.

TABLE VIII

ANNUAL AVERAGE EMISSION RATES OF SEVERAL RADIONUCLIDES FROM SEPARATIONS PLANT STACKS

curies per day

Radionuclide	1962	1961
I^{131}	0.35	0.7
$Zr\text{-}Nb^{95}$	0.0024	0.005
Ru^{103}	0.0009	0.003
Ru^{106}	0.0036	0.005
Ce^{141}	0.0002	0.006
Ce^{144}	0.015	0.01

Earlier measurements have shown that emission rates of the rare earth and yttrium group are about 0.02 curies per day; Sr^{89} about 0.004 curies per day, and Sr^{90} about 0.005 curies per day. Fission product recovery facilities operating at Hanford contributed negligible amounts of radionuclides to the environs during 1962. For example, the average daily emission rate of Sr^{90} from such facilities was 1.4×10^{-4} curies per day.

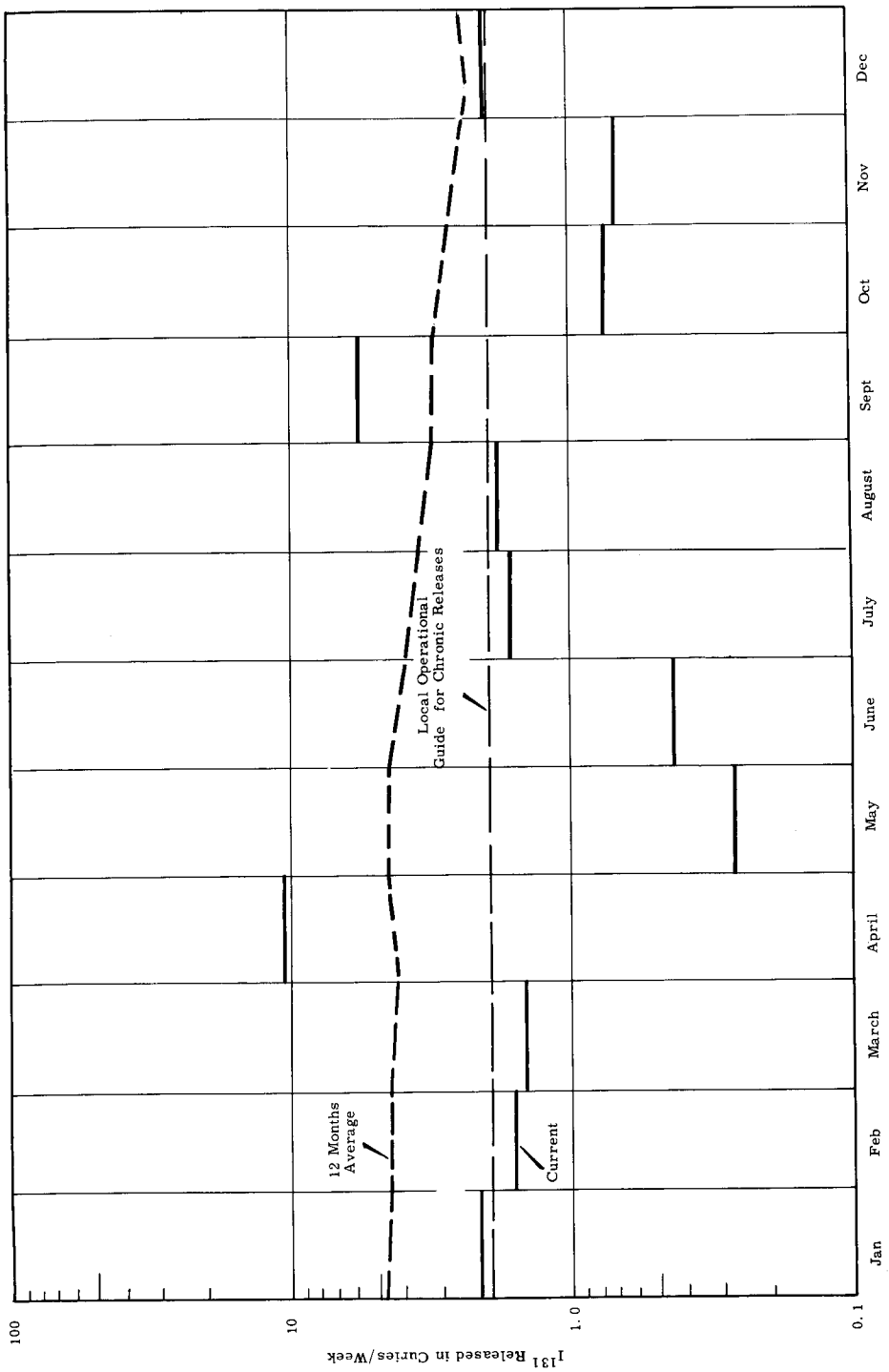

FIGURE 11

Release of I^{131} to the Atmosphere, 1962

2. Radioiodine in Air

Measurements of I^{131} concentrations in air were made routinely at several communities adjacent to the plant. Results of these measurements for 1962 are presented in Appendix B, Table 2, and results for the past few years are summarized in Table IX.

TABLE IX

AVERAGE I^{131} CONCENTRATIONS IN ATMOSPHERE

Location	Distance from Separation Stacks, Miles	Concentrations in Units of 10^{-14} μc/cc		
		1962	1961	1960
Benton City	20	8.1	2.2	5.4
North Richland	21	9.9	4.5	4.3
Richland	23	3.8	2.3	3.0
Pasco	32	7.7	3.6	2.3

The four communities listed in Table IX lie within a 45 degree sector southeast to south of the separations centers.

The annual average I^{131} concentrations in air during 1962 were about twice those observed in 1961. The principal cause of the increase was the added influx of I^{131} during the nuclear weapons tests conducted by the USSR in the fall of 1962. In comparison to this influx, the contribution to the 1962 annual average from the US tests conducted during the spring and summer, was insignificant. In spite of the increased airborne concentrations, direct inhalation of I^{131} was not a significant contributor to the thyroid dose of persons residing in the vicinity of Hanford. The annual dose from this source during 1962 was estimated to be less than 1 mrem.

3. Radionuclides in Milk and Agricultural Produce

The radioactivity in local agricultural produce can be influenced by deposition of airborne radionuclides on the ground or vegetation or by irrigation of food and forage crops with water containing reactor effluent radionuclides.

Generally, the local source of airborne radionuclides is considered to be the chemical separations facilities; however, under certain conditions the ventilation stacks of the reactors or laboratory areas could become the source of interest. There is no farming within about a 13 mile radius of the separations facilities and under most meteorological conditions this distance affords good dilution before the radioactive effluents reach framing areas.

Most of the irrigated land in the vicinity of the Hanford plant is irrigated from the Yakima River, or with water taken out of the Columbia above the project. The Ringold farms and the Riverview District of Pasco, which are about 15 and 30 miles downstream from the reactors, respectively, take water from the Columbia River and some of the reactor effluent radionuclides can be traced through the irrigation processes to milk and produce. The Ringold farms, approximately 13 miles east of the production areas, involve about a dozen people working about 500 acres of land. The Riverview farming area is composed of less than 3000 acres and has 20 to 30 families. This area is about 30 miles southeast of the chemical separations facilities (see Figure 2). Another agricultural area near the project is Benton City on the Yakima River. It is about 20 miles south of the separations facilities.

With the exception of milk obtained from local farms irrigated with Columbia River water, the radionuclide content of milk available in the Tri-City area appears typical of that reported by the US Public Health Service[8] for sections of the country with similar rainfall. Data concerning radionuclides in milk analyzed locally are contained in Appendix C, Tables 1 and 2.

Hanford analyses of milk known to be of local origin showed Sr^{90} concentrations ranging from less than 2 to 24 $\mu\mu c$ SR^{90}/l. Figure 12 shows the results of these analyses. The average concentration of 5.1 $\mu\mu c$ Sr^{90}/l of milk ranks among the lowest in the nation. The sharp increases noted in the spring of 1962 were a result of Russian nuclear tests in the fall of 1961 and US tests during the spring. Concentrations of Sr^{89} and Cs^{137} in milk analyzed at Hanford were usually below the detection levels of 4 $\mu\mu c$ Sr^{89}/l and 30 $\mu\mu c$ Cs^{137}/l. World-wide fallout is the principal source of

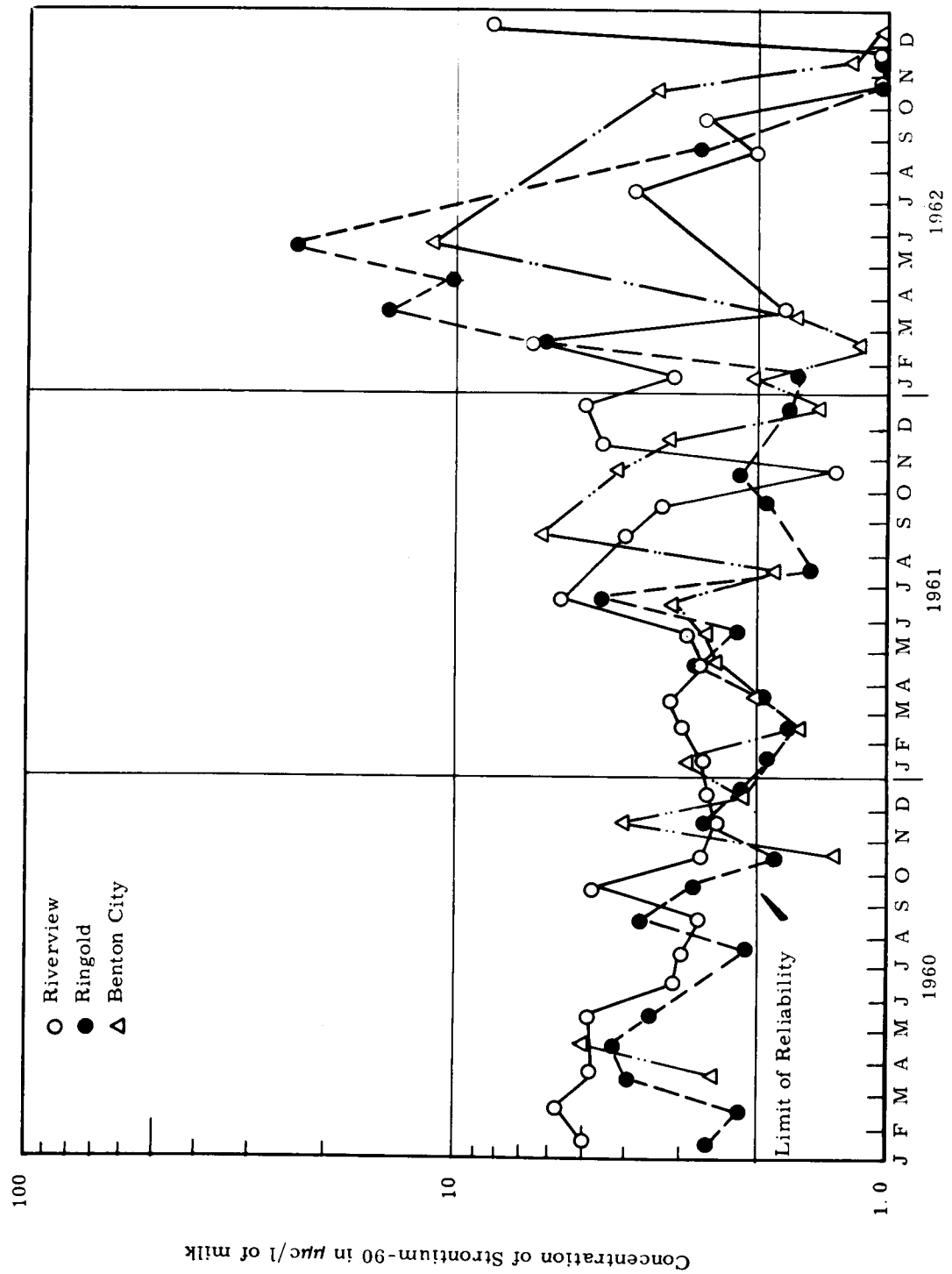

FIGURE 12

Sr^{90} in Locally Produced Milk

these radionuclides in milk. An increase in these radionuclides will probably be detected in early spring 1963 as a result of tests held in 1962.

Irrigation water pumped from the Columbia River is the source of P^{32} and Zn^{65} in the milk of cows which had grazed on irrigated pasture (see Figures 13 and 14). For dairy farms in the Ringold and Riverview areas, the average concentrations of Zn^{65} in milk were 960 μμc/l and 590 μμc/l, respectively, and the average concentrations of P^{32} were 760 μμ/l and 850 μμ/l, respectively. Neither Zn^{65} nor P^{32} was positively detected in milk distributed through commercial outlets in the Tri-City Area. Most of the milk distributed commercially in the Tri-Cities is obtained from areas not irrigated with water drawn from the Columbia River below the Hanford reactors.

At a consumption rate of 1 liter of milk per day the "fallout" nuclides would contribute an average annual dose of less than 1 mrem to the GI tract, 3 mrem to the total body and about 3% of the MPRI for bone. Those residents of Ringold and Riverview who drink milk from their farms received some additional exposure from Zn^{65} and P^{32} amounting to about 10 mrem to the GI tract, 4 mrem to the total body and about 2% of the MPRI for bone.

In addition to the above nuclides, measurements for I^{131} were made in all milk samples. Measurement results obtained in 1962 for I^{131} in milk are illustrated in Figure 15. During the early part of the year, concentrations of I^{131} in local milk were well below 10 μμc/l. Nuclear tests by the US during the spring and early summer caused temporary increases in concentrations of I^{131} in local milk, with a maximum of 70 μμc/l. A sharp rise in I^{131} concentrations occurred during the latter part of August and in September in both local and commercial milk coincident with the resumption of nuclear testing by the USSR. On October 31, a maximum concentration of 580 μμc I^{131}/l was measured in milk from the Ringold area. Relatively high concentrations persisted until the latter part of December at which time the I^{131} content dropped to less than 10 μμc/l of milk. Radioactive decay of I^{131} and decreased use of fresh pasture accounts for the sharp reduction of I^{131} measured in milk at the end of the year.

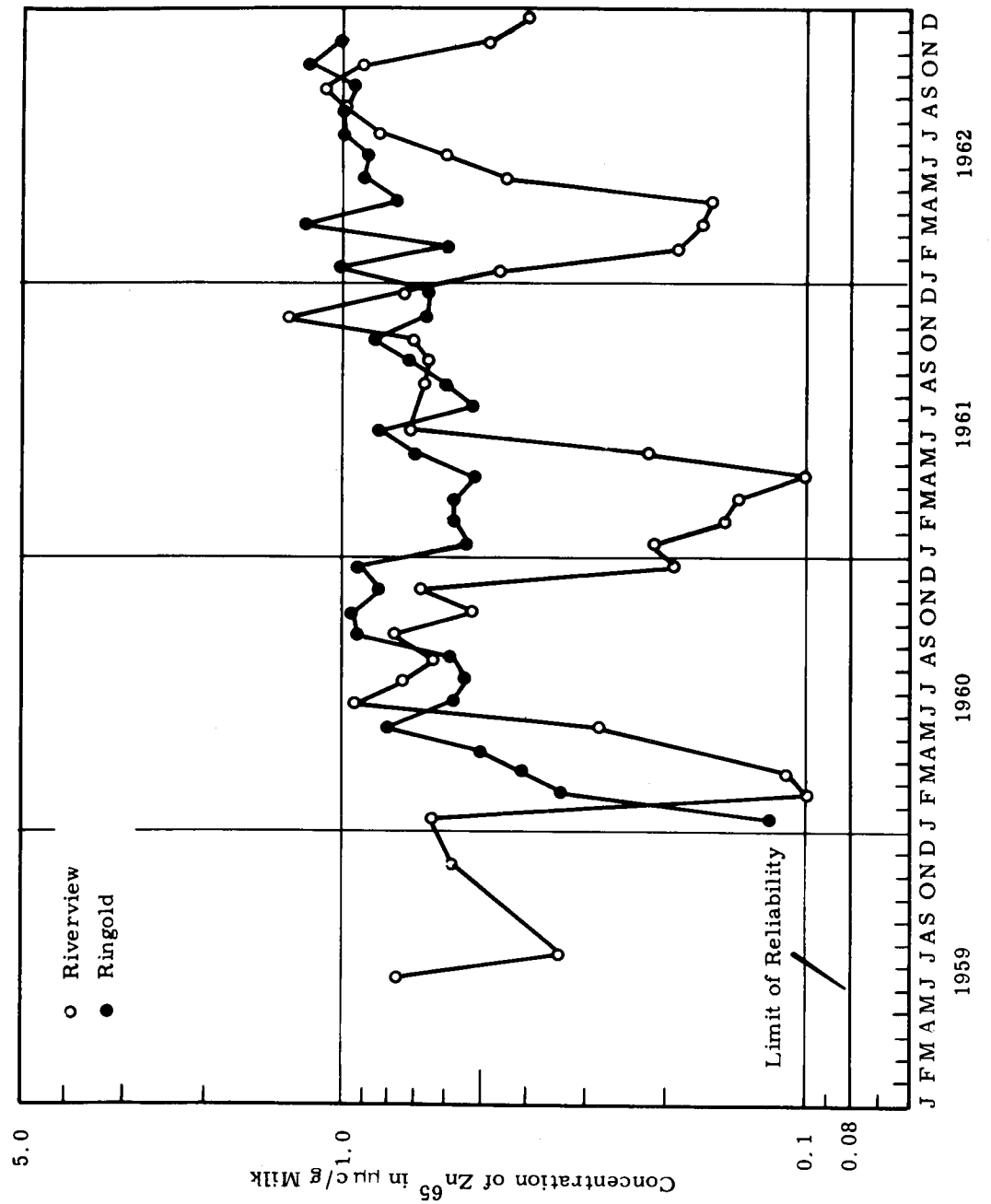

FIGURE 13

Zn^{65} in Locally Produced Milk

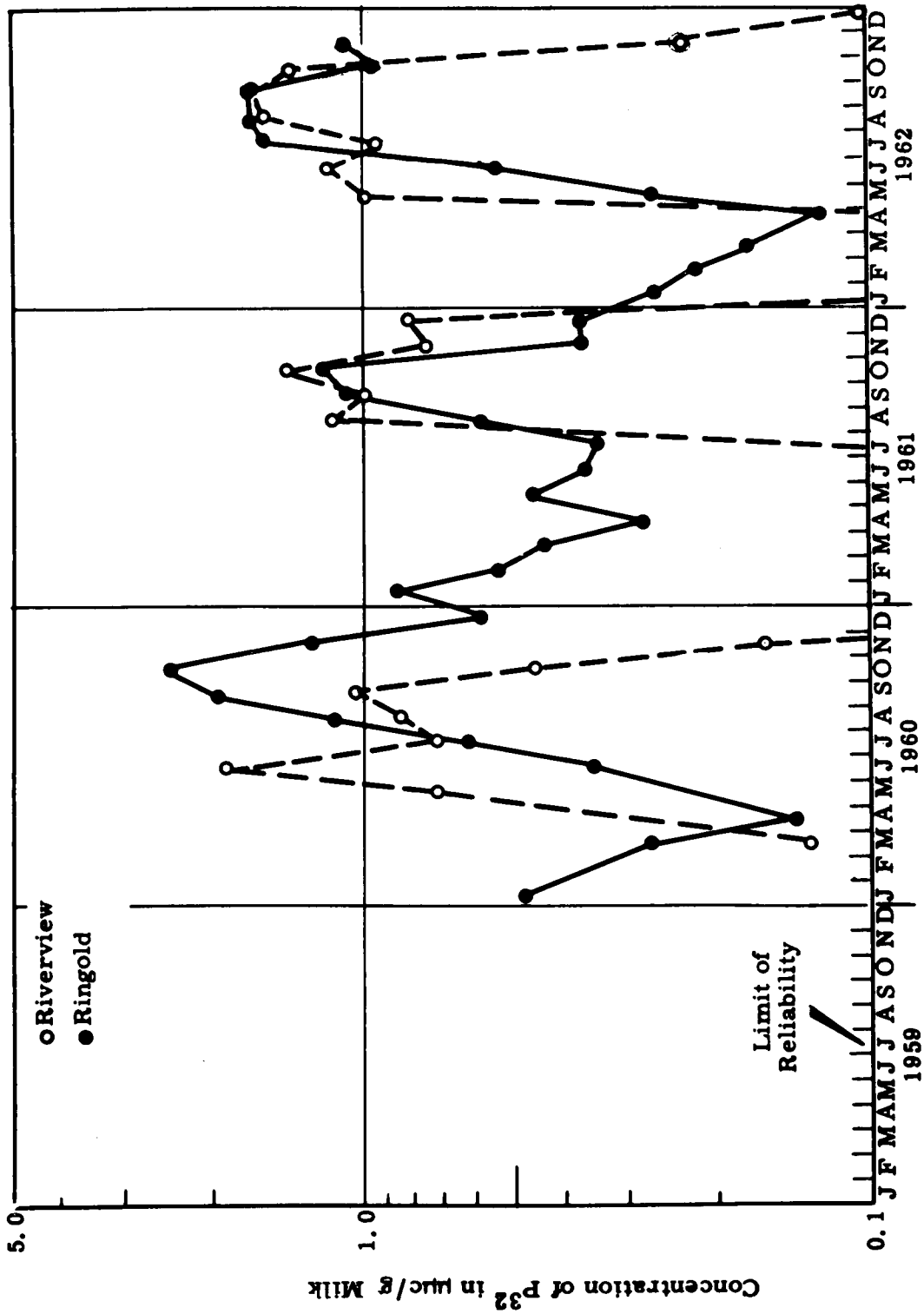

FIGURE 14

P^{32} in Locally Produced Milk

32015-17

AEC-GE RICHLAND, WASH.

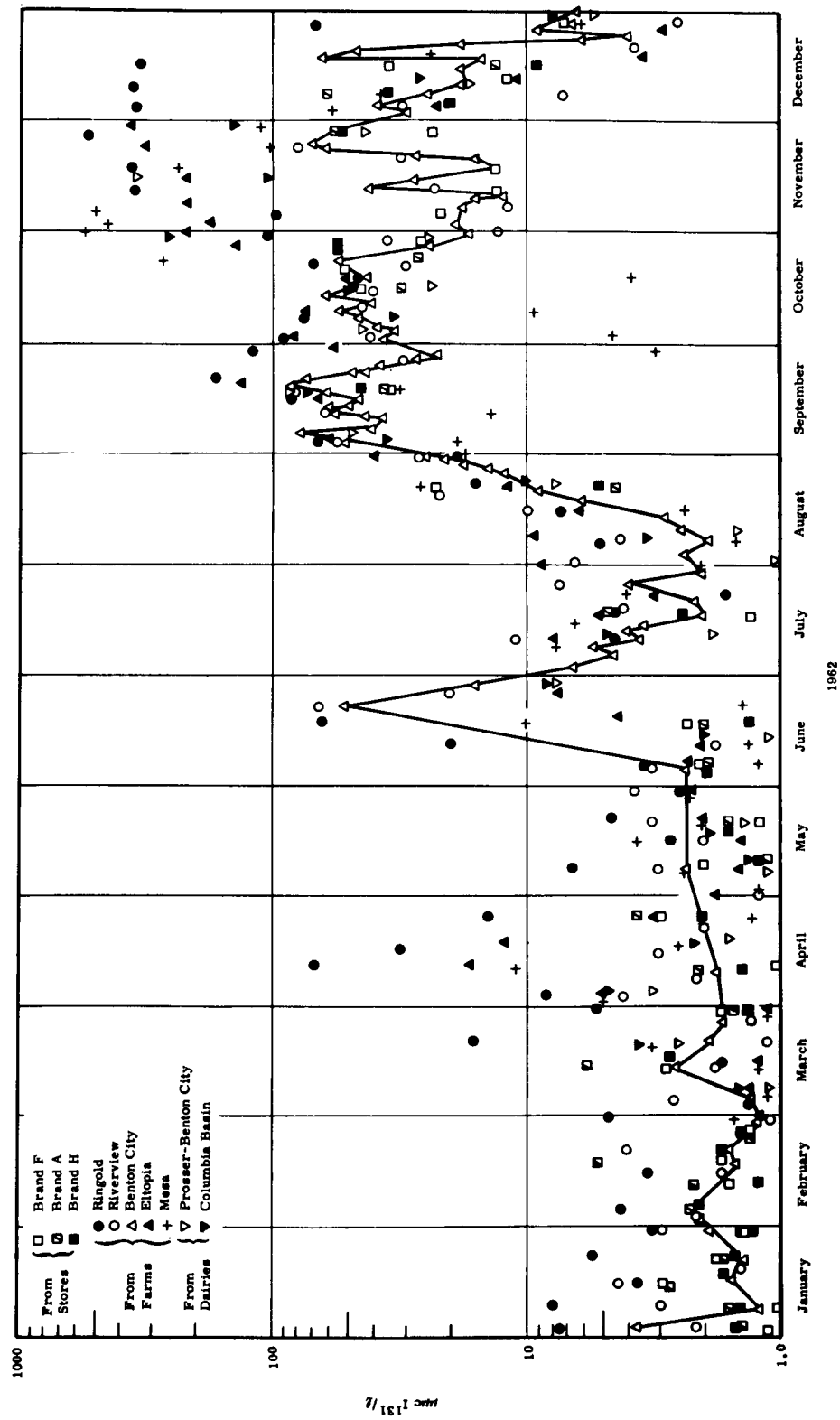

FIGURE 15

I^{131} in Locally Produced Milk

Miscellaneous local produce was purchased periodically from the markets and farms during the growing season and radioassayed. Results of these measurements are tabulated in Appendix C, Tables 6 and 7.

Experience of the past few years has indicated that under normal plant operating conditions local farm produce contains but small quantities of radionuclides. This conclusion was again substantiated by results obtained from sampling of foodstuffs in 1962. The fallout from USSR testing in the fall of 1962 started near the end of the growing season and was of little importance in terms of contamination of produce other than milk.

Estimating dose from ingestion of local produce during periods of little fallout or during normal plant emissions may be accomplished by comparison with milk since the dose involved is small and the associated error does not appreciably alter the estimate of total exposure received from all sources.[9] In the case of Sr^{90}, intake from 1 kg of other foods is considered to be only 20-30% of the Sr^{90} ingested from 1 liter of milk.[10]

The average concentration of I^{131} measured on leafy vegetables sampled from local farms and vegetable markets during the period of May through September was 0.2 μμc/g. An average consumption of 60 grams of leafy vegetables per day during this period would result in an average annual intake of approximately 5 μμc I^{131} per day, implying an annual exposure of about 3 mrem to the thyroid of a "standard man".

4. Concentrations of I^{131} in Beef Cattle Thyroids

Late in 1960 assay of thyroids of cattle slaughtered for beef at Pasco, Washington, was initiated. The program was broadened extensively in 1962 to include thyroids of cattle slaughtered at Moses Lake, Toppenish, Walla Walla, and Wenatchee. Since the concentration of I^{131} in the thyroids is about 2-3 orders of magnitude higher than that in the pasture grass or in milk, it may become advantageous to estimate concentrations of I^{131} in milk and on leafy vegetables from the thyroid samples when the levels in

milk and on leafy vegetables from the thyroid samples when the levels in the milk and vegetables are other wise too low for practical measurement. Additionally, knowledge of cattle thyroid exposure may be developed from the thyroid measurements.

Data obtained from the cattle thyroid program for 1962 are presented in Appendix B, Tables 3 through 7. The results are also illustrated in Figure 16. Thyroid burdens vary widely due to differences in feeding habits, location of residency, etc., prior to slaughter. The increase in concentrations of I^{131} in the thyroids in late 1962 was again the result of fallout from nuclear testing.

5. Radioactive Particulates in the Atmosphere

Air sampling stations maintained by the Hanford project include those located at Benton City, Kennewick, Pasco, Richland, Seattle, Spokane, Walla Walla, and Yakima in Washington; Meacham and Klamath Falls, Oregon; Boise and Lewiston, Idaho; and Great Falls, Montana. Remotely located sample filters are changed weekly by cooperating agencies and sent to Hanford where they are analyzed for the total beta activity. Individual measurement results are presented in Appendix B, Table 1.

The concentration of beta emitters in air filtered at several of the sampling stations during the past few years are shown in Figure 17. The geographical locations of these sampling stations are also shown.

During the first 8 months of 1962 a major portion of the activity in off-site samples was from USSR nuclear testing during the previous fall and a few tests conducted by the U. S. in April and June of this year. Air activity remained in the range of 1 to 10 $\mu\mu c\ \beta/m^3$ of air during this period. Resumption of USSR nuclear testing during the fall caused a sharp rise in air activity to values of 10 to 20 $\mu\mu c\ \beta/m^3$ of air. Similar levels have been observed in previous years following USSR and U. S. tests.

Activity measured in air filter samples are not used in exposure determinations but serve to illustrate the trends in atmospheric contamination throughout the Northwest.

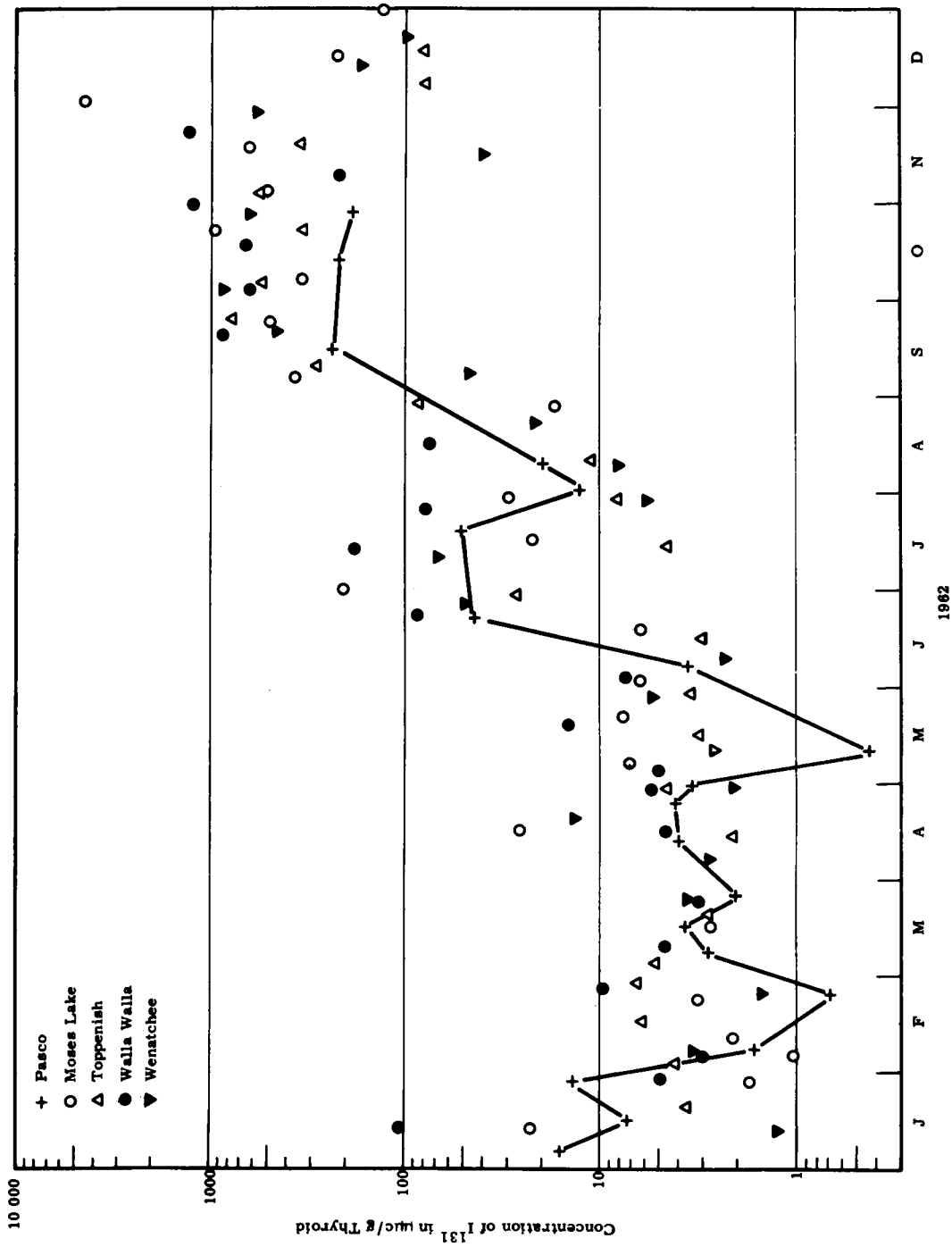

FIGURE 16

Average Concentrations of I131 in Beef Cattle Thyroids, 1962

32015-2
AEC-GE RICHLAND, WASH.

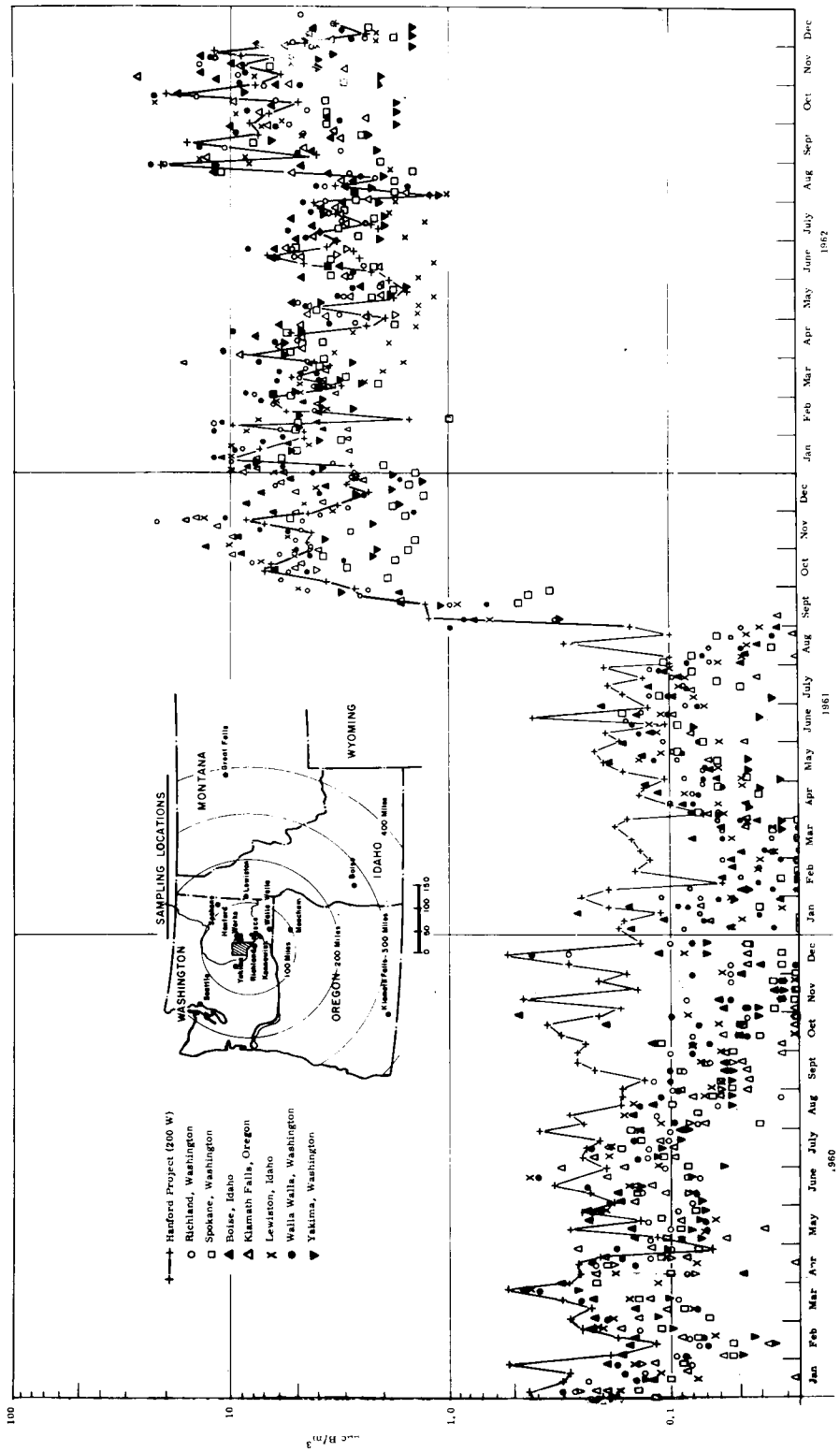

FIGURE 17

Activity on Filters from Several Northwestern United States Sampling Stations

C. External Radiation

1. On the Hanford Reservation

Estimates of the combined exposure from external sources in the vicinity of the Hanford project were made from measurements with ionization chambers stationed above the ground and submerged in the Columbia River. Measurements over the ground indicated that the annual exposure for 1962 was about 170 mr. Virtually all of this radiation originates from natural background and world-wide fallout from nuclear testing and any additional contribution from Hanford sources is not readily discernable. The background measurements remained relatively constant throughout the year at the levels attained after the resumption of nuclear testing in the fall of 1961. Measurements of external radiation in 1960, 1961, and 1962 are illustrated in Figure 18 and tabulated in Appendix D, Table 1.

2. In the Columbia River

Immersion dose measurements were obtained with pocket-type ionization chambers submerged 2 to 5 feet below the surface of the Columbia River. Measurements of immersion dose are shown in Appendix D, Table 2. Exposure rates in the river are higher than those measured over land because of the presence of gamma emitters, especially Na^{24}, from the reactor effluent. Near Richland and Pasco the average dose rate measured in the river during the months of April through October was about 2.1 and 1.4 mr per day respectively; further upstream, near the Laboratories Area, it was 2.9 mr per day. A person swimming or boating in the river for 240 hours during the year would receive about 20 mr in the vicinity of Richland and 14 mr near Pasco.

D. Radioactive Wastes Released to Ground

Liquid wastes from the Chemical Separations areas are disposed of by various means depending on the radioactive contents. "High level wastes", normally containing activity of 100 μc/cc or more, are neutralized and stored in concrete tanks lined with steel. "Intermediate level wastes", containing activity of approximately 5×10^{-5} μc/cc to 100 μc/cc, are sent to

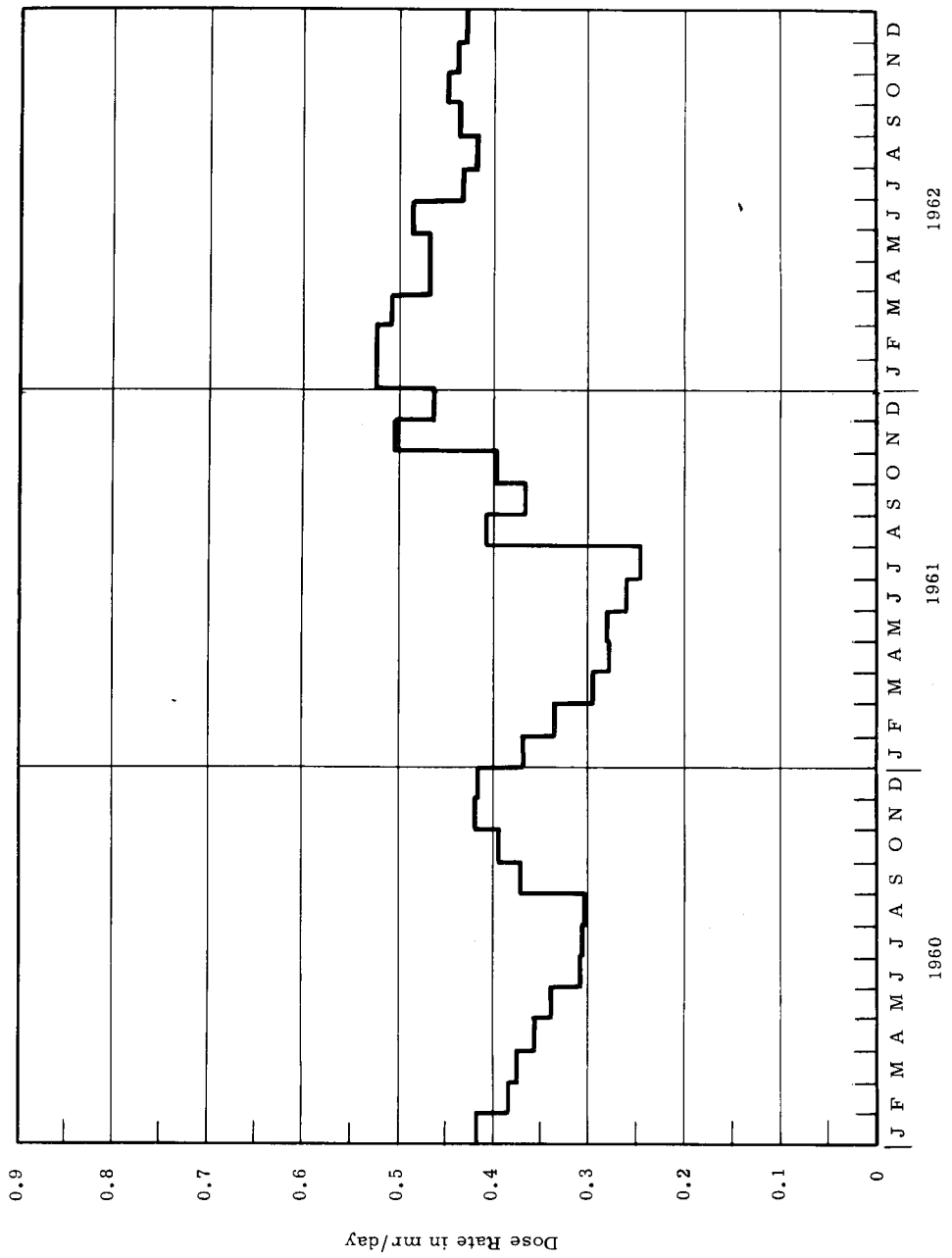

FIGURE 18

External Dose Rate as Measured at Hanford External Dose Test Location

underground cribs from which they can percolate into the soil. "Low level wastes", usually containing less than 5×10^{-5} μc/cc, are sent to depressions in the ground where they have formed surface ponds. The areas selected for liquid waste disposal have soil with good storage capacity and depths of 150 to 350 feet to ground water.

One important objective in local waste disposal practice is the prevention of significant quantities of radiologically important radionuclides from reaching the ground water and ultimately the Columbia River. For this reason wells have been drilled in and around crib and tank storage areas to detect leaks in the tanks and for measuring radionuclides which have reached the ground water. The radionuclides present in ground water have historically been associated with liquid waste sent to cribs. Figures 19 and 20 show the probable extent and concentration of radioactive materials in the ground water.(11)

The total quantity of radioactive materials sent to ground (tritium and radioactive materials in the storage tanks excluded) is estimated to be 2.6×10^{6} curies. Because of radioactive decay, the current total in the ground is estimated as 3.5×10^{5} curies. In order of abundance, the bulk of this material is Ru^{106}, Cs^{137}, and Sr^{90}. Figure 19(11) shows the probable extent and concentration of radioactive materials (excluding tritium) in the ground water.

In 1960 research work performed at the Savannah River Plant identified tritium as a product of U^{235} fission. The yield was established as about one tritium atom per 10^{4} fission events. In 1961 a program was initiated at Hanford to determine the tritium content of the ground water in the vicinity of the Chemical Processing Areas. Figure 20(11) shows the probable extent and concentration of tritium in the ground water as of June, 1962. Subsequent ground water surveys indicate the pattern to be generally the same through 1962. In all probability some tritium originating at the chemical processing areas is now entering the Columbia River at concentrations below the present detection limit of 1×10^{-5} μc/cc. However, the contribution to on- or off-plant personnel radiation exposure dose is negligible.

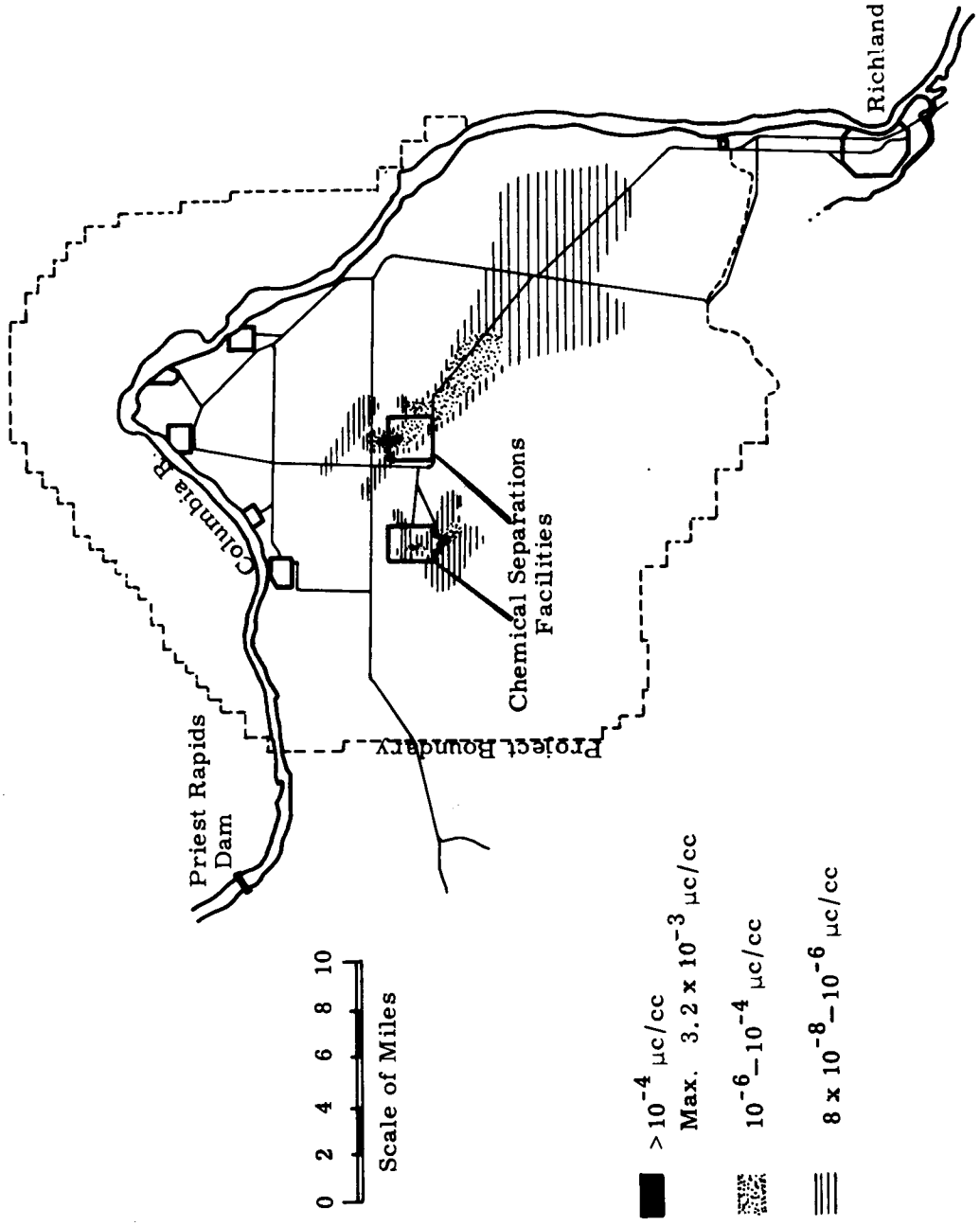

FIGURE 19

Probable Extent of Beta Emitters in Ground Water, 1962

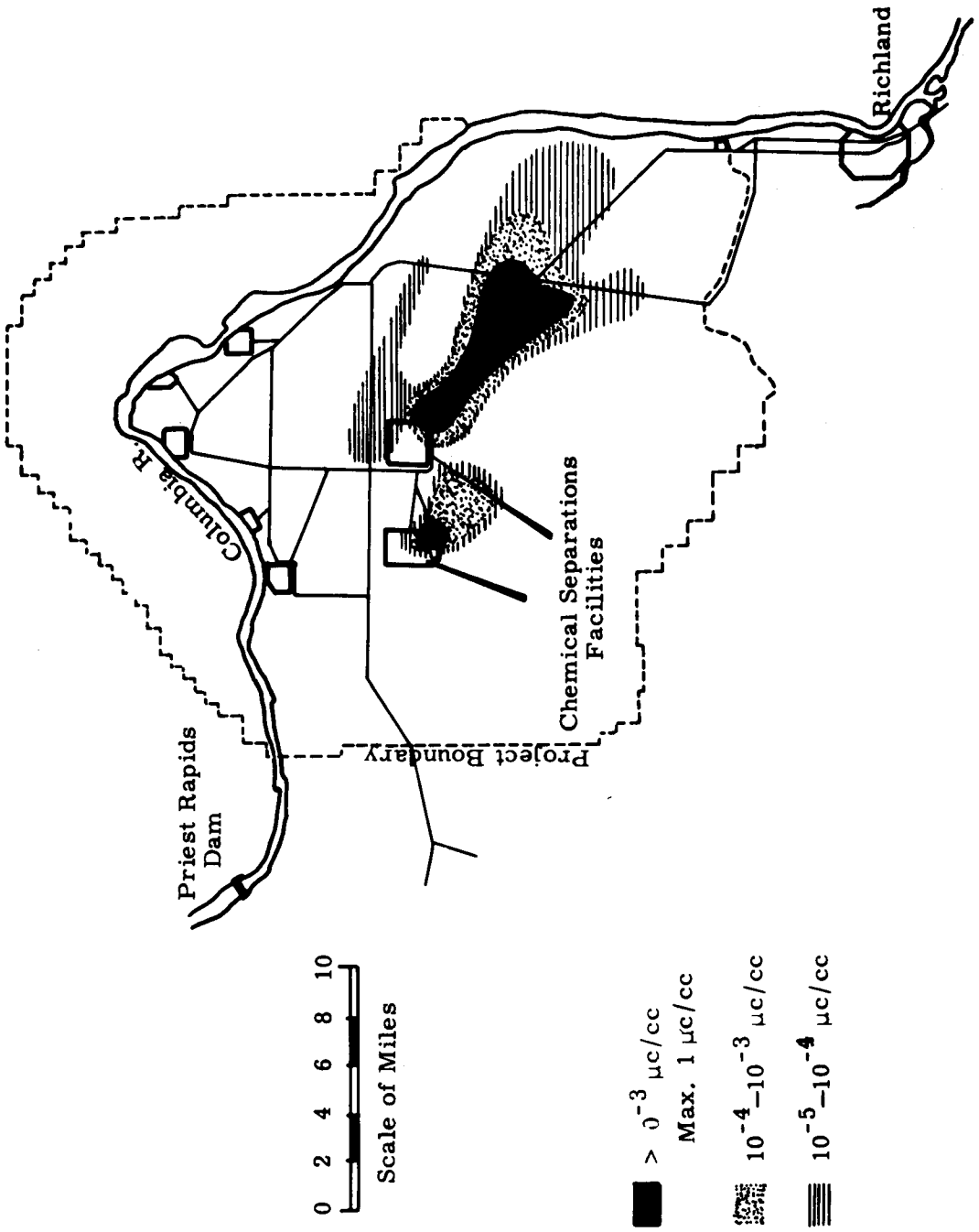

FIGURE 20

Probable Extent of Tritium Emitters in Ground Water, 1962

32015-3
AEC-GE RICHLAND, WASH.

IV. AGGREGATE EXPOSURE FROM ENVIRONMENTAL SOURCES

Individual exposures cannot be stated precisely because dietary habits, periods of accupancy, etc., are rarely known. However, by assuming ingestion rates for various foodstuffs, and making other reasonable assumptions, a useful assessment of radiological conditions may be made. This assessment is also useful for identifying waste disposal practices which warrant particular attention.

Several modes of radiation exposure are illustrated for different groups of the local population in Figures 21 through 24 for the GI tract, bone, total body, and thyroid, respectively. In some cases the estimates of food and water intake assumed may be too high for the average individual, thus exaggerating the estimates of radiation dose. On the other hand, a few individuals with extreme habits may receive doses somewhat greater than those postulated.

The exposure postulated for different groups is represented by blocks whose height is an indication of the dose received and whose width is an approximation to the number of people so exposed. In the case of exposure through drinking water, it is assumed that each resident of the city consumes 2.2 liters per day of water taken at the treatment plant. Some reduction in exposure could be expected at different points in the city due to radioactive decay during transit time in the water mains. The water intake of 2.2 liters per day is the intake of a "standard man" and is convenient in terms of comparisons against MPC's. An exception was made, however, in estimating the thyroid dose from I^{131} in drinking water as illustrated in Figure 24. The thyroid dose was estimated according to the parameters listed in Table X.

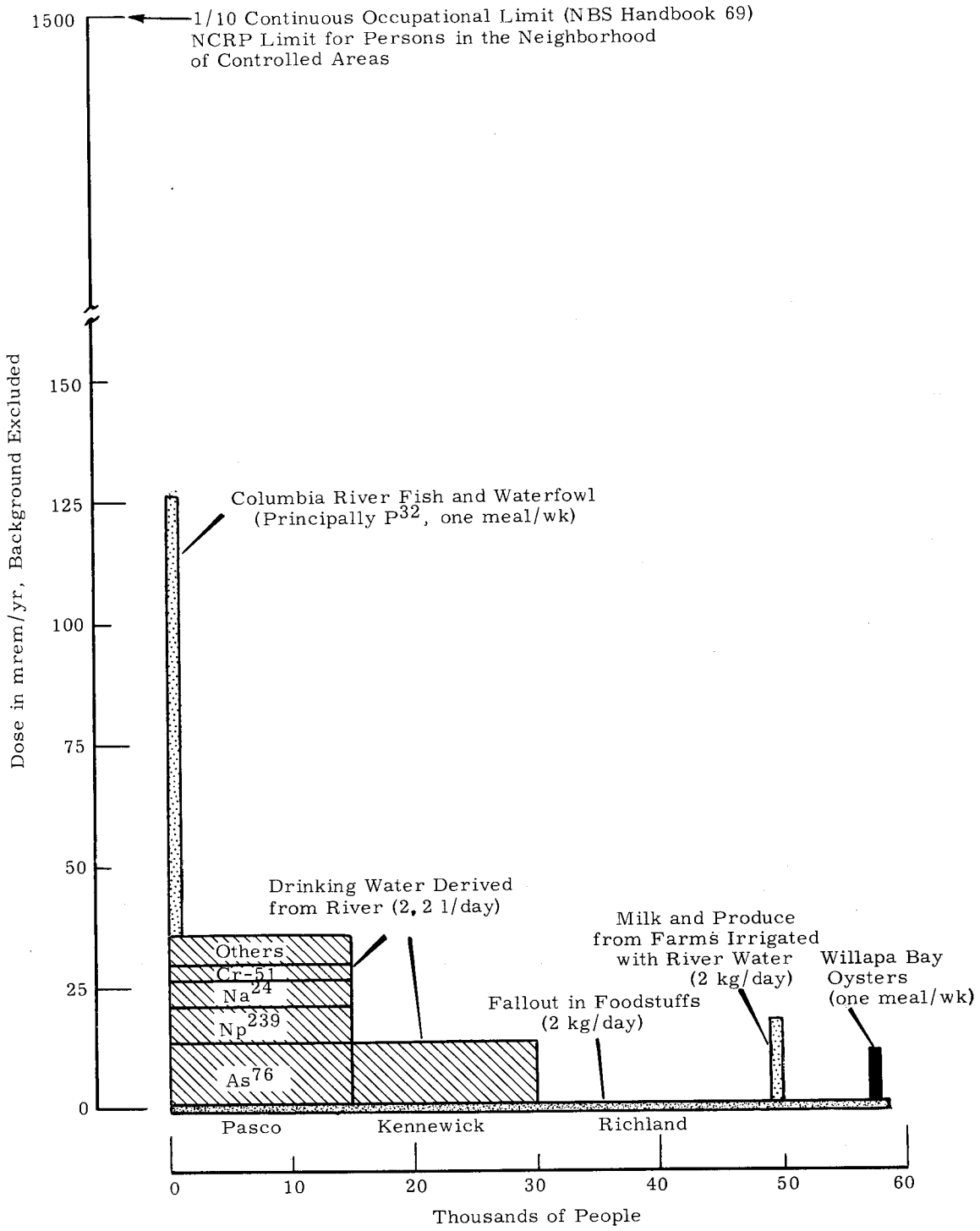

FIGURE 21

Calculated Dose to the GI Tract, 1962

AEC-GE RICHLAND, WASH.

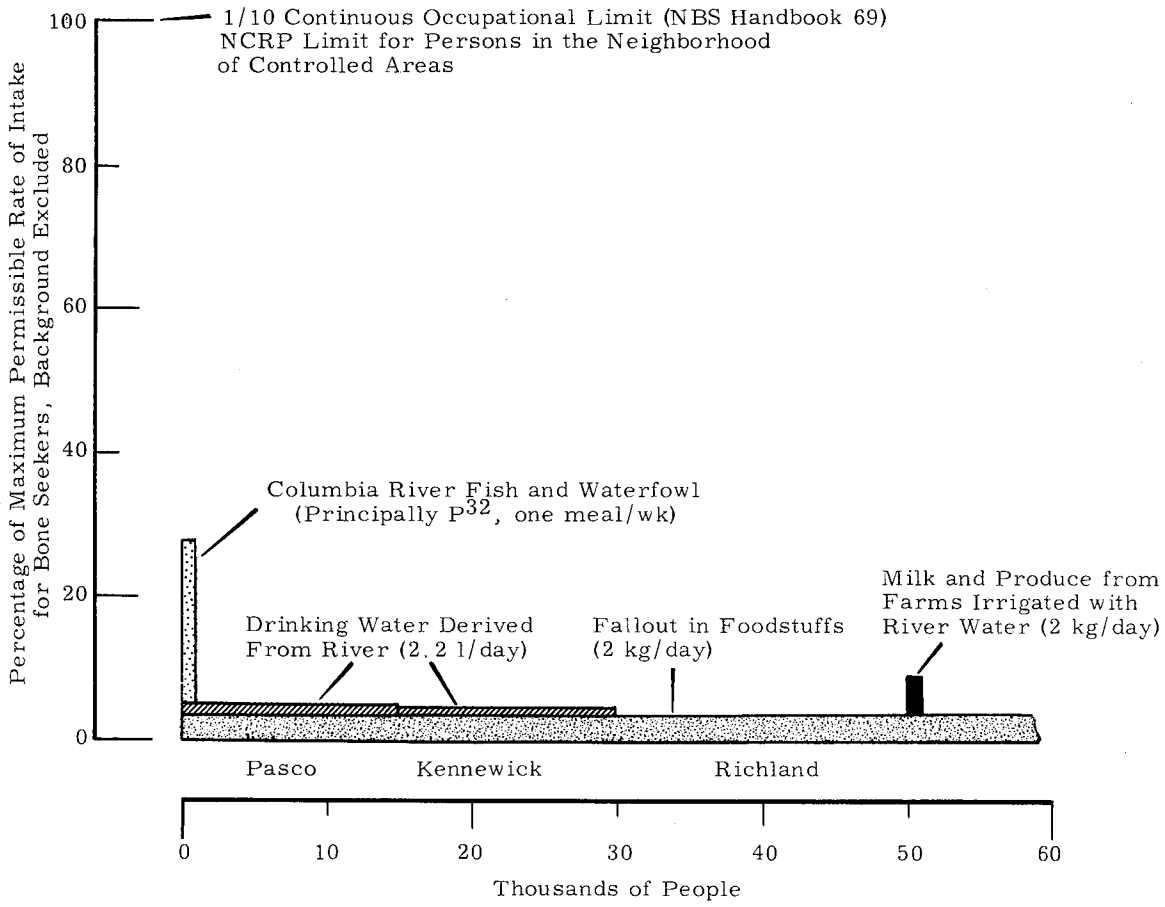

FIGURE 22

Calculated Dose to Bone, 1962

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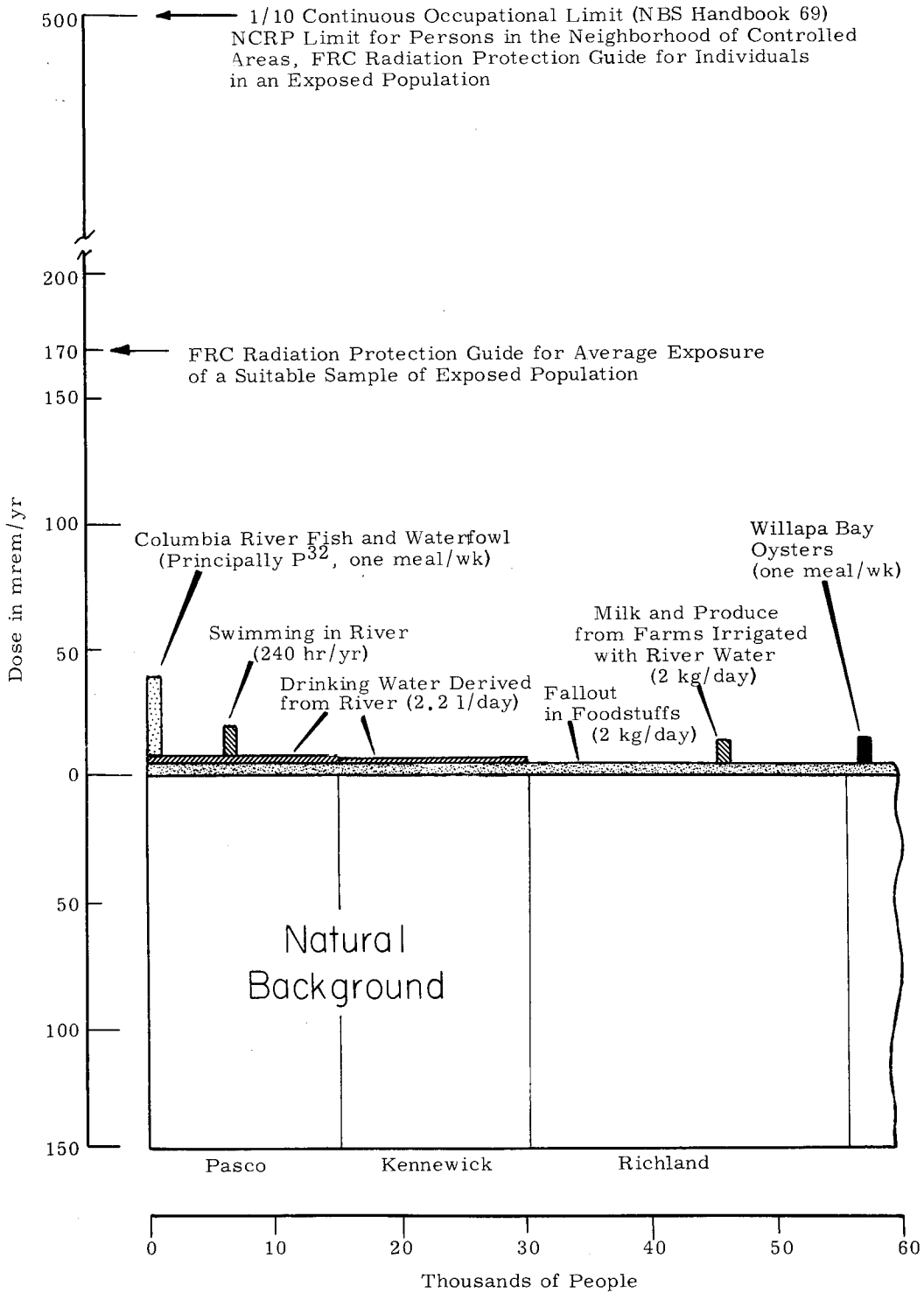

FIGURE 23

Calculated Dose to Total Body, 1962

AEC-GE RICHLAND, WASH.

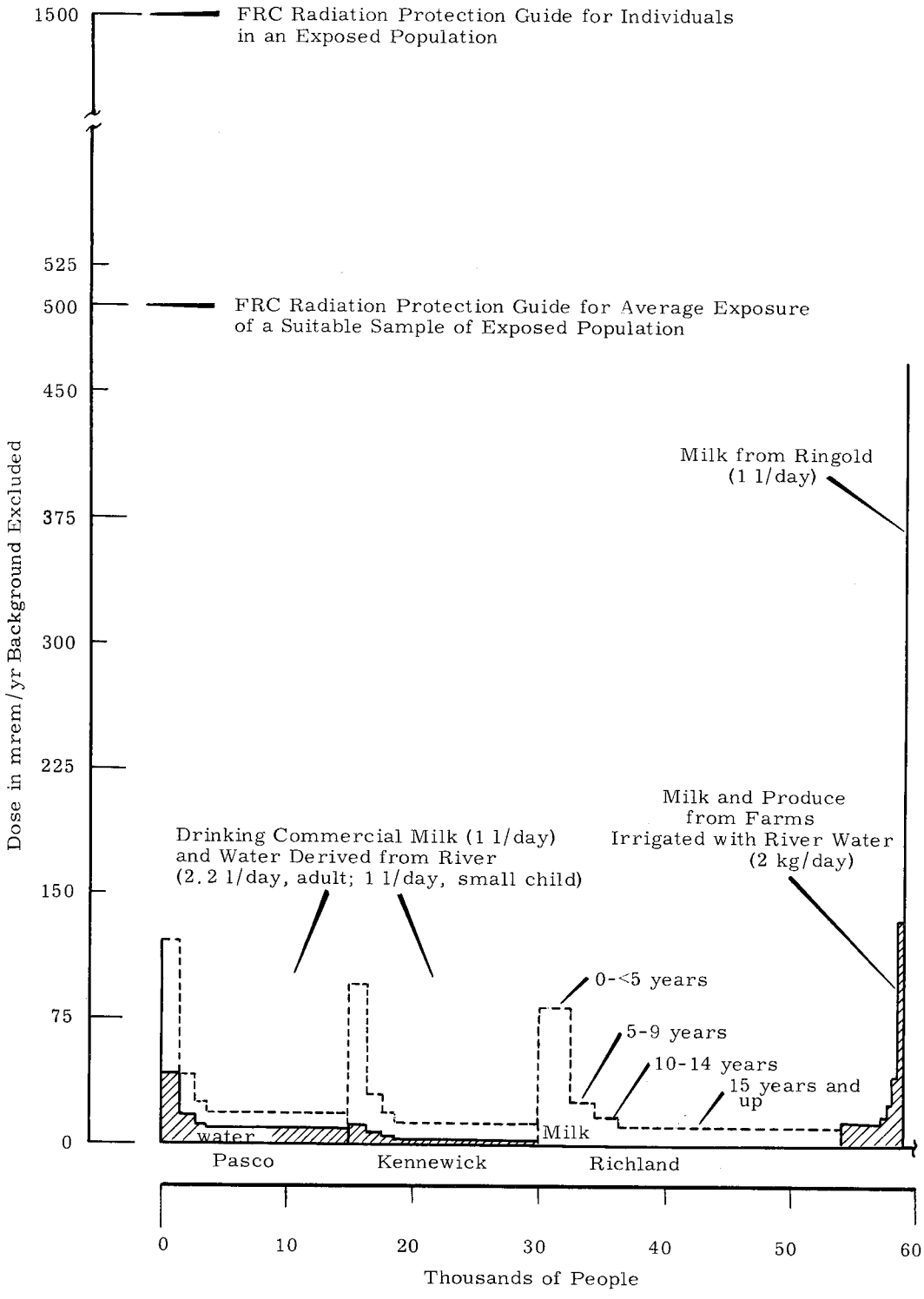

FIGURE 24

Calculated Dose to Thyroid, 1962

AEC-GE RICHLAND, WASH.

TABLE X

ESTIMATE OF THYROID SIZE AND DAILY WATER INTAKE FOR VARIOUS AGE GROUPS

Age Group, yr	Assumed Thyroid Size, g	Assumed Daily Water Intake, liter	Population Distribution, %
0-<5	2	1	10.7
5-9	7	1.5	8.8
10-14	12	1.5	7.4
15-19	17	2.0	7.0
Adults	20	2.2	66.1

(Percentage of population in each age group determined from census statistics).

Estimates of doses from other sources assumes the daily diet for a representative number of people includes 1 liter of milk and 1 kg of farm produce, the two major sources of I^{131}. Other radionuclides in farm products are of much less importance in terms of radiation exposure than are those found in fish and drinking water. In calculating the thyroid dose from these sources it was assumed that 5000 people consumed locally produced milk and foodstuffs a major portion of the year while the remainder of the local population obtained milk and produce from commercial outlets. Distribution of dose versus numbers of people was estimated using the data in Table X for age, thyroid size, and percent of population.

A creel survey was initiated in 1961 in cooperation with the Washington State Game Department to determine the fishing pressure and disposition of fish caught by individual fishermen. The survey was continued into 1962 and a total of over 600 fishermen have been contacted to date for estimates of their annual catch and consumption. Estimates of exposure from this source were made assuming that freshly caught fish from the river were eaten as the main dish one meal per week through the year for an annual consumption of about 25 pounds.

Oysters are a common Pacific Coast seafood in which Zn^{65} and P^{32} is concentrated. Exposure from this source was estimated by assuming oysters are the main dish one meal per week for an annual consumption of about 25 pounds.

By summing radiation exposure from the various sources in a manner which would tend to yield the maximum probable total dose, the annual estimates are about 150 mrem to the GI tract, 67 mrem to the total body, 15 mrem to the thyroid (adult), and 32% of the NCRP MPRI for bone seeking radionuclides. For the majority of Pasco residents consumption of locally caught fish or recreational use of the river would not be a significant source of exposure. The annual exposure for this group of people would be about 50 mrem to the GI tract, 14 mrem to the total body, 80 mrem to the thyroid (infant), and 7% of the NCRP MPRI for bone. Residents of Richland and other communities who do not use the Columbia River or products derived therefrom, but do consume local milk and food products, very likely received an annual exposure of about 25 mrem to the GI tract, 12 mrem to the total body, 80 mrem to the thyroid (infant), and 7% of the MPRI for bone.

V. CONCLUSIONS

Evaluation of results obtained from the radiological surveillance program for the Hanford environs for 1962 showed no unusual conditions attributable to Hanford operations. The results indicate that (1) releases of radioactive wastes to the atmosphere and to the Columbia River were adequately controlled, (2) most of the exposure received by the vast majority of people in the Hanford environs was from natural sources or world-wide fallout rather than from Hanford operations, and (3) a significant reduction in GI tract exposure for people using the river for sanitary water supply was brought about by additional treatment of reactor cooling water. P^{32} continues to be a significant exposure source to a small segment of the population deriving a major portion of their food from the river and from river irrigated fields, but exposure from this nuclide was also reduced in 1962 as a result of the treatment of the cooling water.

VI. ACKNOWLEDGEMENTS

The cooperation of many General Electric Company personnel who collected samples, performed the many radioassays, prepared and provided data and reviewed this document is gratefully acknowledged.

The cooperation and contribution of information by the United States Geological Survey Records Center, Portland, Oregon, the Pasco, Washington City Water Department, and members of several state and federal agencies, listed below who operated air filter sample stations contributed substantially to the report.

Federal Aviation Agency
Walla Walla, Washington
Spokane, Washington
Boise, Idaho
Great Falls, Montana

Washington State Patrol
Yakima, Washington

Civil Aeronautics Administration
Seattle, Washington

U. S. Weather Bureau
Meacham, Oregon
Lewiston, Idaho

USAF 408th Fighter Group Air Defense
Klamath Falls, Oregon

Many samples were supplied during the year by the following individuals and agencies that provided valuable information about the radiological status in the environs.

Dr. P. M. Aldrich (beef thyroids)
Walla Walla, Washington

Dr. Leon Bodie (beef thyroids)
Moses Lake, Washington

Dr. W. H. Harris (beef thyroids)
Toppenish, Washington

Dr. D. R. Marble (beef thyroids)
Pasco, Washington

Dr. W. E. Welsh Wenatchee, Washington	(beef thyroids)
Mr. Stan Gillies South Bend, Washington	(oysters)
Mr. N. Atterberry Benton City, Washington	(milk)
Mr. H. G. Bleazard Eltopia, Washington	(milk)
Mr. F. Buckingham Pasco, Washington	(milk)
Mr. W. Harris Pasco, Washington	(milk)
Mr. D. Johnson Mesa, Washington	(milk)
Mr. M. Kinne Eltopia, Washington	(milk)
Twin City Creamery Kennewick, Washington	(milk)
U. S. Public Health Service Vancouver, Washington	(river water)

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VIII. APPENDIX A

RIVER AND RELATED SAMPLE RESULTS

APPENDIX A
TABLE 1

CONCENTRATIONS OF RADIONUCLIDES IN COLUMBIA RIVER WATER AT HANFORD - 1962

Units of 10^{-9} μc/cc of Water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	As^{76}	$Sr^{89}+Sr^{90}$	Sr^{90}	I^{131}	Np^{239}
1-16	1,200	11,000	430	12,000	17,000	630	1,800	9.8	< 0.56	11	2,700
1-30	680	6,300	270	9,200	9,800	400	1,100	10	< 1.1	13	2,300
2-13	710	5,300	240	5,400	7,100	310	990	5.3	< 0.56	7.8	1,400
2-27	1,100	6,400	270	5,000	7,000	390	1,200	5.6	< 0.39	8.9	1,600
3-13	2,300	8,100	380	6,700	8,900	590	2,300	24	0.64	34	3,200
3-27	2,900	8,300	600	12,000	11,000	1,800	2,400	12	< 0.56	12	3,900
4-10	2,500	8,800	290	14,000	13,000	470	2,200	7.6	0.50	8.7	2,600
4-13	2,800	1,100	400	21,000	18,000	550	4,800	4.8	0.39	12	3,600
4-24	3,600	10,000	310	6,900	18,000	570	2,700	9.1	0.36	10	2,800
5-8	3,100	4,900	230	3,900	13,000	330	1,200	11	0.51	9.8	1,500
5-22	2,800	8,000	250	5,600	72,000	440	1,800	6.4	< 0.33	< 12	1,900
6-5	1,200	3,400	120	3,500	8,100	430	920	3.6	< 0.43	< 6.7	990
6-19	1,700	3,700	100	3,400	7,700	180	990	5.5	< 0.45	11	980
7-3	830	3,300	86	2,200		160	1,100	6.5	< 0.46	6.6	690
7-17	840	3,400	99	3,400	8,800	200	1,000	4.8	< 0.45	< 8.9	1,200
7-31	1,400	6,600	160	5,800	12,000	250	1,600	6.0	0.67	8.4	1,700
8-14	950	610	210	6,300	10,000	280	1,400	13	< 0.72	21	1,900
8-28	500	2,800	110	3,500	3,900	150	620	5.5	0.64	5.4	890
9-11	980	8,500	290	9,700	14,000	250	1,200	8.3	< 0.95	13	2,600
9-25	1,200	8,500	290	9,600	11,000	410	1,200	8.9	1.1	7.9	2,600
10-9	810	5,500	240	7,700	6,800	350	730	11	0.79	6.5	2,100
10-23	800	8,200	310	9,700	14,000	270	1,700	23	1.0	7.2	2,500
11-6	850	9,400	340	9,300	11,000	350	840	42	1.3	28	2,800
12-4	660	4,600	230	5,600	7,400	270	1,200	16	1.2	9.0	1,600

No entry indicates no analysis made.

APPENDIX A
TABLE 2

CONCENTRATIONS OF RADIONUCLIDES IN COLUMBIA RIVER WATER AT PASCO, WASHINGTON - 1962

Units of 10^{-9} μc/cc of Water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	I^{131}	Np^{239}
1-2	94	170	200	6,000	290	240	270	11	0.61	11	800
1-8	220	1,800	250	8,000	1,600	360	610	7.0	0.44	9.3	1,600
1-22	270	2,300	210	4,800	2,400	250	560	5.0	1.8	6.4	1,200
2-5	290	1,600	220	4,800	1,700	180	430	12	< 0.39	11	900
2-19	180	690	140	2,700	820	230	220	3.4	< 0.25	< 3.3	640
3-5	600	1,400	330	6,100	1,400	430	530	6.3	< 0.33	6.6	1,300
3-19	500	1,500	590	6,200	1,700	440	550	20	0.50	9.4	1,900
4-2	570	1,700	220	6,100	1,600	510	770	7.8	< 0.59	6.3	1,700
4-16	570	2,400	210	4,000	1,500	450	870	5.3	< 0.39	5.0	1,400
4-30	710	1,600	120	1,800	2,100	200	520	4.0	< 0.37	< 3.9	740
5-14	570	1,900	190	2,700	2,800	240	630	6.1	< 0.42	4.5	810
5-28	430	1,300	92	1,900	2,200	220	360	5.4	< 0.54	< 3.6	640
6-11	350	1,100	72	1,800	1,700	270	440	2.7	< 0.39	< 1.4	400
6-25	230	1,100	57	1,800	1,400	110	230	4.9	< 0.41	< 1.5	340
7-9	300	1,300	57	1,600	2,000	120	450	2.9	< 0.60	< 3.0	380
7-30	230	1,300	50	2,400	1,800	120	430	5.7	0.54	5.7	710
8-6	290	1,700	84	2,500	2,200	130	330	3.6	0.45	< 6.4	640
8-20	410	2,100	110	4,600	2,700	110	570	5.8	< 0.57	5.6	1,100
9-10	210	1,600	130	4,700	1,500	120	420	7.1	< 0.8	4.8	780
9-17	300	2,200	190	7,600	-	170	660	7.1	0.8	7.4	1,600
10-1	200	1,700	190	6,300	1,800	140	490	6.8	< 0.82	8.8	1,100
10-15	180	1,200	160	4,200	1,200	190	350	12	1.2	5.5	990
10-29	190	1,200	130	3,800	1,300	150	280	10	< 0.93	15	880
11-12	190	1,400	170	4,900	2,000	180	180	12	1.6	4.8	860
11-26	290	2,300	240	5,400	2,400	180	420	7.6	0.9	7.3	1,200
12-10	210	1,100	150	3,500	1,100	120	520	6.7	0.88	< 5.9	670
12-18	310	2,300	190	5,500	2,300	190	520	9.2	1.0	7.1	1,200

No entry indicates no analysis made.

APPENDIX A
TABLE 3

CONCENTRATIONS OF RADIONUCLIDES IN COLUMBIA RIVER WATER AT VANCOUVER, WASHINGTON - 1962

Units of 10^{-9} μc/cc of Water

Date	RE+Y	P^{32}	Cr^{51}	Zn^{65}	Np^{239}
1-11	9.8	66	2,900	70	ND
1-24	16	86	2,200	100	< 50
2-7	21	58	1,100	94	< 32
2-19	13	69	1,700	71	52
3-8	-	52	2,000	100	21
3-21	18	110	2,300	89	< 40
4-30	21	46	2,000	140	130
6-12	11	17	1,100	110	70
7-9	< 5.4	9.8	980	77	ND
7-23	11	8.4	1,500	69	77
8-6	4.3	13	1,800	73	97
8-20	< 5.3	16	1,800	34	150
9-3	< 5.4	14	1,800	< 18	66
9-17	< 8.3	12	2,400	< 19	81
10-1	< 8.6	18	3,100	< 15	180
11-12	17	32	1,400	39	ND
11-26	13	30	1,500	< 18	ND
12-10	9.7	32	1,300	42	34
12-24	9.7	30	1,600	34	ND

No entry indicates no analysis made.
ND - Not detected.

APPENDIX A
TABLE 4

CONCENTRATIONS OF RADIONUCLIDES IN SANITARY WATER
AT PASCO, WASHINGTON - 1962

Units of 10^{-9} μc/cc of Water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	I^{131}	Np^{239}
1-8	14	170	41	3,000	40	98	< 150	8.9	0.49	4.7	100
1-15	49	230	89	7,000	12	200	< 140	9.9	< 0.54	9.3	650
1-22	25	210	62	4,600	85	150	150	4.7	0.34	< 4.6	380
1-29	11	400	40	3,300	120	180	210	5.5	0.63	17	630
2-5	38	200	57	3,800	81	100	< 140	16	< 0.59	15	290
2-19	11	170	25	3,400	53	160	< 79	4.8	< 0.43	< 3.8	390
2-26	330	1,300	210	3,600	1,400	270	420	3.8	< 0.37	< 2.9	940
3-5	86	380	110	4,500	150	200	200	4.5	< 0.29	< 3.0	730
3-12	91	510	100	5,400	190	230	150	4.0	< 0.34	5.6	1,000
3-19	97	450	100	5,900	180	210	160	14	0.57	15	1,100
3-28	94	1,000	69	6,400	380	180	360	13	0.44	9.7	1,300
4-2	95	600	85	6,100	250	250	240	11	< 0.63	7.5	1,100
4-9	59	380	50	1,900	140	160	180	4.2	0.35	< 3.8	510
4-16	83	1,200	55	4,200	360	240	370	5.3	< 0.50	< 5.4	1,100
4-23	110	1,400	52	2,700	830	170	380	7.1	< 0.30	5.9	810
4-30	34	950	13	1,800	310	140	< 240	4.8	< 0.36	< 3.3	350
5-7	12	97	11	890	< 50	49	< 150	5.2	< 0.32	4.2	150
5-14	68	880	44	2,700	300	100	< 140	8.2	< 0.48	9.7	530
5-21	86	470	34	1,700	410	120	< 130	7.4	< 0.48	< 5.2	380
5-28	86	830	25	1,900	590	190	190	9.0	< 0.45	5.8	460
6-4	54	640	24	1,500	420	72	< 140	2.7	< 0.33	< 2.2	290
6-11	76	860	22	1,400	660	48	< 150	2.9	< 0.36	< 1.2	270
6-18	54	800	17	1,900	600	43	< 130	14	< 0.47	12	340
6-25	34	740	11	1,500	430	31	190	5.4	< 0.35	< 1.3	270
7-2	130	760	31	1,500	560	46	200	4.6	< 0.45	< 2.2	350
7-9	60	750	20	840	500	32	280	3.3	< 0.33	< 3.8	190
7-17	65	800	20	1,700	710	43	230	3.2	< 0.42	< 3.6	390
7-23	38	880	15	1,900	570	31	170	5.5	< 0.48	5.6	400
7-30	67	910	21	2,100	620	37	220	4.4	< 0.41	4.5	550

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APPENDIX A
TABLE 4 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN SANITARY WATER
AT PASCO, WASHINGTON - 1962

Units of 10^{-9} μc/cc of Water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	I^{131}	Np^{239}
8-6	42	800	25	1,800	600	41	< 140	5.6	< 0.55	< 13	390
8-13	110	1,200	48	2,800	630	38	240	4.1	< 0.76	< 6.2	610
8-20	67	950	34	3,100	550	28	< 140	5.0	< 0.48	3.8	690
8-27	56	500	40	2,600	280	38	< 130	6.1	0.56	< 4.7	480
9-10	61	1,100	61	4,700	470	42	220	8.6	0.77	6.5	910
9-17	100	1,200	75	7,100	650	24	220	7.6	0.85	< 4.9	1,100
9-24	53	950	90	7,300	450	32	180	6.5	0.88	5.9	1,100
10-1	21	400	27	4,400	96	32	< 140	8.4	< 0.83	8.7	660
10-8	56	1,100	53	6,400	430	50	230	11	0.83	8.0	1,100
10-15	33	240	37	5,200		46	< 160	11	0.79	5.3	610
10-22	30	420	14	4,100	200	44	< 180	7.9	0.84	< 2.9	560
10-28	17	250	20	4,000	94	59	< 64	9.4	< 1.0	6.2	460
11-5	14	89	92	3,600	34	41	< 67	10	< 0.81	5.9	340
11-13	15	260	16	4,800	130	63	< 63	11	< 1.1	5.2	420
11-19	23	170	33	2,800	66	51	< 49	9.5	< 1.3	< 6.0	260
11-26	25	240	13	3,900	95	72	< 49	7.6	< 0.34	< 3.7	410
12-3	41	240	18	3,200	15	38	< 76	5.5	0.64	< 3.6	330
12-10	15	160	13	3,700	46	52	< 100	6.7	0.87	< 5.3	390
12-17	6.1	160	< 6.3	3,100	33	41	< 82	6.5	0.79	< 3.9	210
12-26	10	270	13	2,700	110	39	< 63	6.8	0.95	< 3.4	180
12-31	24	140	21	3,800	44	74	< 68	5.7	0.83	4.3	420

No entry indicates no analysis made.

APPENDIX A
TABLE 5

CONCENTRATIONS OF RADIONUCLIDES IN SANITARY WATER
AT KENNEWICK, WASHINGTON - 1962

Units of 10^{-9} μc/cc of Water

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	I^{131}	Np^{239}
1-29	3.3	34	< 5.5	1,900	20	< 11	< 150	< 0.55	< 0.24	< 3.0	
2-26	5.7	17	< 6.2	1,600	18	< 11	< 150	< 0.56	< 0.23	< 2.9	< 30
3-26	5.8	37	7.4	3,000	22	< 11	< 77	< 0.75	< 0.37	< 2.6	< 40
4-23	24	210	12	2,300	160	< 19	60	< 1.2	< 0.22	< 1.1	97
5-21	< 5.5	26	< 2.6	980	58	< 19	< 150	< 0.50	< 0.11	< 0.93	< 40
6-18	8.8	100	< 7.1	1,000	84	< 19	< 78	1.5	< 0.31	< 3.6	33
8-27	< 5.3	66	< 5.6	2,200	99	< 24	< 140	< 0.67	< 0.24	2.3	140
9-24	6.1	110	9.4	3,200	57	< 19	< 77	0.93	< 0.27	< 1.4	140
10-22	< 6.0	40	< 7.5	2,100	< 47	< 18	< 190	< 0.81	< 0.69	< 2.2	ND
11-19	<11	64	<18	1,800	25	< 24	< 50	< 1.5		< 5.4	42
12-31	12	68	< 6.6	1,900	39	< 20	< 66	< 1.1	< 0.33	< 3.5	53

No entry indicates no analysis made.
ND - Not detected.

APPENDIX A
TABLE 6

ESTIMATED RATE OF TRANSPORT OF RADIONUCLIDES
IN COLUMBIA RIVER WATER AT PASCO, WASHINGTON - 1962
Units of curies/day

Date	RE+Y	Na^{24}	P^{32}	Cr^{51}	Cu^{64}	Zn^{65}	As^{76}	Sr^{89} +Sr^{90}	Sr^{90}	I^{131}	Np^{239}
1-2	13	24	28	850	41	34	38	1.6	0.09	1.6	110
1-8	32	260	36	1,100	230	52	88	1.0	0.06	1.3	230
1-22	54	460	42	960	480	50	110	1.0	0.36	1.3	240
2-5	69	380	52	1,100	400	43	100	2.8	< 0.09	2.6	210
2-19	33	130	25	490	150	42	40	0.62	< 0.05	< 0.60	120
3-5	100	240	56	1,000	240	74	90	1.1	< 0.06	1.1	220
3-19	73	220	86	900	250	64	80	2.9	0.07	1.4	280
4-2	74	220	29	800	210	67	100	1.0	< 0.08	0.82	220
4-16	160	670	58	1,100	420	130	240	1.5	< 0.11	1.4	390
4-30	300	670	51	760	880	84	220	1.7	< 0.16	< 1.6	310
5-14	230	780	78	1,100	1,100	98	260	2.5	< 0.17	1.8	330
5-28	280	850	60	1,200	1,400	140	230	3.5	< 0.35	< 2.3	420
6-11	260	810	53	1,300	1,300	200	330	2.0	< 0.29	< 1.0	300
6-25	140	680	35	1,100	860	68	140	3.0	< 0.25	< 1.0	210
7-9	170	720	32	890	1,100	67	250	1.6	< 0.33	< 1.7	210
7-30	92	520	20	960	720	48	170	2.3	0.22	2.3	280
8-6	115	670	33	990	870	52	130	1.4	0.18	< 2.5	250
8-20	110	550	29	1,200	700	29	150	1.5	< 0.15	1.4	290
9-10	38	290	23	840	270	22	75	1.3	< 0.14	0.86	140
9-17	52	380	33	1,300		29	110	1.2	0.14	1.3	280
10-1	32	270	30	1,000	280	22	78	1.1	< 0.13	1.4	170
10-15	29	190	25	670	190	30	56	1.9	0.19	0.88	160
10-29	37	230	25	740	250	29	54	1.9	< 0.18	2.9	170
11-12	31	230	28	810	230	30	30	2.0	0.26	0.79	140
11-26	68	540	56	1,300	560	42	99	1.8	0.21	1.7	280
12-10	47	240	33	780	240	27	120	1.5	0.20	< 1.3	150
12-18	68	500	42	1,200	500	42	110	2.0	0.22	1.6	260

No entry indicates no analysis made.

APPENDIX A
TABLE 7

ESTIMATED RATE OF TRANSPORT OF RADIONUCLIDES IN COLUMBIA RIVER WATER AT VANCOUVER , WASHINGTON - 1962

Units of curies/day

Date	P^{32}	Cr^{51}	Zn^{65}	Np^{239}
1-11	22	970	23	N.D.
1-24	24	610	28	< 14
2-7	19	350	30	< 10
2-19	22	530	22	16
3-8	12	480	24	5.0
3-21	28	590	23	< 10
4-30	32	1400	96	90
6-12	17	1100	110	69
7-9	6.6	660	52	-
7-23	4.2	750	34	38
8-6	6.5	900	36	48
8-20	5.2	580	11	48
9-3	2.7	350	< 3.5	13
9-17	2.6	530	< 4.2	18
10-1	4.0	700	3.4	41
11-12	8.1	350	9.8	-
11-26	10	520	< 6.2	-
12-10	11	430	14	11
12-24	11	590	13	-

No entry indicates no analysis made.
ND - Not detected.

APPENDIX A
TABLE 8

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Priest Rapids							
1-11		-	-	-	-	-	-
1-11		-	-	-	-	-	-
1-11		-	-	-	-	-	-
1-12		-	1	2	40	-	-
1-12		-	-	-	5	-	-
1-23		32	1	4	70	-	-
1-24		3	-	2	-	-	-
1-24		3	-	5	-	-	-
2-19		2	-	2	-	-	-
2-19		300	2	1	100	1	-
2-19		-	-	2	20	-	-
2-19		2	-	2	-	-	-
2-20		4	2	5	20	-	-
2-20		3	1	6	20	-	-
2-20		200	1	3	100	-	-
2-20		-	-	4	10	-	-
3-6		5	1	3	70	1	-
3-6		3	-	2	-	-	-
3-7		3	-	1	-	-	-
3-7		3	-	1	7	-	-
3-7		6	-	-	-	-	-
3-8		2	-	2	-	-	-
3-8		2	-	2	6	-	-
3-8		3	-	2	-	-	-
3-8		3	-	1	-	-	-
3-8		3	-	2	-	-	-
4-4		11	-	11	-	1	
4-4		29	19	-	-	-	
4-4		24	7	6	-	1	
4-4		25	-	15	50	2	
4-4		14	3	-	-	-	
4-4		8	7	1	-	-	
4-4			2	2	-	-	
4-4		8	2	7	-	-	
5-3			-	3	10	-	-
5-3			1	4	50	1	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF WHITEFISH
TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Priest Rapids (Continued)							
5-4			1	4	90	1	-
5-4			-	4	10	-	-
5-4			-	7	-	-	-
5-4		280	2	3	80	1	
5-4		20	1	3	80	-	
8-21		6	3	9	20	2	-
9-26		100	2	2	70	3	1
9-26		7	-	5	-	-	-
9-26		4	-	5	-	-	-
9-26		4	1	3	8	-	-
11-1		8	-	3	-	-	-
11-1		17	-	4	-	-	-
11-1		20	-	6	-	-	-
11-1		120	1	3	30	1	1
11-12		51	2	2	50	-	-
12-10		220	2	-	50	3	-
12-11		6	-	-	-	-	-
12-11		51	2	1	50	2	-
12-11		140	2	-	70	3	1
12-11		5	-	2	-	-	-
Hanford							
1-4	180		8	14	70	11	1
1-4	460		9	9	120	15	1
1-4	340		4	8	60	7	-
1-5	340		6	11	80	9	1
1-5	510		10	8	90	16	-
1-5	150		4	2	40	4	-
1-5	180		3	8	50	6	-
1-5	190		4	7	70	4	-
1-5	310		3	6	50	7	-
1-5	260		2	7	20	3	-
1-5	430		4	9	80	4	-
1-5	92		4	8	50	4	1

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Hanford (Continued)							
1-5	420		2	8	30	-	-
1-5	1200		1	6	90	2	-
2-1	170		14	24	60	9	1
2-1	140		20	30	40	9	1
2-1	170		10	20	60	6	-
2-1	130		20	30	60	7	-
2-1	130		20	30	60	7	-
2-5	97	89	4	1	40	5	-
2-5	200	180	5	6	60	5	-
2-6	90	87	4	5	50	5	-
2-6	120	120	3	4	20	10	-
2-6	120	100	6	6	70	5	-
2-6	65	35	8	10	120	3	-
2-23		130		90	80		
2-23	82	67	10	40	30	7	-
2-23	91	81	6	7	50	7	-
2-23	110	96	7	9	60	6	-
2-23	110	100	9	9	100	10	-
3-1	75	56	4	4	60	6	-
3-1	190	150	4	2	80	3	-
3-1	430	290	6	4	70	4	1
3-1	130	130	5	4	60	8	1
3-1	530	440	6	7	90	3	-
3-2	13	7	3	4	50	4	-
3-2	100	82	3	3	40	4	-
3-2	81	70	1	3	40	2	-
3-2	150	140	3	5	50	4	-
3-2	210	180	3	5	70	1	-
3-5	85	72	10	6	50	5	-
3-5	57	50	6	3	50	4	-
3-5		70					
3-19	69	50		40			
3-19	280	260	4	4	60	2	-
3-19	210	170	2	5	50	2	-
3-19	170	100	5	18	90	3	2

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Hanford (Continued)							
4-13	180	84	5	5	40	4	1
4-13	150	94	9	6	50	9	-
4-13	170	84	7	5	60	5	-
4-13	580	340	10	-	70	9	1
4-13	140	82	2	5	50	3	-
4-13	480	340	3	4	50	-	1
4-13	230	100	5	5	50	4	-
4-13	240	130	2	4	9	1	1
4-13	250	160	5	3	50	3	1
4-13	260	190	3	11	80	62	-
4-13	500	310	-	17	100	5	
4-13	180	110	3	23	70	5	
5-9		60	3	2		4	
5-9	110	43	6	3	40	5	-
5-9	370	310	1	1	90	1	-
5-10	62	41	-	3	9	-	-
5-10	50	42	5	4	40	3	-
5-10	140	27	3	5	60	2	-
7-2		22	3	130	20	3	1
7-2	31	17	6	40	30	3	-
7-2	43	31	4	50	30	3	-
7-2	53	42	2	40	7	1	-
7-2	110	95	6	70	30	2	-
7-2	77	46	5	80	30	2	-
7-3	88	67	8	60	50	3	1
8-15	530	560	1	10	20	1	-
8-15	250	220	3	20	40	1	-
8-15	330	390	4	9	40	3	-
8-15	350	300	4	20	60	3	-
8-15	140	130	3	20	30	2	-
9-18	570	620	3	4	40	4	-
9-18	700	270	3	5	30	3	-
9-18	530	280	1	-	20	1	-
9-19	240	250	3	3	30	4	1
9-19	570	550	3	3	30	3	-
9-19	610	620	2	3	30	2	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Hanford (Continued)							
9-25		1100	3	-	60	4	-
10-29	410	330	3	-	60	2	-
10-29	520	420	3	1	60	4	1
10-29	480	360	2	-	30	2	1
10-29	170	110	3	-	40	2	1
10-29	570	490	2	-	40	2	-
10-29	180	170	2	-	40	2	-
11-5	61	33	3	-	30	4	1
11-20	260	230	4	-	40	2	-
12-6	190		2	8	40	2	1
12-6	220		2	8	50	5	1
12-6	230		1	-	30	3	-
12-26	44	20	1	-	30	2	-
Ringold							
1-8	250		8	20	70	7	1
1-8	510		10	30	70	6	1
1-9	130		5	20	40	3	-
1-9	220		10	40	60	8	-
1-9	700		10	30	80	4	-
1-9	670		13	50	120	4	1
1-9	850		14	60	140	7	1
2-13	880	840	2	4	100	1	-
2-13	590		2	5	100	1	-
2-14	550	520	6	5	90	6	-
2-14	390	340	6	7	100	7	-
2-14	700	650	2	4	70	2	-
2-14	94		9	5	80	9	1
2-14	430	350	5	3	70	4	-
2-14	290	210	4	4	80	4	-
2-15	77		4	3	70	4	-
2-15	440	330	7	2	90	6	-
3-1		98	13	64	70		
3-12	100	15	8	2	100	9	-

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Ringold (Continued)							
3-12	650		2	2	100	2	-
3-13		220		58	60		
3-13	320	140	-	2	40	-	-
3-14	480	450	3	2	80	2	-
3-14	400	350	3	5	60	-	-
3-14	450	250	3	2	100	2	-
3-14	440	210	4	5	120	1	-
3-14	360	340	4	3	100	2	-
3-14	41	18	8	4	80	7	-
3-14	500		2	4	50	1	-
3-14	440	310	9	3	80	6	-
3-14	500	520	3	6	60	2	-
3-14	240	100	6	7	70	4	-
3-14	610	380	6	7	100	3	-
3-14	220		6	4	80	5	1
3-14	390		2	5	40	-	-
3-29	510	450	6	10	110	5	1
3-29	790	610	6	9	120	7	-
3-29	710	330	7	10	160	7	-
3-29	570	460	5	7	80	4	1
3-29	900	780	3	9	120	2	-
3-29	900	770	4	8	130	4	1
3-29	420	350	3	2	90	4	-
3-29	510	410	2	5	90	2	-
3-29	780	640	6	-	130	2	-
5-24		14	7	10	-	2	
6-4	130	100	7	80	70	7	
6-5	130	91	10	100	60	2	-
6-5	290	210	5	60	90	6	1
6-5	250	150	5	60	100	9	
6-5	29	8	3	30	5	2	1
6-20		46	-	110	20	1	-
6-28		130	1	150	-	1	-
7-6	60	47	1	60	10	1	1
7-6	280	260	3	80	40	3	1

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF WHITEFISH
TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Ringold (Continued)							
7-6	180	150	3	70	40	2	-
7-6	400	360	2	70	30	2	1
7-6	2000	1900	3	50	60	2	-
7-11		79	1	20	10	2	
7-19		280		160	20		-
7-30	26	16	1	10	10	2	-
7-31	97	84	1	8	10	-	-
7-31	870	870	3	10	50	4	-
8-13	560	610	6	30	30	3	-
8-13	880	830	5	30	50	4	-
8-13	1400	1600	-	20	40	1	-
8-13	240	220	3	30	30	2	-
8-13	520	510	3	20	40	3	1
8-27	320	270	2	50	50	2	-
9-4	210	78	3	30	60	4	1
9-10	590	210	4	20	30	4	-
9-12	450	470	3	50	30	2	2
9-14	690	570	3	20	40	4	-
9-14	1300	1000	4	8	40	3	1
9-14	790	860	3	6	30	3	1
9-14	690	730	1	3	40	20	-
9-14	360	240	1	10	30	1	-
9-14	640	670	2	9	50	3	-
9-18	790	740	5	2	50	3	-
10-4	580	470	4	10	50	3	-
10-11	1300	570	4	1	60	3	-
10-17	88	63	3	-	20	3	-
10-22	540	470	4	7	60	4	1
10-22	450	380	2	-	70	2	1
10-22	1100	790	2	-	70	3	1
10-22	700	680	3	-	60	3	1
10-22	540	580	3	-	70	3	1
10-22	860	730	2	-	80	2	-
11-13	270	260	4	-	60	4	1
11-30	150	100	4	-	30	3	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Ringold (Continued)							
12-13	320	240	1	6	30	2	-
12-17	180	140	4	20	40	4	-
12-17	150	160	3	10	40	3	-
12-17	290		2	10	60	4	-
12-17	320	300	2	8	70	4	-
12-17	120	120	2	10	40	2	1
12-18	180	200	2	20	50	4	-
12-31	190	150	10	3	50	10	1
Richland							
1-15	320	260	1	4	90	4	-
1-15	400		5	5	100	7	-
1-16	300	180	6	5	70	10	1
1-16	250		6	4	70	7	-
1-16	370		10	3	100	13	-
2-1	110		4	10	40	5	-
2-26	200	170	9	3	80	10	-
2-26	66		5	2	50	7	-
2-26	690	640	2	1	90	4	-
2-27	140	120	3	3	50	3	-
2-27	340	310	3	1	90	2	-
2-27	740	630	4	2	200	4	-
2-28	56	45	6	3	60	7	-
4-20	120	71	8	-	50	7	-
4-20	230	170	12	-	40	-	-
4-20	810	530	10	-	70	-	-
4-20	340	220	22	-	130	3	-
4-20	980	770	7	2	130	4	-
4-20	770	650	4	-	60	2	-
5-15	110	98	6	70	70	20	-
5-15	100	92	4	500	40	3	3
6-20	43	26	6	20	30	4	1
6-20	13	3	-	30	-	-	-
6-21	21	9	-	30	-	-	-

* Results less than the reporting limit are indicated by a (-)
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Richland (Continued)							
6-21	230	190	2	110	40	2	1
6-22	59	43	3	110	20	1	-
7-19	110	90	2	12	20	3	-
7-19	42	34	1	5	8	1	-
7-19	74	58	2	7	12	3	-
7-19	2000	1400	-	6	40	1	1
8-9	160	160	2	20	30	2	-
8-9	39	39	1	20	9	2	-
8-9	40	35	6	7	30	4	-
8-9	14	10	2	10	10	1	-
8-9	510	580	5	10	40	2	-
8-10	260	250	3	20	80	3	-
8-10	68	66	2	20	10	2	-
8-10	180	170	1	20	10	2	-
8-10	110	97	2	10	10	2	-
8-10	190	200	2	20	30	1	-
9-6	380	270	1	5	40	2	-
9-6	930	850	3	5	40	3	-
9-6	790	790	4	5	30	4	-
10-15	420	440	3	2	40	3	1
10-15	230	170	1	2	30	1	-
10-16	1400	1300	1	-	60	4	1
12-3	430	360	3	-	60	5	-
12-3	560	480	2	6	60	6	-
12-3	240	240	2	8	70	2	1
12-3	300	280	1	4	60	4	-
Burbank							
2-9	20	6	1	-	60	-	-
3-22	14	5	3	3	50	2	-
10-9	120	95	1	4	20	1	-
12-29	40	29	1	4	40	1	1

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF WHITEFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
McNary							
3-26	85	57	1	-	40	1	
10-3		340	-	5	30	-	-
10-3		460	-	2	20	-	-
11-9		200	-	2	30	-	-
11-9		210	-	2	30	-	-
11-9		460	1	1	50	-	-
11-9		270	1	4	50	-	-
Coyote Rapids							
12-27		-					
12-27		4	2	-	-	-	-

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF BASS
TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Priest Rapids							
7-23		-	-	5	-	-	-
Hanford							
5-10	37	41	-	4	30	-	-
7-3	67	56	-	10	20	-	1
7-3			-	30	20	-	1
Ringold							
4-26	58	12	16	-	30	-	-
4-26	58	9	13	-	20	-	
4-26	48	21	12	-	20	-	-
4-26	60	7	5	-	20	-	-
4-26	59	6	4	-	20	-	1
4-26	62	7	5	-	10	-	-
4-26	16	10	3	-	20	-	1
5-1	35	5	5	-	10	-	-
5-1	47	6	2	6	-	-	1
5-1	37	5	3	2	-	-	-
5-1	53	9	7	-	30	-	-
5-1	50	8	10	-	30	-	-
6-5	25	9	2	30	20	2	-
6-5	28	10	2	20	30	-	-
6-5	24	11	3	30	30	2	
6-5	47	28	3	30	30	-	-
6-5	29	15	2	20	20	1	-
7-5	21	15	-	20	10	-	1
7-5	20	11	-	20	20	-	1
7-5	160	150	-	30	20	-	1
7-5	65	53	-	40	30	-	1
7-30	280	270	1	20	40	-	-
7-30	480	360	1	15	40	-	-
7-30	55	43	-	10	40	-	1

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF BASS TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Ringold (Continued)							
8-13	300	330	-	10	30	-	-
8-13	1000	840	-	20	40	-	-
8-13	290	280	-	30	30	-	-
9-14	2100	1600	1	4	60	1	1
Richland							
1-17	29		-	2	40	-	-
8-10	290	190	-	10	20	-	-
9-7	430	400	-	4	30	-	1
9-7	690		-	3	30	-	-
9-7	520	320	-	4	30	-	-
Burbank							
8-1	21	20	-	8	10	-	-
8-29	150	58	-	20	30	-	-
McNary							
5-16		6	4	40	8	3	
8-31		170	-	3	10	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF CARP
TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Priest Rapids							
5-3		16	-	2	70	-	-
5-3		20	-	3	90	-	-
5-3		13	-	-	-	-	-
7-23		3	-	5	-	-	-
7-24		3	-	6	-	-	-
9-27		300	-	4	70	-	1
Hanford							
4-13	190	10	1	8	300	-	-
4-13	150	25	-	7	200	-	-
4-13	80	15	4	40	90	3	-
4-13	87	19	10	-	100	-	-
5-9	110	12	-	6	200	-	-
5-9	140	41	-	5	160	-	-
5-10	53	11	-	1	90	-	-
6-13	97	63	-	6	80	-	-
8-16	110	130	-	30	20	-	-
Ringold							
6-5	160	120	5	60	80	4	4
7-6		170	-	60	140	-	-
7-6		140	-	40	60	-	-
7-6	170	130	-	50	60	-	-
7-6	170	150	-	30	20	-	-
7-6	99	86	-	40	50	-	-
8-13	56	45	-	10	50	-	-
8-14	180	140	-	10	20	-	-
8-14	59	55	-	10	50	-	-
8-14	480	310	-	20	130	-	-
10-25	670	640	-	1	110	1	1
10-26	800	670	-	-	180	1	2

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF CARP
TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Richland							
2-27	53	14	-	-	100	-	-
2-28	45	16	-	-	100	-	-
4-19	140	47	-	2	200	-	-
4-20	120	90	10	-	40	-	
5-15	64	43	1	10	20	8	
9-7	34	27	-	4	30	-	-
9-12	55	47	-	9	40	-	-
9-12	310	270	-	20	100	-	-
10-16	440	220	-	1	110	1	1
10-16	56	37	-	1	15	-	-
Burbank							
2-8	35	5	-	1	200	-	-
2-9	30	6	-	1	200	-	-
3-22	6.0	-	-	4	100	-	-
3-22	9.9	-	-	4	100	-	-
4-5	76	11					
4-10	61	8	9	-	130	-	-
4-10	190	15	10	-	200	-	-
5-23	46	30	5	50	40	4	-
5-23	50	7	3	30	100	2	-
5-23	30	6	6	60	100	5	4
5-23	31	3	3	30	70	2	-
5-23	33	5	3	30	70	2	-
6-19	17	5	-	70	60	-	-
6-19	15	3	-	40	40	-	-
6-19	69	45	-	40	120	-	-
6-19	26	3	-	30	110	-	1
7-17	81	73	-	4	40	-	-
7-17	41	23	-	4	180	-	-
7-17	49	39	-	4	50	-	-
7-17	34	23	-	3	60	-	-
8-2			-	8	40	-	-
8-2	33	33	-	7	50	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF CARP
TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Burbank (Continued)							
8-2	140	130	-	9	40	-	-
8-2	79	85	-	7	40	-	-
8-29	150	140	-	4	50	-	-
8-29	100	70	-	4	70	-	-
8-29	62	50	-	4	90	-	-
8-29	49	36	-	5	80	-	-
8-29	77	64	-	4	70	-	-
10-9	33	22	-	3	40	-	-
11-7	70	43	-	3	60	-	-
12-29	3	3	-	1	60	-	-
McNary							
5-8		18	-	2	20	-	-
5-8		9	-	2	70	-	-
6-15		21	-	60	80	-	-
8-31		78	-	7	70	-	-
8-31		71	-	5	50	-	-
8-31		130	-	6	50	-	-
8-31		110	-	7	140	-	-
8-31		76	-	6	50	-	-
10-3		86	-	1	30	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF CHISELMOUTH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Priest Rapids							
4-4		11					
4-4		15	-	4	90	-	
4-4		12	-	10	40	-	
4-4		14					
4-4		11	-	6	50	-	
7-23		7	-	10	-	-	1
7-24		-	-	4	7	-	-
7-24		4	-	10	90	-	1
8-20		9	-	10	-	-	-
9-26		610	-	2	60	-	1
9-27		480	-	2	70	-	1
9-27		520		4	60	-	-
9-27		790	1	2	50	-	-
11-2		75	-	-	6	-	-
11-2		200	-	-	30	-	-
11-2		680	1	2	100	1	1
11-2		490	1	-	80	2	2
11-2		400	-	4	100	1	2
12-11		28	-	-	7	2	3
12-11		78	-	2	90	-	-
12-11		41	-	2	90	-	-
12-11		7	-	-	-	1	2
12-11		71	1	-	50	-	-
Hanford							
4-13	120	66	1	4	50	-	-
4-13	200	140	1	4	30	-	1
4-13	230	150	2	6	100	-	1
4-13	320	200	2	7	100	-	-
4-13	130	48	2	5	90	-	1
5-10	99	45	2	4	100	-	-
5-10	180	97	1	3	120	-	4
9-19	3900	3700	1	6	100	3	1
9-19	4300	3600	1	8	90	3	-

* Results less than the reporting limit are indicated by a (-)
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF CHISELMOUTH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Hanford Continued							
9-19	2100	1400	-	2	80	-	1
10-30	2400	180	2	2	140	4	2
10-30	2600	2400	2	-	140	4	2
12-7	450		1	20	100	2	1
12-7	360		1	7	140	2	1
12-7	340		1	20	100	1	-
12-7	460		1	20	130	1	1
12-7	580		2	8	150	1	1
Ringold							
7-6	940	900	1	70	50	-	-
7-30	2000	2000	8	-	40	-	-
7-30	820	630	-	10	50	-	-
7-31	2400	2200	1	7	60	1	1
7-31	1200	850	1	20	80	-	-
7-31	510	410	-	10	50	-	-
8-14	1700	1300	1	20	60	-	-
8-14	1100	760	1	30	40	1	-
8-14	1900	1100	1	30	70	-	-
8-14	1800	1700	-	30	60	1	-
8-14	1100	1000	-	20	40	-	-
9-14	1500	1400	1	6	70	1	1
9-14	2300	1900	1	8	90	2	1
9-14	2400	2300	1	7	90	1	-
9-14	830	540	-	3	50	-	-
9-14	2100	2000	1	6	80	1	1
10-26	760	720	-	-	70	1	1
10-26	1500	1300	1	3	90	2	1
10-26	1600	830	1	5	130	3	2

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF CHISELMOUTH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Richland							
1-17	190		1	5	100	-	-
1-17	230		1	6	200	-	-
1-30	71		-	8	200	-	-
1-30	80		-	6	100	-	-
1-30	99		1	6	200	-	-
1-30	77		-	6	100	-	-
2-27	79	64	1	-	100	-	-
2-27	63	53	2	-	100	1	-
5-15	270	200	5	60	100	-	-
5-15	230	200	10	100	200	8	7
5-15	200	140	7	80	100	6	5
5-15			3	30	80	3	2
5-15	290	190	10	100	300	-	9
5-15	170	120	4	40	200	1	1
6-21	210	160	1	110	80	-	1
6-22	39	19	-	120	70	-	-
6-22	23	8	1	110	50	-	-
6-22	64	40	1	110	70	-	-
6-22	770	690	2	140	130	-	1
7-19	17	12	-	9	-	-	-
7-19	700	530	-	7	80	-	-
7-19	1300	1000	-	8	80	-	-
7-19	680	610	1	3	50	-	-
8-10	94	92	-	50	30	-	-
8-10			1	60	30	-	-
8-10	340	300	1	60	70	-	-
8-10	45	42	1	60	60	-	-
8-10	130	130	-	6	50	-	-
9-6	730	710	-	9	70	-	-
9-7	2100	2100	-	8	90	1	-
10-16	1400	720	1	3	110	2	1

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF CHISELMOUTH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Burbank							
2-8	73	53	1	-	100	-	-
2-9	55	50	1	-	100	-	-
2-9	35	15	1	1	100	-	-
2-9	61	50	1	2	100	-	-
2-9	81	63	1	2	100	-	-
2-9	62	48	1	1	80	-	-
3-22	37	24	1	5	100	-	-
3-22	20	15	1	5	90	-	-
3-22			9	30	200	8	3
3-22	47	33	1	4	100	-	-
3-22	50	34	1	4	100	-	-
4-10	84	48	10	-	100	-	-
4-10	81	43	9	-	100	-	
4-10	77	14	4	-	200	-	1
4-10	64	42	20	-	-	-	
4-10	44	13	8	-	40	-	
5-22	69	56	7	80	20	6	
5-22	57	15	10	10	30	30	
5-22	150	100	7	80	100	6	-
5-22	130	60	8	90	80	6	
6-19	13	5	-	80	40	-	-
7-17	54	39	1	5	50	-	-
8-2	840	6	-	20	30	-	-
8-2	22	12	-	5	7	-	-
8-2	22	14	-	10	30	-	-
10-9	390	120	1	-	80	-	1
10-9		1300	-	-	100	2	1
10-9	1400	1100	1	6	90	2	1
11-7	1400	1400	1	5	80	2	2
12-29	38	26	1	2	90	1	2
12-29	44	27	1	2	90	1	1
12-29	120	85	2	-	140	2	2
12-29	49	36	-	3	90	-	-
12-29	65	48	-	-	60	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF CHISELMOUTH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
McNary							
3-27	130	90	2	-	100	-	
3-27	120	86	-	10	90	-	
3-27	110	67	2	-	100	-	
3-27	110	72	2	2	100	1	
3-27	390	310	2	9	100	-	
4-17		69	2	-	80	-	1
4-17		200	20	-	40	-	
4-17		150	-	3	30	1	
5-8		49	6	70	90	-	4
5-8		40	7	70	100	5	4
5-8		30	-	30	70	-	-
6-15		100	-	110	40	-	-
7-10		84	-	7	30	-	-
10-3		360	-	-	40	-	-
11-9		330	1	-	90	1	2
11-9		190	-	-	50	-	-
11-9		360	-	-	90	1	1
11-9		1200	1	-	80	2	2
11-9		400	1	-	90	1	1
12-20		92	1	20	100	2	4
12-20		100	-	3	70	-	1
12-20		76	1	20	40	2	3
12-20		75	-	3	50	-	-
12-20		91	-	3	110	-	1
12-20		98	1	4	90	-	1
12-20		79	2	30	80	3	4
12-20		56	-	-	20	-	-
12-20		64	1	5	130	-	1
12-20		100	-	3	50	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF PERCH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Hanford							
10-30	11		-	-	-	-	-
10-30	9		-	6	-	-	-
10-30	30	24	-	3	-	-	-
10-30	24	24	-	-	-	-	-
12-7	51	42	2	3	20	-	1
12-7	370	350	-	1	80	-	-
Ringold							
10-26	18		-	-	-	-	-
10-26	12		-	-	-	-	-
10-26	10		-	-	-	-	-
10-26	23	24	-	-	-	-	-
10-26	1500	900	-	3	100	-	1
Richland							
1-17	31		-	2	30	-	-
1-17	28		-	7	40	-	-
1-17	75		2	9	70	-	-
1-17	59		-	5	70	-	-
1-17	33		-	8	80	-	-
1-30	19		-	5	50	-	-
1-30	21		-	4	80	-	-
2-27	17	10	-	-	30	-	-
2-27	9		-	-	40	-	-
2-27	15		-	-	80	-	-
4-19	29		20	-	-	-	
4-19	23		-	-	40	-	-
4-19	82	49	-	2	60	-	-
4-19	42	32	-	2	100	-	-
5-14	18	17	1	10	20	8	
5-14	15	13	1	10	20	8	
5-14	20	20	20	200	30	10	

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF PERCH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Richland (Continued)							
5-14	14	14	1	10	20	9	
5-14	36	12	90	10	20	8	
7-19	140	150	-	10	6	-	-
9-7	51	50	-	10	30	-	-
9-7	9		-	10	-	-	-
9-7	230	220	-	10	40	-	-
9-12	310	300	1	20	10	-	-
9-12	480	410	-	20	20	-	-
10-15	240	210	-	-	40	-	-
10-15	220	180	-	-	50	-	-
10-15	810	680	1	-	40	-	-
12-4	7		-	2	-	-	-
12-4	11		-	-	-	-	-
12-4	9	7	-	1	-	-	-
12-4	11		-	3	-	-	-
12-4	6	8	-	2	-	-	-
12-4	7	8	-	2	-	-	-
12-4	26		-	3	-	-	-
12-4	27		-	-	20	-	-
12-4	10		-	-	-	-	-
12-4	45		-	-	-	-	-
12-4	10		-	-	-	-	-
12-4	8	11	-	-	-	-	-
Burbank							
4-5	91	63	1	20	30	2	
4-5	38	9	-	2	80	-	
4-5	110	43	1	8	70	2	
4-5	41	23	-	9	80	-	
4-10	29	15	20	-	20	-	
5-21	14	9	7	80	50	6	
5-22	31	11	-	80	40	6	
6-19	16	7	-	90	20	-	-
6-19	15	13	-	110	10	-	1

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF PERCH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Burbank (Continued)							
8-28	14		-	10	10	-	-
8-29	68	58	-	20	20	-	-
8-29	130	120	-	50	40	-	-
10-8	100	77	-	-	30	-	-
10-8	46	36		1	20	-	-
10-8	46	38	-	1	20	-	-
10-8	67	46	-	2	20	-	-
10-8	110	93		3	30	-	-
11-6	45	30	1	10	20	-	-
11-7	82	50	-	80	30	-	-
11-7	87	69	-	4	40	-	-
11-7	200	210	-	10	90	1	2
12-29	12	7	-	-	20	-	-
12-29	47	9	-	-	20	-	-
12-29	23	17	-	-	40	-	-
McNary							
3-27		55	3	-	40	5	

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF SQUAWFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Priest Rapids							
1-24		-	-	2	-	-	-
1-24		-	-	2	6	-	-
1-24		2	-	3	8	-	-
2-20		-	-	3	-	-	-
2-20		-	-	3	-	-	-
2-21		-	-	2	-	-	-
3-8		5	-	3	-	-	-
4-4		4	-	2	9	-	
4-4		-	10	-	-	-	
4-4		98	7	-	-	-	
5-3		13	-	3	20	-	-
5-4		21	-	-	-	-	-
6-25		4	-	60	10	-	-
6-26		2	-	40	-	-	-
6-26		3	-	40	-	-	-
6-26		4	-	60	-	-	-
6-26		11	-	90	40	-	1
7-23		-	-	5	-	-	-
7-23		3	-	7	-	-	-
7-23		120	1	60	70	-	1
7-23		4	-	9	-	-	-
7-23			-	5	70	-	1
8-20		7	-	20	-	-	-
8-20		7	-	20	-	-	-
8-20		19	1	20	50	-	-
8-20		17	1	30	-	-	-
8-20		11	-	20	-	-	1
9-26		4	-	2	-	-	-
9-26		4	-	2	-	-	-
9-27		11	1	1	-	-	-
9-27		17	-	2	-	-	-
11-2		9	-	-	-	-	-
11-2		130	1	19	60	1	1
11-2		30	-	3	-	-	-

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF SQUAWFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Priest Rapids (Continued)							
12-11		11	-	-	-	-	-
12-11		9	-	-	-	-	-
12-11		6	-	-	-	-	-
12-11		6	-	-	-	-	-
12-11		6	-	-	-	-	-
Hanford							
4-13	43	10	-	2	50	-	1
4-13	190	85	1	10	50	-	2
4-13	68	15	6	1	100	-	
6-12	12	5	7	80	80	1	2
6-12	20	6	7	80	40	6	
6-12	10	5	7	80	70	6	3
6-12	17	7	9	80	60	8	6
6-12	35	14	10	200	100	10	
7-2	64	45	2	130	80	-	1
7-2	51	33	2	90	70	-	1
7-3	43	28	2	40	20	-	2
7-3	30	30	2	40	40	-	1
7-3	93	80	1	10	50	-	-
8-15	440	380	-	30	50	-	-
8-16	55	49	-	30	40	-	-
8-16	170	160	-	40	60	-	1
9-19	410	260	-	5	30	-	-
9-19	120	73	-	3	30	-	-
9-19	600	490	-	6	50	-	-
9-19	67	38	-	2	20	-	-
9-19	490	330	-	3	40	-	-
10-30	310	190	-	-	60	-	1
10-30	370	270	-	2	90	-	1
10-30	260	200	1	-	80	1	1
10-30	310	180	-	-	70	-	1
10-30	270	210	1	-	60	-	1

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF SQUAWFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Hanford (Continued)							
12-7	150		1	10	80	-	1
12-7	59		1	8	50	-	1
12-7	130		-	20	90	-	-
12-7	56		-	7	20	-	-
12-7	87		1	10	80	-	1
Ringold							
5-1	25	7	-	10	40	-	1
5-1	100	13	10	-	20	-	-
5-1	33	8	3	30	20	3	2
6-5	32	11	9	90	80	2	-
7-5	61	36	-	50	30	-	-
7-6		16	-	50	20	-	1
7-30	55	42	1	10	30	-	1
7-30	49	36	-	10	30	-	-
7-30	90	73	1	10	50	-	-
7-30	160	140	1	20	60	-	-
7-31	91	64	-	20	50	-	1
8-13	230	220	-	30	40	-	1
8-13	13	7	-	20	-	-	-
8-13	67	57	-	20	10	-	-
8-13	75		-	10	30	-	-
8-13	110	110	-	20	30	-	-
9-14	740	650	-	-	70	-	-
9-14	690	680	-	-	70	-	-
9-14	530	380	-	-	50	-	-
9-14	46		1	-	10	-	1
9-14	830	770	-	-	50	-	-
10-25	130	110	-	-	40	-	1

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF SQUAWFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Richland							
1-17	12		-	2	10	-	-
1-30	25		-	5	60	-	-
4-20	25	5	3	-	20	-	-
4-20	24	14	10	-	10	-	
4-20	47	6	20	-	30	-	
4-20	31	8	9	-	60	-	
5-15	40	9	8	90	80	4	
5-15	43	17	8	90	40	70	
5-15	37		3	40	30	3	
5-15	60	21	10	100	100	7	1
5-15	44	14	9	100	60	30	6
6-21	40	28	-	30	20	-	-
6-21	30	12	-	60	40	-	1
6-22	64	47	1	80	30	-	1
7-19	29	14	-	20	40	-	1
7-19	58	44	-	10	20	-	-
7-19	55	46	1	10	40	-	1
7-19	17	8	-	4	20	-	1
7-19	14	7	-	4	20	-	1
8-9	170	140	1	20	30	-	1
8-10	12	8	1	20	20	-	1
9-12	41	26	-	6	10	-	-
10-16	180	91	-	-	30	-	1
10-16	170	120	-	4	40	-	1
Burbank							
3-22	5	4	-	7	7	-	-
4-10	15		20	-	-	-	
6-18	40	11	-	140	20	-	-
6-19	11	3	-	40	10	-	-
6-19	6	6	-	90	30	-	-
6-19	20	5	-	60	20	-	-
7-17	18	15	-	4	20	-	-
7-17	37	25	-	6	30	-	-

* Results less than the reporting limit are indicated by a (-)
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF SQUAWFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
7-17	15	7	-	3	20	-	-
7-17	23	19	-	8	20	-	-
7-17	77	65	-	4	20	-	-
8-29	14	10	-	20	30	-	-
8-29	200	190	-	20	40	-	-
10-9	45	29	10	-	20	1	1
11-7	65	38	-	10	40	-	-
12-29	5	5	-	1	20	-	-
12-29	7	6	-	-	20	-	-
12-29	7	5	-	-	20	-	-
McNary							
3-27	30	6	1	-	20	-	
3-27		18	-	-	30	2	
3-27		13	-	10	40	1	
4-16		10	15	-	60	-	
4-16		12	20	-	40	-	
4-16		12	-	-	60	-	
4-16			30	-	30	-	
4-17		25	30	-	40	-	
4-17		16	10	-	50	-	
4-17		8	15	-	20	-	
5-7		12	7	70	60	5	
5-7		17	6	100	60	9	
5-8		14	8	90	30	6	
5-16		31	2	200	5	20	
6-15		5	-	5	20	-	-
6-15		9	-	5	20	-	-
6-15		6	-	70	20	-	-
6-15		31	-	100	40	-	-
6-15		7	-	80	10	-	-
7-10		8	-	7	40	-	-
7-10		17	-	6	20	-	-
7-10		9	-	9	20	-	-
8-6		34	-	7	6	-	-
8-7		31	-	10	20	-	-

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF SQUAWFISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
McNary (Continued)							
8-7		24	-	10	20	-	-
8-7		15	-	20	20	-	-
8-30		13	-	6	20	-	-
8-30		11	-	4	20	-	-
8-30		92	-	15	30	-	-
8-31		160	-	7	20	-	-
8-31		54	-	9	30	-	-
10-3		110	-	-	30	-	-
10-3		230	-	-	30	-	-
10-3		64	-	2	20	-	-
10-3		200	1	-	50	-	-
10-3		72	-	3	30	-	-
12-20		5	-	3	-	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF COARSE SCALE SUCKERS TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Priest Rapids							
1-12		-	-	-	-	-	-
2-19		-	-	2	-	-	1
2-20		-	-	3	10	-	-
3-8		-	-	10	30	-	-
5-2		67	3	30	40	2	1
5-2		5	3	30	5	2	
5-2		4	2	20	-	2	
5-3		9	-	2	-	-	-
6-26		49	-	30	-	-	-
6-26		42	-	40	30	-	-
7-24		-	-	5	-	-	1
8-20		23	-	9	40	-	-
8-20		-	-	7	-	-	-
8-21		130	-	10	40	-	-
8-21		58	-	8	70	-	-
11-2		130	-	3	20	-	-
11-2		6	-	5	20	-	1
11-2		430	-	2	60	1	1
11-2		390	-	2	30	1	1
12-10		-	-	1	-	-	-
12-11		-	-	-	5	-	-
Hanford							
1-5	330		1	5	50	2	1
1-5	390		1	5	60	2	1
1-5	430		-	2	-	-	-
2-5	140	150	-	3	70	1	-
3-2	290	270	1	5	100	1	1
3-6	110	99	1	3	60	2	-
3-19	420	330	1	-	80	2	
3-19	3		1	7	110	2	
4-13	270	180	2	5	40	1	1
4-13	470	360	-	5	40	-	1

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF COARSE SCALE SUCKERS TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Hanford Continued							
4-13	66	16	1	1	30	-	1
4-13	460	290	2	5	120	1	1
4-13	540	420	1	2	40	1	1
5-9	91	30	1	3	40	-	-
5-10	82	51	1	3	40	-	-
5-10	86	55	1	3	60	1	1
5-10	170	110	1	3	50	-	1
5-10	71	30	5	50	70	4	2
6-12	98	80	3	30	6	2	
6-13	70	48	2	30	50	-	1
6-13	45	30	4	40	70	3	-
6-13	110	80	4	40	30	3	3
6-13	120	85	4	50	50	3	-
8-15	500	550	-	20	30	-	-
8-15	750	690	1	40	60	-	-
8-15	620	730	1	20	60	-	-
8-15	1800	2100	3	50	110	-	1
9-19	700	760	-	4	50	-	1
9-19	880	860	-	20	40	1	1
9-19	940	780	-	4	40	-	-
9-19	280	250	-	5	30	-	-
9-19	310	280	-	4	30	-	-
10-30	1800	1800	1	6	80	2	2
10-30	440	300	-	-	30	1	-
10-30	370	370	-	6	30	1	1
10-30	570	490	1	1	40	1	1
10-30	360	330	-	4	40	1	1
12-7	390		1	8	70	2	1
12-7	81		-	7	30	1	1
12-7	190		1	10	40	1	1
12-7	150		1	10	60	1	2
12-7	240		-	10	30	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF COARSE SCALE SUCKERS TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Ringold							
1-9	360		1	6	70	2	1
1-9	360		1	5	70	2	1
1-9	300		-	3	60	2	1
1-9	370		1	6	80	2	1
2-15	120	100	-	4	40	1	1
3-29	580		1	20	90	2	
3-29	470	420	2	-	90	3	
3-29	450	370	1	15	90	3	
3-29			1	-	50	2	
3-29	390	340	2	15	120	2	
5-1	430	370	3	30	60	2	-
6-4	170	120	4	50	60	3	3
6-4	240	190	6	60	100	3	
6-5	58	31	3	40	50	3	3
6-5	120	87	4	50	60	3	-
6-5	120	86	3	30	60	3	
7-6	500	430	1	30	30	-	1
7-6	360	340	1	30	40	-	1
8-14	640	680	1	10	30	-	-
8-14			-	10	30	-	-
8-14	610	640	-	30	40	-	-
9-14	270	110	-	4	50	1	1
9-14	140	77	-	5	50	-	1
9-14	1500	1500	-	9	70	1	1
9-14	2300	2000	1	10	100	2	2
10-23	560	540	-	3	40	1	1
10-23	230	210	-	1	30	1	1
12-18	150	150	-	5	30	-	1
12-18	88	79	1	10	30	1	1
12-18	140	140	1	20	30	1	-
12-18	130	140	1	10	40	-	-
12-18	200	200	1	20	40	1	1
12-18	180	180	1	10	70	1	1

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF COARSE SCALE SUCKERS TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Richland							
4-20	110		14	-	40	-	-
4-20	140	74	4	-	50	-	-
4-20	280	230	10	-	80	40	-
4-20	300	190	8	-	50	-	-
4-20	270	150	5	-	60	1	-
4-20	220	180	5	-	80	1	2
5-15	260	170	5	50	50	4	3
5-15	440	390	2	20	50	2	2
6-21	180	160	1	40	40	-	1
6-22	150	130	1	50	50	-	1
6-22	140	120	1	50	40	-	1
6-22	250	200	1	40	40	-	1
6-22	130	100	2	60	50	-	1
8-10	460	420	1	20	40	-	1
8-10	96		-	20	20	-	-
8-10	590	510	-	20	40	-	1
9-11	1100	980	1	10	80	1	-
9-12	250	230	-	4	30	-	-
9-12	1100	1000	-	9	40	1	1
12-4	260		-	3	30	1	1
Burbank							
2-8	13	5	-	2	40	-	-
2-9	41	24	-	2	10	-	-
3-22	20	14	-	3	40	-	-
3-22	43	35	-	2	20	-	1
3-22	24	18	-	3	20	-	-
3-22	290	300	1	3	100	1	1
4-10	36	14	4	-	20	-	
4-10	56	32	6	-	30	-	
4-10	110	16	9	-	30	-	
4-10	35	12	8	-	20	-	
4-10	89	14	10	-	-	-	

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF COARSE SCALE SUCKERS TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Burbank (Continued)							
6-19	60	43	-	30	20	-	-
6-19	150	130	-	60	50	-	-
8-2	15	11	-	7	10	-	1
8-2	3		-	7	40	-	-
8-2	200	190	-	8	20	-	-
8-2	19	9	-	7	30	-	-
8-29	120	97	-	10	30	-	-
8-29	110	80	-	10	30	-	-
8-29	76	74	-	3	10	-	-
8-29	39	38	-	5	50	-	-
8-29	96	94	-	3	20	-	-
10-9	660	660	-	4	20	-	-
10-9	120	100	-	4	30	-	-
11-7	180	6	-	4	40	-	1
11-7	83	68	-	3	30	-	-
11-7	230	170	-	3	50	1	1
11-7	160	130	-	4	40	-	-
McNary							
3-26	140	92	1	-	50	-	
3-27		89	1	20	60	1	
4-17		10	7	-	30	-	-
4-17		240	-	-	50	1	1
5-8		54	5	60	50	4	-
7-10		36	-	6	40	-	-
7-10		36	-	5	20	-	-
7-10		130	-	7	20	-	-
8-6		61	-	10	30	-	-
8-8		85	-	9	20	-	-
8-8		35	-	7	30	-	-
8-31		78	-	4	30	-	-
8-31		530	-	6	30	-	-
8-31		130	-	4	30	-	-
8-31		270	-	8	30	-	-
8-31		360	-	4	20	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF COARSE SCALE SUCKERS TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
McNary Continued							
10-3		160	-	2	20	-	-
10-3		190	-	7	20	-	-
10-3		610	-	3	20	-	-
10-3		360	-	3	20	-	-
10-3		-	-	2	30	-	-
11-9		140	-	-	30	-	-
11-9		150	-	2	20	-	-
11-9		140	-	2	40	-	1
11-9		180	-	3	30	-	-
11-9		99	-	2	30	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF FINE SCALE SUCKERS TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Priest Rapids							
3-7		-	-	2	40	-	-
6-22		4	-	60	-	-	-
6-22		4	-	60	-	-	-
6-22		6	-	70	-	-	-
6-22		6	-	90	-	-	-
8-21		3	-	7	10	-	-
9-27		120	-	4	8	-	-
11-2		15	-	4	-	-	-
11-2		12	-	2	50	-	1
11-2		7	-	3	8	-	-
11-2		5	-	3	40	-	1
Hanford							
1-5	1000		2	6	100	4	2
4-13	290		1	5	70	-	1
4-13	470	430	1	4	100	1	1
4-13	2200	2200	4	6	400	3	4
4-13	670	570	1	4	30	-	1
4-13	530	520	1	6	110	-	-
5-10		120	2	20	-	2	
6-13	630	540	3	30	10	3	2
6-13	780	700	5	50	100	4	1
6-13	380	340	1	8	120	-	1
10-3	2300	1900	-	1	70	-	1
Ringold							
1-9	310		1	7	70	4	2
1-9	520		-	4	60	-	2
2-14	670	610	1	5	140	1	2
5-1	440		2	20	10	2	-
6-5	36		3	30	30	2	-
7-31	330	320	1	6	30	-	1
7-31	450	430	-	10	90	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF FINE SCALE SUCKERS TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Ringold							
7-31	500		-	7	40	-	1
7-31	710	670	-	7	40	-	-
7-31	410	400	1	6	60	-	1
10-25	1100	1100	-	2	70	1	1
10-26	1400	480	-	-	100	-	1
10-26	260	250	-	3	30	1	1
Richland							
1-30	82		2	5	30	1	-
1-30	170		3	6	100	1	-
1-30	390		1	4	110	1	1
1-31	450		6	1	130	1	1
1-31	720		20	10	100	2	2
4-20	510	360	10	-	110	-	
5-15	810	680	4	40	90	3	2
5-15	870	860	6	60	100	2	2
8-10	1100	960	2	40	70	-	1
8-10	1500	1500	1	50	60	-	1
10-16	2600	2200	4	10	330	5	7
Burbank							
2-8	170		1	2	80	1	1
2-9	270	260	1	3	130	1	1
2-9	180	190	1	3	120	1	1
2-9	130	100	1	3	170	-	-
3-22	17	8	1	3	80	-	1
3-22	4	-	-	3	-	-	-
3-22	5	-	1	15	20	1	2
3-22	210		2	4	90	1	1
3-22	33	5	-	3	30	-	-
4-10	580	390	6	-	70	-	-
4-10	43	11	-	3	60	1	1

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF FINE SCALE SUCKERS TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*		2	0.6	1	5	0.7	0.7
Burbank (Continued)							
4-10	510	330	7	-	80	-	-
4-10	130	92	10	-	90	-	-
4-10	21	7	7	-	-	-	
5-22	130	110	4	40	50	3	
5-22	130	84	8	80	90	6	
5-22	24	6	4	50	8	3	
8-2	200		-	7	30	-	-
11-7	1900	1900	1	-	90	10	70
12-29	170	150	1	-	70	1	2
NcNary							
4-17		51	5	-	30	-	
4-17		220	5	-	70	-	1
5-8		51	-	2	40	-	-
6-15		5	-	60	30	-	1
6-15		5	-	60	30	-	-
6-15	370	300	-	40	50	-	-
8-7		210	-	10	30	-	-
8-7		340	-	10	40	-	-
8-7		300	-	10	50	-	-
8-31		26	1	4	70	-	1
10-3		3	-	-	40	2	-
10-3		-	-	20	40	1	1
10-3		620	-	3	40	-	1
10-3		3	-	3	50	-	1
10-3		560	-	3	30	-	-
11-19		260	-	2	50	-	1
11-19		820	-	-	80	2	2
12-20		65	-	3	50	-	1
12-20		130	-	5	30	-	1

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF MISCELLANEOUS FISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Specie	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*			2	0.6	1	5	0.7	0.7
Priest Rapids								
3-8	Sturgeon		3	-	2	-	-	-
3-8	Steelhead		3	-	2	-	-	-
4-4	Steelhead		-	5	-	-	-	
6-26	Sturgeon		3	-	40	-	-	-
7-23	Chub		4	-	10	-	-	-
7-23	Chub		3	-	9	-	-	-
8-20	Chub		19	-	8	40	-	-
11-2	Chub		470	1	-	130	2	-
12-11	Chub		35	1	-	100	1	-
Hanford								
3-1	Trout	200	170	-	4	120	-	-
4-13	Sturgeon	33	9	-	2	9	-	1
4-13	Chub	160	51	4	20	120	-	2
6-12	Chub	140	110	5	60	200	5	4
6-12	Chub	94	76	7	70	100	5	4
6-12	Sturgeon	27	9	3	30	40	2	-
8-16	Chub	980	870	1	70	60	1	-
12-7	Chub	170	140	2	20	80	1	1
12-7	Chub	210	190	2	5	60	2	1
12-7	Chub	320	290	1	10	120	1	-
12-7	Sturgeon		21	-	4	10	-	-
Ringold								
1-8	Steelhead	710		-	4	110	1	-
3-12	Steelhead	16	11	-	2	-	-	-
3-14	Trout	130	150	2	4	110	-	-
3-29	Trout			2	-	170	6	
6-4	Chub		76	10	200	200	10	
6-4	Chub	140	97	10	100	100	4	
6-4	Chub	120	87	10	100	90	9	
6-4	Chub	110	65	10	100	200	9	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF MISCELLANEOUS FISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Specie	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*			2	0.6	1	5	0.7	0.7
Ringold (Continued)								
7-30	Chub	490	400	3	30	70	2	-
7-30	Salmon			1	-	-	-	2
7-30	Sturgeon	16	11	-	10	20	-	-
7-31	Chub	150	140	2	10	100	1	-
8-14	Chub	540	390	1	40	70	-	-
8-14	Chub	730	660	-	90	90	-	-
Richland								
1-16	Steelhead	390		1	4	130	2	-
1-17	Crappie	33		-	3	50	-	-
1-17	Channel Cat	12		-	4	10	-	-
1-30	Catfish	20		-	6	30	-	-
1-30	Catfish	11		-	3	30	-	-
4-19	Crappie	50		-	-	20	-	-
6-22	Sturgeon	27	17	1	30	10	-	1
7-19	Bullhead	48	9	-	20	-	-	-
7-19	Sturgeon	30	20	-	9	20	1	-
7-19	Brn. Trout	190	160	-	4	20	-	1
10-15	Bluegill	10	11	-	-	7	-	-
10-15	Bluegill	110	87	-	-	40	-	1
10-16	Rainbow Trout	560	460	1	-	30	-	-
10-16	Rainbow Trout	780	670	-	1	60	1	1
10-16	Rainbow Trout	540	410	-	-	40	-	-
12-3	Trout	520	520	1	8	60	1	-
12-4	Bluegill	14		-	-	-	-	-
Burbank								
2-9	Salmon	6	4	-	-	-	-	-
3-22	Channel Cat	8	-	-	4	20	-	-
4-5	Bullhead	48	24	-	5	50	-	-
4-5	Chub	50	22	-	5	40	-	-
4-10	Channel Cat	21	4	6	-	10	-	
4-10	Channel Cat	23	9	6	-	90	-	

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF MISCELLANEOUS FISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Specie	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*			2	0.6	1	5	0.7	0.7
Burbank (Continued)								
4-10	Channel Cat	24	13	20	-	6	-	
4-10	Channel Cat	25	14	10	-	20	-	
4-10	Channel Cat	30	20	30	-	-	-	
5-21	Catfish	16	9	8	90	30	6	
5-21	Catfish	17	9	7	80	30	6	
5-21	Catfish			-	2	7	-	
5-21	Catfish	33	8	7	80	30	6	
5-22	Channel Cat	19	8	9	100	50	8	
5-22	Channel Cat	11	8	7	80	30	6	
5-22	Channel Cat	20	7	5	50	30	4	
5-22	Channel Cat	19	5	4	50	20	3	
5-22	Channel Cat	21	4	3	30	6	2	
6-18	Bluegill	14	8	-	100	30	-	-
6-19	Crappie	16	6	-	50	20	-	-
6-19	Channel Cat	11	3	-	50	20	-	-
6-19	Channel Cat	7	3	-	40	20	-	-
6-19	Channel Cat	15	3	-	40	10	-	-
6-19	Channel Cat	18	6	-	70	30	-	-
6-19	Channel Cat	13	5	-	60	20	-	-
7-16	Bullhead	18	11	-	3	20	-	-
7-17	Channel Cat			-	6	20	-	-
7-17	Channel Cat	11	5	-	4	8	-	-
7-17	Bullhead	12	7	-	2	10	-	-
8-1	Bullhead	81	64	-	20	10	-	-
8-1	Bullhead	290	270	-	10	20	-	-
8-2	Channel Cat	12	8	-	7	20	-	-
8-2	Channel Cat			-	6	10	-	-
8-2	Channel Cat	34	17	-	9	10	-	-
8-2	Channel Cat	13	6	-	5	10	-	-
8-2	Channel Cat	21	18	-	6	20	-	-
8-2	Bluegill	56	43	-	10	20	-	-
8-2	Sturgeon	24	21	-	8	30	-	-
8-28	Bullhead	22	13	-	20	10	-	-
8-28	Bullhead	41	32	-	30	20	-	-
8-28	Bullhead	22	15	-	20	20	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF MISCELLANEOUS FISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Specie	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*			2	0.6	1	5	0.7	0.7
Burbank (Continued)								
8-28	Catfish	37	29	-	10	20	-	-
8-28	Catfish	52	68	-	20	20	-	-
8-28	Bluegill	290	260	-	30	30	-	-
8-28	Bluegill	37	30	2	30	10	-	-
8-28	Bluegill	230	160	-	30	40	-	-
8-28	Bluegill	42	35	-	30	20	-	1
8-28	Bluegill	20		-	30	20	-	-
8-29	Crappie	210	190	5	30	30	-	-
8-29	Crappie	360	320	-	30	40	-	-
8-29	Channel Cat	22	17	-	10	20	-	-
8-29	Channel Cat	56	27	-	50	70	-	-
8-29	Channel Cat	100	83	-	9	30	-	-
8-29	Channel Cat	18	15	-	8	10	-	-
10-9	Channel Cat	31	25	-	3	10	-	-
10-9	Crappie	160	120	-	5	40	-	-
11-7	Channel Cat	44	36	-	4	20	-	-
11-7	Crappie	83	67	-	5	40	-	-
McNary								
8-6	Chub		500	1	10	60	-	-
8-8	Channel Cat		9	-	8	9	-	-
8-8	Channel Cat		16	-	7	10	-	-
8-31	Channel Cat		2200	-	3	10	-	-
8-31	Chub		220	-	5	40	-	-
10-2	Steelhead		-		3	-	-	-
10-3	Chub		190	-	-	20	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 8 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MUSCLE OF MISCELLANEOUS FISH TAKEN FROM THE COLUMBIA RIVER - 1962

Units of μμc/g

Date	Specie	Total Beta	P^{32}	Co^{60}	K^{40}	Zn^{65}	Co^{58}	Cs^{137}
Reporting Limits*			2	0.6	1	5	0.7	0.7
Coyote Rapids								
2-2	Steelhead		6	-	1	-	-	-
2-2	Steelhead		2	-	2	-	-	-
2-2	Salmon		240	-	2	30	-	-
3-9	Steelhead		-	-	1	-	-	-
8-3	Trout		74	1	10	30	-	-
12-27	Steelhead		3	-	1	-	-	-
12-27	Steelhead		2	-	3	-	-	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX A
TABLE 9

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL CONTRIBUTED BY HUNTERS - 1962

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Dayton			
10-14	Mallard	-	-
10-14	"	-	-
10-14	"	-	-
Mesa			
10-14	Golden Eye	< 7.8	< 5.3
10-14	Mallard	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"	8.4	-
10-14	"	-	-
10-15	"	-	-
10-15	"	-	-
10-15	"	-	-
10-15	"	-	-
10-15	"	-	-
11-14	"	-	-
11-14	"	-	-
11-14	"	13	11
10-14	Pintail	-	-
10-14	"	-	-
10-14	Teal	-	-
10-14	"	5.1	-
10-14	"	-	-
10-14	"	-	-
10-14	"	-	-
10-14	"	< 6.9	-
10-14	"	< 5.1	-
10-14	"	-	-

Results less than reporting limit are indicated by a (-).

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL CONTRIBUTED BY HUNTERS - 1962

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Patterson Ferry			
10-28	Brant	-	-
Prosser			
10-21	Gadwall	-	-
10-21	"	-	-
10-20	Mallard	-	-
10-26	"	-	-
10-26	"	-	-
10-26	"	-	-
10-26	"	-	-
10-26	"	-	-
10-26	"	-	-
10-26	Pintail	-	-
10-26	"	-	-
10-20	Teal	-	-
10-20	"	< 8.3	< 5.7
10-21	"	-	< 6.0
10-21	"	-	< 5.2
10-26	"	-	-
10-26	"	-	-
10-26	"	-	-
10-21	Widgeon	-	-
10-21	"	-	-
10-26	"	-	-
10-26	"	-	-
Sunnyside			
10-14	Widgeon	-	-
12-17	Golden Eye	-	-
10-13	Mallard	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-18	"	-	-
11-25	"	-	-
11-25	"	-	-

Results less than reporting limit are indicated by a (-).

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL CONTRIBUTED BY HUNTERS - 1962

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Sunnyside (continued)			
11-26	Mallard	-	-
11-26	"	-	-
11-26	"	-	-
12-8	"	-	-
12-8	"	-	-
11-26	Pintail	-	-
10-14	Shoveler	-	-
10-14	"	-	-
10-14	"	-	-
11-18	"	-	-
12-1	"	-	-
10-13	Teal	-	-
10-13	"	-	-
10-14	"	-	-
10-14	"	-	-
11-18	"	-	-
11-18	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
11-26	"	-	-
12-1	"	-	-
12-1	"	-	-
12-1	"	-	-
12-1	"	-	-
12-1	"	-	-
12-1	"	-	-
12-8	"	-	-
12-17	"	-	-
12-17	"	-	-
11-18	Widgeon	-	-
11-18	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-
11-25	"	-	-

Results less than reporting limit are indicated by a (-).

APPENDIX A
TABLE 9 (Continued)

CONCENTRATIONS OF BETA EMITTERS
IN WATERFOWL CONTRIBUTED BY HUNTERS - 1962

Units of 10^{-5} μc/g

Date	Specie	Beta	P^{32}
	Reporting Limits	5	5
Umapine, Oregon			
10-13	Mallard	-	-
10-13	"	-	-
12-26	"	-	-
10-20	Teal	< 7.1	< 5.7

Results less than reporting limit are indicated by a (-).

APPENDIX A
TABLE 10

CONCENTRATIONS OF BETA EMITTERS IN WATERFOWL HEADS AND MUSCLES SAMPLED WITHIN THE HANFORD RESERVATION - 1962

Units of 10^{-5} μc/g

Date	Specie	Head		Muscle	
		Beta	P^{32}	Beta	P^{32}
Reporting Limits*		5	5	5	5
Hanford					
12-6	Golden Eye	140	130	110	95
12-6	Golden Eye	43	39	28	22
12-6	Golden Eye	19	19	13	12
12-6	Mallard	-	-	-	-
12-6	Mallard	-	-	-	-
12-6	Mallard	-	-	-	-
12-6	Mallard	-	-	-	-
12-6	Old Squaw	-	-	-	-
12-6	Pintail	5.2	-	7.2	5.4
Richland					
11-17	Mallard	-	-	-	-
Lower River					
10-25	Canadian Honker	-	-	-	-
12-3	Canadian Honker	11	11	15	12
12-3	Canadian Honker	-	-	-	-
10-15	Coot	5.4	-	-	-
10-16	Coot	-	-	-	-
10-16	Coot	-	-	-	-
10-16	Coot	-	-	-	-
10-19	Coot	-	-	-	-
12-3	Golden Eye	13	12	15	14
12-3	Golden Eye	350	370	110	120
12-13	Golden Eye	26	29	18	17
12-13	Golden Eye	190	190	170	180
10-15	Mallard	-	-	-	-
10-15	Mallard	-	-	-	-
10-15	Mallard	10	10	11	7.7

* Results less than reporting limit are indicated by a (-).

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS IN WATERFOWL HEADS AND MUSCLES SAMPLED WITHIN THE HANFORD RESERVATION - 1962

Units of 10^{-5} μc/g

Date	Specie	Head		Muscle	
		Beta	P^{32}	Beta	P^{32}
Reporting Limits*		5	5	5	5
Lower River (Continued)					
10-15	Mallard	-	-	-	-
10-15	Mallard	-	-	-	-
10-19	Mallard	-	-	-	-
10-19	Mallard	-	-	-	-
10-19	Mallard	-	-	-	-
10-19	Mallard	-	-	5.6	-
10-19	Mallard	5.1	-	-	-
10-22	Mallard	-	5.2	9.4	-
10-22	Mallard	5.3	-	-	-
12-3	Mallard	-	-	-	-
12-3	Mallard	-	-	-	-
12-3	Mallard	-	-	-	-
12-3	Mallard	-	-	-	-
12-3	Mallard	-	-	-	-
12-17	Mallard	-	-	-	-
12-26	Mallard	-	-	-	-
12-26	Mallard	-	-	-	-
12-26	Mallard	-	-	-	-
12-26	Mallard	-	-	-	-
12-26	Mallard	-	-	-	-
10-23	Merganser	300	300	550	160
10-31	Merganser	39	30	27	22
10-31	Merganser	29	28	21	19
12-13	Pintail	-	-	-	-
12-17	Pintail	-	-	-	-
10-15	Ruddy Duck	-	-	-	-
10-15	Ruddy Duck	-	-	-	-
10-15	Ruddy Duck	-	-	-	6.6
10-25	Teal	56	59	38	49
10-30	Teal	32	33	41	31
10-30	Teal	36	34	42	38
10-30	Teal	31	32	26	10
10-30	Teal	18	12	6.0	6.4

* Results less than reporting limit are indicated by a (-).

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS IN WATERFOWL HEADS AND MUSCLES SAMPLED WITHIN THE HANFORD RESERVATION - 1962

Units of 10^{-5} µc/g

Date	Specie	Head		Muscle	
		Beta	P^{32}	Beta	P^{32}
Reporting Limits*					
Upper River					
11-20	Golden Eye	62	64	32	32
11-13	Mallard	-	-	-	-
11-13	Mallard	-	-	-	-
11-13	Mallard	-	-	-	-
11-13	Mallard	-	-	-	-
11-13	Mallard	-	-	-	-
12-26	Mallard	-	-	-	-
12-26	Mallard	6.9	6.2	15	13
12-26	Mallard	-	-	-	-
12-26	Mallard	-	-	-	-
12-26	Mallard	-	-	-	-
11-14	Teal	25	25	26	25
11-14	Teal	73	77	43	41
11-14	Teal	64	53	37	32
11-14	Teal	19	17	17	15
12-26	Teal	12	10	-	-
12-26	Widgeon	-	-	-	-
Gable Swamp					
12-5	Mallard	-	-	-	-
12-5	Mallard	-	-	-	-
12-5	Mallard	-	-	-	-
12-5	Mallard	7.7	-	15	5.3
12-5	Mallard	10	-	11	-
12-5	Mallard	8.9	-	7.6	-
Redox Swamp					
12-14	Bufflehead	-	-	-	-
11-19	Merganser	-	-	-	-

* Results less than reporting limit are indicated by a (-).

APPENDIX A
TABLE 10 (Continued)

CONCENTRATIONS OF BETA EMITTERS IN WATERFOWL HEADS AND MUSCLES SAMPLED WITHIN THE HANFORD RESERVATION - 1962

Units of 10^{-5} µc/g

Date	Specie	Head		Muscle	
		Beta	P^{32}	Beta	P^{32}
Reporting Limits*		5	5	5	5
U Plant Swamp					
11-16	Coot	53	-	40	-
11-16	Mallard	100	-	290	-
11-16	Mallard	15	-	26	-
11-16	Widgeon	29	-	67	-
11-16	Widgeon	59	-	69	-

* Results less than reporting limit are indicated by a (-).

IX. APPENDIX B

ATMOSPHERIC AND VEGETATION SAMPLE RESULTS

APPENDIX B
TABLE 1

AVERAGE BETA ACTIVITY ON FILTERS
FROM PACIFIC NORTHWEST STATIONS - 1962
Units of $\mu\mu c/m^3$ of Filtered Air

Week Ending Date	Richland, Washington	Spokane, Washington	Boise, Idaho	Byers Landing	Klamath Falls, Oregon	Lewiston, Idaho	Walla Walla, Washington
1-6	3.4	2.0	8.4	2.3	7.6	10	5.8
1-13	10	5.9	12	7.7	7.6	10	12
1-20	8.8	5.0	5.5	6.6	2.9	10	9.8
1-27	5.8	3.2	5.9	4.1	2.9	4.4	7.2
2-3	6.0	5.2	3.8	3.5	2.9	8.5	12
2-10	12	5.0	4.0	10		7.5	11
2-17	4.1	1.0	4.0	1.8	4.0	3.6	3.8
2-24	6.5	7.4	4.7	5.1	4.0	6.2	7.2
3-3	7.7	5.4	6.6	5.0	3.3	4.8	8.6
3-10	4.1	2.3	3.8	3.0	3.3	4.8	3.9
3-17	4.8	3.0	3.9	3.5	3.7	2.4	6.2
3-24	4.5	3.9	5.8	4.7	3.7	2.0	6.0
3-30	4.5	3.7	5.4	2.8	16	1.6	7.5
4-6	9.2	5.5	8.6	8.1	9.3	3.4	11
4-13	5.0	3.9	6.1	3.7	4.9	1.9	6.4
4-20	7.6	6.7	7.9	5.4	4.9	2.8	9.9
4-27	2.5	1.8	6.2	6.4	4.9	1.4	3.6
5-4	3.2	2.4	4.6	2.5	3.7	1.4	4.3
5-11	5.0	4.1	5.3	3.1	4.5	1.4	4.3
5-18	3.1	2.3	2.1	2.6	2.9	1.2	3.3
5-25	2.1	1.8	2.6	1.6	2.2	0.7	2.8
6-1	2.9	3.6	4.8	2.2	3.0	1.4	2.8
6-8	2.5	2.2	3.2	1.8	3.4	1.2	3.6
6-15	5.1	3.5	6.6	3.4	4.5	2.6	6.4
6-22	5.3	5.1	6.4	4.8	5.1	2.8	8.7
6-29	4.9	3.4	6.4	3.0	3.9	2.2	5.5
7-6	3.4	2.6	5.0	2.2	4.2	1.6	4.7
7-12	4.0	3.2	4.2	2.0	3.0	2.1	5.6
7-19	2.4	2.2	5.4	1.8	3.1	1.3	3.1
7-27	3.6	3.0	3.9	3.0	3.3	1.9	4.4

No entry indicates no analysis made.

APPENDIX B
TABLE 1 (Continued)

AVERAGE BETA ACTIVITY ON FILTERS
FROM PACIFIC NORTHWEST STATIONS - 1962
Units of $\mu\mu c/m^3$ of Filtered Air

Week Ending Date	Richland, Washington	Spokane, Washington	Boise, Idaho	Byers Landing	Klamath Falls, Oregon	Lewiston, Idaho	Walla Walla, Washington
8-3	3.8	2.7	3.1	2.2	2.4	1.8	4.7
8-10	1.2	1.8	2.8	0.9	1.6	1.0	1.6
8-17	3.8	1.8	3.0	1.8	3.2	3.2	4.0
8-23	2.2	1.3	2.8	1.6	2.9	3.1	2.6
8-31	2.8	1.5	3.6	0.7	5.1	1.9	3.6
9-7	21	11	12	13	13	8.6	23
9-15	3.2	2.1	4.9	2.8	4.5	8.6	4.9
9-21	11	8.1	4.4	5.4	3.1	14	14
9-28	4.7	2.5	3.5	3.0	3.3	4.8	9.6
10-5	5.5		10	2.7	6.9	7.3	6.5
10-12	4.6	3.8	3.7	2.8	2.4	5.8	3.3
10-19	6.3	3.8	6.5	2.8	7.5	9.9	8.5
10-26	15	3.8	18	8.4	10	23	23
11-2	6.7	3.1	6.5	4.5	5.7	8.0	4.8
11-9	9.3		12	3.2	27	6.0	9.3
11-16	14	6.9	14	5.5	3.0	4.1	8.7
11-23	5.4		10	2.8	9.4	5.5	9.0
11-30	12		14	6.4	5.7	9.2	13
12-7	5.1	4.3	7.8	3.6	5.7	4.1	6.4
12-14	2.5	1.8	4.7	1.5	3.6	2.2	2.8
12-21	3.5	2.4	4.4	2.1	4.4	2.2	3.2
12-28	5.0	4.8	11	4.6	13	6.6	5.5

No entry indicates no analysis made.

APPENDIX B
TABLE 1 (Continued)

AVERAGE BETA ACTIVITY ON FILTERS
FROM PACIFIC NORTHWEST STATIONS - 1962
Units of $\mu\mu c/m^3$ of Filtered Air

Week Ending Date	Yakima, Washington	Pasco, Washington	Kennewick, Washington	Benton City, Washington	Seattle, Washington	Meacham, Oregon	Great Falls, Montana
1-6	3.9	3.4	2.6	3.6	4.6	6.8	7.3
1-13	7.8	6.4	5.7	7.7	5.5	5.6	12
1-20	5.2	8.6	8.6	9.5	3.0	2.6	6.6
1-27	4.0	6.5	5.8	6.3	3.4	5.9	4.8
2-3	5.0	5.7	4.5	4.6	3.6	9.0	11
2-10	5.0	9.0	8.2	11	3.2	6.9	4.6
2-17	2.8	4.9	4.5	4.4	1.8	3.7	2.4
2-24	3.9	2.9	2.7	3.2	4.6	3.9	4.2
3-3	5.2	8.6	7.6	8.3	4.9	6.5	5.5
3-10	2.5	4.2	4.3	4.0	2.2	4.5	4.6
3-17	3.2	3.6	3.5	4.0	3.5	4.0	4.8
3-24	4.0	5.0	4.6	5.8	3.2	5.8	5.9
3-30	2.8	2.0	3.0	3.4		4.1	4.9
4-6	5.8	8.5	7.7	6.5	6.8	9.6	6.6
4-13	5.8	3.7	3.5	3.3	3.4	5.6	4.4
4-20	4.9	6.4	6.0	5.8	3.7	9.1	9.9
4-27		4.6	3.5	4.5	1.8	2.1	6.4
5-4	1.8	2.9	2.3	2.2	2.7	3.8	3.5
5-11	4.0	3.9	3.8	4.4	3.7	4.0	4.8
5-18	1.9	3.2	2.9	3.1	1.8	2.1	2.5
5-25	1.6	2.3	2.6	3.4	1.5	2.1	2.6
6-1	2.8	1.8	1.5	2.0	1.3	3.0	
6-8	2.1	3.0	1.5	3.6	1.1	2.1	6.2
6-15	3.4	4.1	3.5	4.4	2.6	4.9	6.5
6-22	2.9	5.4	5.6	6.4	2.0	5.8	6.2
6-29	2.5	5.0	4.6	5.3	1.7	3.4	5.7
7-6	2.1	3.3	2.7	3.6	1.6	3.2	4.1
7-12	2.0	3.2	2.6	3.3	1.6	3.4	3.3
7-19	2.0	3.0	2.9	2.6	1.2	2.3	2.3
7-27	3.8	2.8	3.4	2.7	1.7	3.0	3.3

No entry indicates no analysis made.

APPENDIX B
TABLE 1 (Continued)

AVERAGE BETA ACTIVITY ON FILTERS
FROM PACIFIC NORTHWEST STATIONS - 1962
Units of $\mu\mu c/m^3$ of Filtered Air

Week Ending Date	Yakima, Washington	Pasco, Washington	Kennewick, Washington	Benton City, Washington	Seattle, Washington	Meacham, Oregon	Great Falls, Montana
8-3	2.1	3.7	3.4	3.9	1.3	3.0	2.1
8-10	1.1	0.7	1.5	2.1	0.7	1.1	1.9
8-17	2.3	1.9	1.7	2.1	1.9	2.9	3.5
8-23	2.0	2.8	2.5	3.4	0.7	1.9	2.0
8-31	2.0	2.4	1.8	2.4	1.0	4.8	3.4
9-7	12	15	13	13	7.7	20	6.1
9-15	2.2	5.9	5.3	5.3	3.0	2.2	
9-21	6.8	9.9	5.5	10	5.0	12	9.9
9-28	2.5	4.3	3.4	5.1	2.7	3.5	3.6
10-5	1.8	4.5	3.7	4.9	3.5	12	10
10-12	1.8	4.2	4.1	4.7	3.8	2.4	7.3
10-19	1.8	2.9	1.7	2.6	6.0	4.7	12
10-26	9	10	6.7	10	11	22	17
11-2	2.1	14	6.6	11	4.1	5.1	4.8
11-9	2.1	6.5	3.4	4.0	13	11	15
11-16	4.2	9.2	11	7.6	7.6	5.6	15
11-23	4.2	2.6	1.5	2.0	8.5	8.9	14
11-30	3.5	17	7.9	13	5.2	9.0	17
12-7	1.5	5.0	2.8	4.0	5.1	5.5	8.4
12-14	1.5	4.4	2.4	3.1	1.8	3.6	4.7
12-21	1.5	3.0	2.0	2.7	5.9	4.0	10
12-28	3.4	5.5	3.1	4.4	5.7	7.0	10

No entry indicates no analysis made.

APPENDIX B
TABLE 2

CONCENTRATIONS OF I^{131}
IN THE ATMOSPHERE - 1962
Units of 10^{-14} $\mu c/cc$ of Air

Date	Richland, Washington	North Richland, Washington	Benton City, Washington	Pasco, Washington
1-2	5.9	3.2	0.5	3.7
1-9	1.6	9.8	1.7	9.7
1-16	2.4	19	1.2	17
1-23	7.0	5.6	0.2	17
1-30	1.3	9.1	2.2	5.9
2-5	4.7	22	1.0	5.3
2-13	4.4	5.9	1.5	5.7
2-20	2.8	6.8	0.3	3.4
2-27	1.9	13	2.1	3.8
3-6	0.9	2.2	1.4	5.4
3-13	1.4	1.7	5.6	4.4
3-20	0.1	11	3.1	3.2
3-27	2.5	1.8	3.0	3.7
4-4	1.2	10	5.9	2.8
4-10	3.3	12	6.0	5.6
4-16	13	11	8.6	2.3
4-23	1.3	2.7	4.2	3.0
4-30	1.1	7.2	5.8	1.3
5-7	2.1	9.2	5.6	1.8
5-14	0.7	7.0	3.9	4.4
5-21	0.1	3.7	7.9	3.3
5-28	0.2	3.6	1.8	0.5
6-4	3.1	5.6	5.9	1.1
6-11	1.7	32	4.7	1.6
6-18	1.7	9.1	12	1.9
6-25	2.1	1.8	22	1.1
7-2	0.3	2.0	4.0	1.0
7-9	1.8	4.1	8.9	6.1
7-16	0.7	3.6	6.5	2.2
7-23	1.9	5.3	11	1.6
7-30	2.7	8.0	3.1	Lost
8-6	4.3	3.7	6.5	5.0
8-13	1.8	6.5	1.9	4.7
8-20	2.9	5.0	8.0	8.0
8-27	4.3	5.4	11	8.2
9-4	4.8	39	41	53
9-10	9.0	16	29	25
9-13	6.5	21	16	7.7
9-14	20	33	19	31

APPENDIX B
TABLE 2 (Continued)

CONCENTRATIONS OF I^{131}
IN THE ATMOSPHERE - 1962

Units of 10^{-14} $\mu c/cc$ of Air

Date	Richland, Washington	North Richland, Washington	Benton City, Washington	Pasco, Washington
9-18	56	65	33	18
9-25	2.3	11	9.0	17
10-2	2.7	5.9	7.6	11
10-9	3.3	11	11	14
10-15	1.1	7.9	6.7	40
10-23	2.8	18	26	23
10-30	3.1	18	21	19
11-6	1.8	8.4	7.3	8.5
11-13	4.2	14	16	11
11-19	2.2	7.3	8.6	4.4
11-26	11	13	20	7.8
12-3	0.5	1.0	4.8	2.2
12-10	3.2	6.3	1.9	2.4
12-18	2.5	4.3	5.9	3.5
12-27	0.9	3.4	3.1	0.2

APPENDIX B
TABLE 3

QUANTITY OF I^{131} RELEASED
FROM THE SEPARATIONS AREAS - 1962

Month	Average curies/day
January	0.31
February	0.23
March	0.22
April	1.5
May	0.04
June	0.06
July	0.23
August	0.26
September	0.83
October	0.11
November	0.10
December	0.31

APPENDIX B
TABLE 4

I^{131} IN BEEF THYROIDS FROM CATTLE SLAUGHTERED AT PASCO, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
1-4	37.45	3.7	Kennewick
1-4	40.16	6.3	Pasco
1-4	44.18	59	Burbank
1-4	43.40	3.0	Eltopia
1-4	29.33	12	Kennewick
1-10	55.7	17	Franklin Co.
1-11	49.3	2.1	Braden School
1-11	38.5	2.5	Braden School
1-12	23.7	11	Locust Road
1-13	45.78	3.9	Mesa
1-13	23.57	6.5	Pasco
1-16	26.0	24	Pasco
1-16	43.8	2.7	Mesa
1-16	37.3	0.79	Pasco
1-16	62.1	3.0	Kennewick
1-16	73.8	6.4	Burbank
1-17	43.12	6.3	Pasco
1-17	26.66	62	Pasco
1-17	31.83	3.2	Kennewick
2-6	29.63	3.5	Kennewick
2-6	40.15	0.77	Kennewick
2-6	42.48	1.2	Pasco
2-6	36.25	1.1	Pasco
2-26	32.7	1.2	Mesa
2-26	43.7	0.81	Mesa
2-26	45.6	0.48	Mesa
2-26	48.8	0.51	Mesa
2-26	56.0	0.28	Connell
3-7	30.32	3.5	Kennewick
3-7	36.21	6.2	Kennewick
3-7	34.00	1.3	Pasco
3-7	33.75	2.2	Eltopia
3-7	67.31	1.3	Kennewick
3-14	37.23	2.2	Pasco
3-14	58.18	7.5	Kennewick
3-14	41.10	3.0	Kennewick
3-14	33.65	2.8	Pasco
3-14	23.36	3.2	Pasco
3-21	31.62	4.2	Pasco
3-21	21.69	4.7	Kennewick
3-21	28.78	3.4	Hermiston
3-21	24.31	0.21	Kennewick
3-21	47.45	0.11	Pasco

APPENDIX B
TABLE 4 (Continued)

I^{131} IN BEEF THYROIDS FROM CATTLE SLAUGHTERED AT PASCO, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
3-28	34.8	57	Mesa
3-28	41.9	4.2	Pasco
3-28	37.8	6.5	Pasco
3-28	44.2	1.0	Kennewick
3-28	35.2	55	Pasco
4-12	61	1.9	Pasco
4-12	46	4.1	W. Richland
4-12	39	5.0	Mesa
4-12	30	6.5	Connell
4-12	32	2.3	Richland
4-25	43.79	1.6	Kennewick
4-25	43.9	2.9	Kennewick
4-25	39.75	3.1	Pasco
4-25	30.29	5.9	Pasco
4-25	47.51	7.8	Pasco
4-27	34	< 2.5	Franklin Co.
4-27	29	4.5	Franklin Co.
5-9	60.9	0.37	Connell
5-9	46.3	0.79	Kennewick
5-9	34.6	< 0.24	Pasco
5-9	28.8	< 0.32	Pasco
6-6	31.5	< 0.37	Kahlotus
6-6	30.5	2.2	Kennewick
6-6	54.7	1.2	Pasco
6-6	23.3	14	Kennewick
6-6	49.4	0.68	Pasco
6-20	48.5	0.21	Pasco
6-20	63.5	40	Kennewick
6-20	39.2	1.4	Kennewick
6-20	51.0	17	Eltopia
6-20	23.5	1.3	Mesa
7-18	58.8	86	Kennewick
7-18	52.4	82	Kennewick
7-18	41.5	71	Pasco
7-18	48.7	22	Pasco
7-18	35.6	0.31	Kennewick
8-1	31.2	4.5	Kennewick
8-1	40.4	21	Pasco
8-1	30.9	< 0.35	Kennewick
8-1	36.6	32	Pasco
8-1	38.5	4.0	Kennewick

APPENDIX B
TABLE 4 (Continued)

I^{131} IN BEEF THYROIDS FROM CATTLE SLAUGHTERED AT PASCO, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
8-8	36.2	1.2	Pasco
8-8	36.6	0.80	Pasco
8-8	20.5	4.3	Kennewick
8-8	35.4	0.79	Pasco
8-8	44.7	2.9	Pasco
9-17	68.3	2.5	Pasco
9-17	60.9	6.4	Connell
9-17	41.6	350	Pasco
9-17	46.5	800	Pasco
9-17	39.7	18	Pasco
10-11	49	35	Pasco
10-11	47	0.68	Pasco
10-11	48	120	Pasco
10-11	32	860	Pasco
10-11	95	86	Pasco
10-25	73	280	Pasco
10-25	29	16	Pasco
10-25	41	28	Pasco
10-25	44	320	Pasco
10-25	38	310	Pasco

APPENDIX B
TABLE 5

I^{131} IN BEEF THYROIDS FROM CATTLE SLAUGHTERED AT MOSES LAKE, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
1-10	52.7	3.2	Quincy
1-13	38.0	5.7	Moses Lake
1-13	29.6	2.6	Moses Lake
1-13	44.8	11	Moses Lake
1-13	26.7	97	Moses Lake
1-13	48.4	17	Moses Lake
1-27	72.4	0.88	Moses Lake
1-27	54.3	2.6	Moses Lake
1-27	48.2	1.4	Moses Lake
1-27	47.9	1.9	Moses Lake
1-27	44.5	2.4	Lind
2-5	37.0	0.33	Moses Lake
2-10	24.4	3.3	S. W. Moses Lake
2-10	55.5	< 2.2	N. Moses Lake
2-10	34.1	0.72	S. Moses Lake
2-10	48.2	1.1	Warden
2-10	37.1	< 3.3	Warden
2-17	32.2	4.3	Moses Lake
2-17	56.8	2.0	Moses Lake
2-17	32.0	2.3	Marlin
2-17	55.8	5.8	Stratford
2-17	44.9	1.8	Wilson Creek
3-17	32.0	< 2.6	Moses Lake
3-17	34.0	< 2.5	Moses Lake
3-17	30.0	< 3.0	Moses Lake
3-17	34.0	< 2.7	Moses Lake
3-17	28.0	< 3.0	Moses Lake
3-31	28.3	< 3.4	Wilson Creek
3-31	37.5	< 2.5	Block 42, Line Coulee
3-31	32.3	4.4	Block 42, Line Coulee
3-31	43.7	< 2.2	East Moses Lake
3-31	24.7	< 3.9	Block 89, Moses Lake
4-21	29.5	5.1	Marlin
4-21	31	32	Block 89, Moses Lake
4-21	26	61	Benge
4-21	32	4.2	Block 40, Moses Lake
4-21	32	25	Benge
5-5	43	17	Ritzville
5-5	33	< 3.6	Moses Lake
5-5	39	4.8	Moses Lake
5-5	56	4.7	Wilson Creek
5-5	46	5.4	Moses Lake

APPENDIX B
TABLE 5 (Continued)

I^{131} IN BEEF THYROIDS FROM CATTLE SLAUGHTERED AT MOSES LAKE, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
5-19	19	6.1	Othello
5-19	31.5	7.5	Lind
5-19	46.4	4.6	Mesa
5-19	41.2	15	Moses Lake
5-19	22.2	< 4.3	Mesa
6-2	36.3	3.3	Block 40
6-2	17.3	7.6	Smyrna
6-2	32.4	4.4	Smyrna
6-2	19.4	12	Othello
6-2	21.0	< 4.5	Warden
6-16	32	13	Ellensburg
6-16	39	< 2.4	Quincy
6-16	29	< 3.2	Quincy
6-16	38	< 2.4	Warden
6-16	29	10	Odessa
6-30	61	70	Connell
6-30	41	850	Wilson Creek
6-30	38	14	Moses Coulee
6-30	22	92	Othello
6-30	30	< 3.1	Moses Lake
7-14	39	< 2.3	Quincy
7-14	39	23	Moses Lake
7-14	43	48	Ephrata
7-14	38	18	Moses Lake
7-14	33	18	Moses Lake
7-28	39	20	Moses Lake
7-28	38	37	Odessa
7-28	59	1.8	Othello
7-28	32	51	Othello
7-28	27	33	Odessa
8-11	33	5.7	Othello
8-11	54	< 1.8	Moses Lake
8-11	49	2.7	Warden
8-11	80	5.7	Moses Lake
8-11	62	< 1.8	Moses Lake
8-25	65	< 1.5	Royal City
8-25	32	9.7	Moses Lake
8-25	42	< 2.3	Warden
8-25	61	60	Moses Lake
8-25	44	80	Warden
9-8	38	240	Ritzville
9-8	56	240	Moses Lake

APPENDIX B
TABLE 5 (Continued)

I^{131} IN BEEF THYROIDS FROM
CATTLE SLAUGHTERED AT MOSES LAKE, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
9-8	21	590	Ritzville
9-8	50	390	Ritzville
9-8	28	340	Warden
9-22	53	460	Block 40
9-22	38	570	Moses Lake
9-22	36	50	Block 42
9-22	52	69	Block 42
9-22	30	1300	Ritzville
10-6	55	110	Moses Lake
10-6	37	680	Moses Lake
10-6	52	54	Moses Lake
10-6	38	790	Moses Lake
10-6	39	< 2.3	Moses Lake
10-20	27	2300	Ritzville
10-20	16	220	Warden
10-20	26	400	Warden
10-20	27	1700	Ritzville
10-20	23	190	Quincy
11-3	25	260	Warden
11-3	33	210	Warden
11-3	47	1700	Ritzville
11-3	40	130	Grand Coulee
11-7	46	170	Warden
11-17	25	600	Ritzville
11-17	19	220	Othello
11-17	36	1600	Ritzville
11-17	26	360	Moses Lake
11-17	42	360	Moses Lake
12-1	46	4100	Ritzville Tag #410D
12-1	22	8700	Ritzville Tag #419D
12-1	24	3500	Ritzville Tag #733D
12-1	28	3400	Ritzville Tag #420D
12-1	34	2700	Hartline Tag #913D
12-15	53	10	Grant Co. Tag #251D
12-15	60	110	Othello Tag #845D
12-15	46	9.2	Odessa Tag #628D
12-15	29	160	Othello Kill #6228
12-15	29	830	Lind Kill #6227
12-29	39	110	Moses Lake Tag #3490
12-29	29	140	Moses Lake Tag #350
12-29	35	120	Moses Lake Tag #645D
12-29	47	< 1.8	Moses Lake Tag #390
12-29	27	260	Moses Lake Kill #6888

APPENDIX B
TABLE 6

I^{131} IN BEEF THYROIDS FROM
CATTLE SLAUGHTERED AT TOPPENISH, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
1-19	22.2	2.8	Toppenish
1-19	47.0	4.3	Toppenish
2-2	79.2	0.74	Toppenish
2-2	13.8	< 9.7	Wapato
2-2	52.2	1.3	Wapato
2-16	29.0	< 4.6	Toppenish
2-16	30.6	< 4.4	Toppenish
2-16	14.3	< 9.3	Wapato
2-23	29	8.2	White Swan
2-23	70	5.1	White Swan
2-23	33	12	Moxee
2-23	71	3.7	Wapato
2-23	36	6.6	Yakima
2-26	35	2.8	Brownstone
3-2	31	6.0	Wapato
3-2	45	4.0	Wapato
3-2	35	3.8	Wapato
3-2	35	6.8	Wapato
3-16	40	3.0	Granger
3-16	24	3.5	Granger
3-16	26	3.7	Zillah
3-16	31	1.9	Zillah
3-16	34	1.9	Toppenish
4-13	39	< 2.3	Wapato
4-13	49	< 1.9	Wiley City
4-13	41	< 2.4	White Swan
4-25	30	11	Yakima Co.
4-27	53	1.9	Moxee
4-27	35	2.9	Wapato
4-27	53	1.9	Moxee
5-18	49	3.4	Wiley City
5-18	38	3.5	Toppenish
5-18	25	< 4.4	Wapato
5-18	61	2.7	Wapato
5-18	57	2.1	Moxee
5-25	32	3.7	Wapato
5-25	37	3.4	Wapato
6-15	50	< 2.0	Wapato
6-15	29	< 3.4	Wapato
6-15	28	< 3.5	Wapato
6-15	30	< 3.3	Wapato
6-15	26	< 3.8	Harrah

APPENDIX B
TABLE 6 (Continued)

I^{131} IN BEEF THYROIDS FROM
CATTLE SLAUGHTERED AT TOPPENISH, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
6-29	51	25	Wahkiacus
6-29	54	27	Wapato
6-29	27	23	Wahkiacus
6-29	52	28	Wahkiacus
6-29	49	33	Wahkiacus
7-13	38	< 2.6	White Swan
7-13	43	< 2.3	Zillah
7-13	36	< 2.7	Zillah
7-13	33	11	Wapato
7-13	40	3.3	White Swan
7-27	30	3.3	Yakima
7-27	57	2.6	Moxee
7-27	43	15	Wapato
7-27	35	17	Wapato
7-27	29	3.6	Yakima
8-10	39	< 2.7	Harrah
8-10	40	6.9	Toppenish
8-10	50	16	Toppenish
8-10	45	26	Wapato
8-10	18	< 5.9	Toppenish
8-27	45	4.0	White Swan
8-27	88	13	Wapato
8-27	40	44	Wapato
8-27	39	680	Wapato
9-10	41	230	Yakima
9-10	61	180	Yakima
9-10	34	500	Satus
9-10	31	500	Satus
9-10	27	55	Yakima
9-21	35	310	White Swan
9-21	29	1300	White Swan
9-21	46	730	Wahkiacus
9-21	43	850	Wahkiacus
10-5	33	210	Yakima
10-5	38	710	Granger
10-5	48	510	Yakima
10-5	41	910	Yakima
10-5	30	300	Yakima
10-12	76	220	Zillah
10-12	35	680	Toppenish
10-12	38	230	Wapato

APPENDIX B
TABLE 6 (Continued)

I^{131} IN BEEF THYROIDS FROM CATTLE SLAUGHTERED AT TOPPENISH, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
10-12	45	170	Zillah
10-12	35	380	Yakima
11-2	52	90	Yakima
11-2	44	75	Yakima
11-2	85	7.8	Yakima
11-2	30	1300	Wapato
11-5	35	1100	Wapato
11-16	15	44	Wapato
11-16	63	940	Wapato
11-16	44	6.8	Yakima
11-16	36	23	Wapato
11-16	28	700	Toppenish
12-7	37	160	Zillah
12-7	32	110	Yakima
12-7	52	60	Yakima
12-7	84	41	Yakima
12-7	36	25	Yakima
12-14	37	42	Moxee
12-14	46	11	Yakima
12-14	41	24	Wapato
12-14	47	5.6	Cowiche
12-14	28	320	Wapato

APPENDIX B
TABLE 7

I^{131} IN BEEF THYROIDS FROM CATTLE SLAUGHTERED AT WALLA WALLA, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
1-11	28.1	210	Prescott
1-12	63.7	1.3	Milton-Freewater, Oregon
1-25	48.8	2.4	Walla Walla
1-25	49.6	9.5	Prescott
2-5	71.4	< 1.7	Walla Walla Co.
2-6	55.0	0.6	Walla Walla Co.
2-7	48.0	5.6	Walla Walla Co.
2-7	52.0	5.6	Walla Walla Co.
2-8	58.0	0.9	Touchet
2-7	25.0	< 5.4	Waitsburg
2-23	50	9.0	College Place
2-23	18	11	Walla Walla
2-23	25	15	Umapine, Oregon
2-23	70	4.5	Walla Walla
2-23	31	9.1	Walla Walla
3-8	47	8.2	Walla Walla
3-8	36	< 2.7	Starbuck
3-8	21	< 4.6	Starbuck
3-8	37	< 2.6	Walla Walla
3-8	18	< 5.4	Starbuck
1-25	23.1	2.7	Lowden
1-25	21.2	4.8	Lowden
2-8	30.0	1.5	Lowden
3-21	31	< 3.0	Touchet
3-21	61	1.4	Lowden
3-21	23	< 4.0	Lowden
3-21	20	4.8	Walla Walla
3-21	46	< 2.0	Lowden
4-13	26	3.9	Lowden
4-13	26	< 3.8	Lowden
4-13	32	< 3.1	Lowden
4-13	20	< 4.9	Walla Walla
4-12	25	6.8	Milton-Freewater, Oregon
4-24	25	5.4	Lowden
4-24	38	6.9	Lowden
4-24	23	6.2	Lowden
4-24	32	< 3.0	Walla Walla
4-24	20	< 4.9	Touchet

APPENDIX B
TABLE 7 (Continued)

I^{131} IN BEEF THYROIDS FROM CATTLE SLAUGHTERED AT WALLA WALLA, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
5-2	34.5	< 3.4	Walla Walla
5-2	39.7	< 2.7	Walla Walla
5-2	38.7	4.1	Touchet
5-2	49.3	6.1	Prescott
5-2	40.6	8.1	Walla Walla
5-9	47.6	< 0.2	Walla Walla
5-16	28.0	17	Clyde-Snake River
5-16	35.0	12	Clyde-Snake River
5-16	29.0	6.3	Walla Walla
5-16	34.0	16	Clyde-Snake River
5-16	23.0	22	Clyde-Snake River
6-5	32.5	3.2	Lowden
6-5	38.6	5.1	College Place
6-5	52.7	14	Lowden
6-5	34.6	3.9	Lowden
6-5	36.0	10	College Place
6-21	29	< 3.4	Waitsburg
6-21	58	29	Milton-Freewater, Oregon
6-21	32	130	Walla Walla
6-21	30	170	Lowden
6-21	35	95	Walla Walla
7-12	23	227	Cottonwood
7-12	51	< 1.9	North Fork W.W. River
7-13	35	137	Walla Walla
7-13	50	122	Cottonwood
7-13	30	394	Cottonwood
7-19	50	141	Cottonwood
7-19	25	25	College Place
7-20	51	80	Sprague and State Line
7-20	3	61	Hermiston, Oregon
7-20	19	89	Sprague and State Line
8-24	23	130	LaGrande, Oregon
8-24	42	80	Lowden
8-24	27	70	Milton-Freewater, Oregon
8-24	27	38	Milton-Freewater, Oregon
8-24	47	47	Milton-Freewater, Oregon

APPENDIX B
TABLE 7 (Continued)

I^{131} IN BEEF THYROIDS FROM CATTLE SLAUGHTERED AT WALLA WALLA, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
9-20	55	780	State Line
9-20	32	1200	State Line
9-20	41	983	Walla Walla
9-20	28	1500	Walla Walla
9-20	48	22	Walla Walla
10-2	31	220	Walla Walla
10-2	16	1100	Lowden
10-2	46	600	Walla Walla
10-2	47	520	Walla Walla
10-2	34	880	Touchet
10-18	36	410	Walla Walla
10-18	22	1000	Walla Walla
10-18	19	690	Walla Walla
10-18	26	9.7	Lowden
10-18	44	1200	Walla Walla
10-25	35	2200	Blue Mountains
10-25	30	41	Pasco
10-25	35	620	Prescott
10-25	26	2600	Blue Mountains
10-25	45	680	Weston, Oregon
11-8	47	22	Milton-Freewater, Oregon
11-8	42	19	Blalock Mountain
11-8	34	400	Walla Walla
11-8	29	13	Lowden
11-8	43	560	Walla Walla
11-20	53	400	Walla Walla
11-20	46	2100	Blue Mountains
11-20	37	130	Clyde
11-20	24	16	Hinkle, Oregon
11-20	30	3800	Blue Mountains

APPENDIX B
TABLE 8

I^{131} IN BEEF THYROIDS FROM CATTLE SLAUGHTERED AT WENATCHEE, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
1-10	59.1	2.4	Chelan Co.
1-12	66.3	0.23	Chelan Co.
2-5	68.7	4.2	Chelan Co.
2-5	67.6	3.6	Chelan Co.
2-5	53.3	< 2.3	Chelan Co.
2-26	88	0.12	Douglas Co.
2-26	35	1.6	Chelan Co.
2-26	66	2.7	Douglas Co.
2-26	68	1.4	Grant Co.
2-26	81	1.5	Chelan Co.
3-22	31	< 4.3	Grant Co.
3-22	41	< 3.3	Othello
3-22	31	< 4.4	Othello
3-22	80	< 1.7	Chelan Co.
3-22	31	< 4.4	Grant Co.
4-9	23	< 3.9	Douglas Co.
4-9	27	< 3.3	Douglas Co.
4-9	47	3.6	Grant Co.
4-9	60	< 1.5	Grant Co.
4-9	50	< 1.8	Douglas Co.
4-16	59	< 1.6	Chelan Co.
4-16	31	< 3.0	Chelan Co.
4-16	49	37	Grant Co.
4-16	31	26	Grant Co.
4-16	57	1.9	Grant Co.
4-25	42	< 2.0	Douglas Co.
4-27	54	2.2	Chelan Co.
5-7	51	< 2.2	Douglas Co.
5-7	38	< 2.9	Chelan Co., S.
5-7	40	< 2.8	Grant Co.
5-7	63	2.1	Chelan Co., S.
5-7	27	< 4.1	Chelan Co., S.
5-22	55	< 1.7	Spokane Co.
5-22	48.7	3.0	Chelan Co.
5-22	45.2	5.4	Grant Co.
5-22	41	7.3	Grant Co.
5-22	36	9.7	Grant Co.
6-7	37	< 2.4	S.E. Chelan Co.
6-7	36	< 3.0	Grant Co.
6-7	37	< 2.9	Grant Co.
6-7	65	1.7	Okanogan Co.
6-7	48	< 2.2	S.E. Chelan Co.

APPENDIX B
TABLE 8 (Continued)

I^{131} IN BEEF THYROIDS FROM
CATTLE SLAUGHTERED AT WENATCHEE, WASHINGTON - 1962

Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
6-19	37	5.5	Grant Co.
6-19	33	< 2.9	Grant Co.
6-19	33	16	Grant Co.
6-19	36	210	Grant Co.
6-19	42	12	Grant Co.
7-9	58	13	Grant Co.
7-9	33	< 2.7	Grant Co.
7-9	38	21	Grant Co.
7-9	50	6.6	Lincoln Co.
7-9	48	280	Lincoln Co.
7-26	30.3	7.3	Douglas Co.
7-26	45.7	5.2	Douglas Co.
7-26	32.4	13	Douglas Co.
7-26	55	< 1.6	Chelan Co.
7-26	33.7	< 2.6	Chelan Co.
8-7	24.3	< 3.7	Douglas Co.
8-7	36.5	< 2.5	Grant Co.
8-7	19.1	13	Grant Co.
8-7	56	16	Lincoln Co.
8-7	46.4	5.5	Grant Co.
8-20	39	89	Chelan Co.
8-20	32	23	Grant Co.
8-20	47	2.7	Grant Co.
8-20	30.3	< 3.1	N.W. Grant Co.
8-20	39.3	18	Chelan Co.
9-5	62	91	Grant Co.
9-5	30	15	Douglas Co.
9-5	67	52	Douglas Co.
9-5	34	< 4.1	Franklin Co.
9-5	43	77	Adams Co.
9-18	45	6.7	S.E. Chelan Co.
9-18	46	690	S.E. Chelan Co.
9-18	57	18	N.W. Grant Co.
9-18	59	990	S.E. Chelan Co.
9-18	45	670	S.E. Chelan Co.
10-2	34	1700	S.E. Chelan Co.
10-2	49	1100	W. Douglas Co.
10-2	49	1100	W. Douglas Co.
10-2	49	250	Grant Co.
10-2	33	280	E. Grant Co.

APPENDIX B
TABLE 8 (Continued)

I^{131} IN BEEF THYROIDS FROM
CATTLE SLAUGHTERED AT WENATCHEE, WASHINGTON - 1962
Units of μμc/g of Thyroid

Date Sampled	Thyroid Wt (g)	I^{131} Concentration	Grazing Area
10-24	47	490	W. Douglas Co.
10-24	44	1100	W. Douglas Co.
10-24	57	400	N.E. Kittitas Co.
10-24	72	870	W. Douglas Co.
10-24	39	320	N.E. Kittitas Co.
11-14	51	51	Douglas Co.
11-14	43	24	Lincoln Co.
11-14	32	31	Lincoln Co.
11-14	63	2.5	Franklin Co.
11-14	40	99	Grant Co.
11-27	63	140	Chelan Co., S.C.
11-27	56	2500	Chelan Co., S.C.
11-27	28	110	Chelan Co., S.C.
11-27	115	41	Chelan Co., S.C.
11-27	53	160	Chelan Co., S.C.
12-11	73	32	Chelan Co.
12-11	49	27	Grant Co.
12-11	35	13	Grant Co.
12-11	54	61	Pend O'reille Co.
12-11	38	690	Grant Co.
12-18	58	18	S.E. Chelan Co.
12-18	59	450	Grant Co.
12-18	43	25	N.E. Grant Co.
12-18	41	3.4	S.E. Chelan Co.
12-18	71	5.0	S.E. Chelan Co.

X. APPENDIX C

FARM PRODUCE AND COMMERCIAL FOODSTUFF RESULTS

APPENDIX C
TABLE 1

CONCENTRATIONS OF I^{131} IN MILK - 1962

Units of μμc/ℓ

Date	I^{131}	Date	I^{131}	Date	I^{131}
Ringold					
1-3	7.3	5-8	6.6	9-12	85
1-9	7.7	5-15	2.6	9-20	167
1-15	3.6	5-23	< 4.6	9-26	117
1-23	5.3	5-29	2.4	10-2	88
1-29	3.2	6-6	3.3	10-10	74
2-5	4.2	6-12	< 20	10-16	44
2-14	< 3.3	6-20	64	10-24	69
2-28	4.7	7-10	4.6	10-30	103
3-6	1.3	7-18	4.8	11-7	96
3-14	1.7	7-24	1.6	11-13	351
3-20	< 16	8-7	5.2	11-21	362
3-28	5.2	8-15	7.4	11-27	548
4-3	8.3	8-21	16	12-5	350
4-11	68	8-29	19	12-11	354
4-17	31	9-4	68	12-19	334
4-25	14			12-27	69
Riverview					
1-3	2.1	5-8	3.0	9-12	63
1-9	< 2.9	5-15	2.0	9-20	83
1-15	4.4	5-23	< 3.2	9-26	31
1-23	< 1.4	5-29	3.7	10-2	43
1-29	2.9	6-6	3.1	10-10	45
2-5	< 2.1	6-12	1.8	10-16	40
2-15	< 1.7	6-20	66	10-24	29
2-20	< 4.0	6-26	20	10-30	35
2-28	< 1.1	7-10	11	11-1	13
3-6	< 2.6	7-18	4.2	11-7	12
3-14	< 1.8	7-24	6.5	11-13	24
3-20	< 1.1	8-1	5.4	11-21	31
3-28	< 1.3	8-7	4.3	11-27	80
4-3	4.2	8-15	10	12-5	32
4-11	< 2.1	8-21	22	12-11	6.3
4-17	3.0	8-29	27	12-19	3.6
4-25	< 2.0	9-4	54	12-27	2.5
5-1	< 1.2				

Results less than the reporting limit are indicated by a (-).

APPENDIX C
TABLE 1 (Continued)

CONCENTRATIONS OF I^{131} IN MILK - 1962

Units of μμc/ℓ

Date	I^{131}	Date	I^{131}	Date	I^{131}
Benton City					
1-3	3.7	8-8	2.5	10-11	50
1-8	< 1.2	8-9	1.7	10-12	39
1-17	< 1.6	8-13	2.5	10-15	63
1-23	1.4	8-14	2.8	10-16	50
1-31	1.9	8-15	3.7	10-17	50
2-5	< 2.1	8-16	2.5	10-18	50
2-14	< 1.5	8-17	3.6	10-19	46
2-20	< 1.6	8-20	9.6	10-22	41
2-27	< 1.2	8-22	6.5	10-23	52
3-6	< 1.3	8-23	10	10-24	50
3-14	< 2.6	8-24	11	10-25	61
3-21	< 1.9	8-28	13	10-26	52
3-28	< 1.7	8-29	12	10-29	24
4-12	< 1.8	8-30	18	10-30	22
5-9	< 2.4	8-31	25	10-31	17
6-5	< 2.4	9-4	52	11-1	19
6-20	52	9-5	61	11-2	19
6-28	16	9-6	69	11-5	20
7-2	6.6	9-7	41	11-6	18
7-5	4.5	9-10	38	11-7	17
7-6	5.4	9-11	42	11-8	16
7-9	3.5	9-12	58	11-9	13
7-10	4.5	9-13	60	11-12	42
7-11	4.0	9-14	51	11-13	37
7-12	4.2	9-17	47	11-14	27
7-13	2.6	9-18	61	11-15	19
7-16	1.7	9-19	87	11-16	13
7-17	2.1	9-20	77	11-19	6.9
7-18	1.4	9-21	74	11-20	16
7-19	4.0	9-24	49	11-21	27
7-23	-	9-25	38	11-26	61
7-24	1.9	9-26	31	11-27	63
7-25	< 2.2	9-27	28	11-28	70
7-26	-	9-28	23	11-29	61
7-27	3.7	10-1	37	11-30	55
7-30	2.0	10-2	36	12-3	29
7-31	1.0	10-3	33	12-4	34
8-1	1.6	10-4	38	12-5	39
8-2	3.2	10-5	38	12-6	29
8-3	2.4	10-8	34	12-7	24
8-6	< 1.7	10-9	45	12-10	18
8-7	< 1.6	10-10	55	12-11	16

APPENDIX C
TABLE 1 (Continued)

CONCENTRATIONS OF I^{131} IN MILK - 1962

Units of μμc/ℓ

Date	I^{131}	Date	I^{131}	Date	I^{131}
Benton City (Continued)					
12-12	18	12-18	49	12-26	6.1
12-13	15	12-19	48	12-27	3.9
12-14	15	12-20	21	12-28	9.1
12-17	63	12-21	18	12-29	6.7
				12-31	6.1
Eltopia					
2-28	< 1.2	6-12	< 2.0	10-2	84
3-3	1.3	6-20	4.4	10-10	77
3-14	< 1.2	6-26	7.5	10-16	49
3-20	< 1.1	7-10	7.8	10-24	141
3-28	< 1.3	7-18	5.2	10-30	216
4-3	5.0	7-24	3.1	11-1	181
4-11	17	8-1	8.7	11-7	217
4-17	12	8-7	9.5	11-13	220
4-25	3.0	8-15	6.3	11-21	329
5-1	< 1.8	8-21	12	11-27	362
5-8	1.4	8-29	40	12-5	23
5-15	< 1.4	9-4	58	12-11	11
5-23	2.0	9-12	67	12-19	3.4
5-29	2.2	9-18	106	12-27	2.9
6-6	< 2.3	9-26	58		
Mesa					
2-28	< 1.5	6-12	1.3	10-2	4.5
3-6	< 1.1	6-20	10	10-10	9.3
3-14	< 1.1	6-26	1.4	10-16	3.8
3-20	< 3.3	7-10	7.8	10-24	282
3-28	< 1.1	7-18	6.7	10-30	582
4-3	5.0	7-24	4.1	11-1	461
4-11	21	8-1	2.1	11-7	510
4-17	2.5	8-7	< 1.5	11-13	233
4-25	< 1.3	8-15	2.4	11-21	100
5-1	< 1.2	8-21	26	11-27	111
5-8	< 2.4	8-29	18	12-5	58
5-15	3.7	9-4	19	12-11	36
5-23	< 2.0	9-12	14	12-19	24
5-29	< 2.3	9-18	33	12-27	6.0
6-6	< 1.2	9-26	3.2		

APPENDIX C
TABLE I (Continued)

CONCENTRATIONS OF I^{131} IN MILK - 1962

Units of μμc/ℓ

Date	I^{131}	Date	I^{131}	Date	I^{131}
Local Purchase - Commercial Milk					
Brand A					
1-2	1.4	3-13	< 5.9	7-17	4.8
1-8	< 1.6	3-28	< 1.5	8-23	4.5
1-16	< 2.7	4-11	< 2.1	9-17	37
1-23	1.7	4-26	< 3.7	10-17	32
1-29	< 1.4	5-10	< 1.1	10-22	27
2-5	< 2.3	5-22	< 1.6	11-28	59
2-13	< 2.2	6-7	< 1.9	12-6	60
2-19	< 5.3	6-19	< 2.0	12-17	13
2-26	< 1.3				
Brand F					
1-2	1.1	4-11	< 1.1	10-22	52
1-8	-	4-26	< 2.9	10-29	26
1-16	< 2.9	5-9	< 2.0	11-5	22
1-23	< 1.8	5-22	< 1.2	11-12	13
1-29	< 1.4	6-7	< 2.1	11-19	13
2-5	< 2.1	6-19	< 2.3	11-28	24
2-13	1.6	7-17	1.3	12-6	21
2-19	< 1.7	8-23	11	12-12	12
2-26	< 1.3	9-17	35	12-17	35
3-13	< 2.8	10-17	45	12-28	7.2
3-28	< 1.7				
Brand H					
1-2	1.5	3-13	< 2.8	7-17	< 2.4
1-8	< 1.4	3-28	< 1.3	8-23	5.3
1-16	< 1.7	4-11	< 1.4	9-17	46
1-23	< 1.5	4-26	< 2.0	10-17	48
1-29	< 1.3	5-9	< 1.2	10-22	55
2-5	< 2.1	5-22	< 1.6	11-28	54
2-13	< 1.2	6-7	< 1.9	12-6	36
2-19	< 1.7	6-19	< 1.3	12-17	9.0
2-26	< 1.4				

APPENDIX C
TABLE 2

CONCENTRATIONS OF RADIONUCLIDES IN MILK - 1962

Units of μμc/ℓ

Date	K^{40}	Zn^{65}	Cs^{137}	P^{32}	Sr^{90}
Reporting Limits*	300	80	30	100	2
Ringold					
1-3	1300	770	-	370	
1-9	1900	750	-	280	-
1-15	1800	820	-	230	
1-29	5600	1800	-	170	
2-5	1500	630	-	190	6.3
3-6	1400	1200		110	15
4-3	1700	1100	-	-	10
4-17	1500	540	-	120	
4-27	2000	630	-	180	
5-1	1900	580	36	140	24
5-8	1900	1100	-	-	
5-15	1800	940	-	620	
5-23	1800	1000	-	450	
6-6	1400	900	-	790	
6-20	1900		60	210	
6-26	1600	900	-	660	
7-18	1600	1000	-	1600	
8-1	1500	1200	-	2100	2.7
8-15	1700	850	62	380	
8-29	1600	920	-	2700	
9-12	1400	950	38	1700	
10-10	1500	940	36	690	-
10-24	1700	1500	100	1200	
11-7	1400	800	65	820	-
11-13	1400	1300	91	1400	
12-27	-	-	-		
Riverview Irrigation District					
1-9	1600	310	-	-	3.1
1-15	1800	260	-	-	
1-29	5300	800	-	-	
2-5	1600	260	-	-	6.6
2-15	1300	120	-	-	
2-20	1500	190	-	-	
2-28	1400	140		-	

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX C
TABLE 2 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MILK - 1962

Units of μμc/ℓ

Date	K^{40}	Zn^{65}	Cs^{137}	P^{32}	Sr^{90}
Reporting Limits*	300	80	30	100	2
Riverview Irrigation District (Continued)					
3-6	1200	180		-	-
4-3	1900	170	-	-	
4-17	2300	220	74	-	
4-25	1700	110	32	-	
5-1	1600	93	50	-	
5-8	1800	320	-	940	
5-15	1700	570	33	1100	
5-23	1800	580	76	1100	
5-29	1700	630	62	850	
6-12	2000	560	-	1600	
6-20	1800		-	1100	
6-26	1300	630	-	1200	
7-10	1300	810		880	3.9
7-18	1300	910	-	1100	
7-24	1300	770		770	
8-1	1500	730	46	840	2.0
8-7	1600	830	-	800	
8-15	1400	1100	44	2100	
8-21	1300	1200	-	2200	
8-29	1400	1200	-	1800	
9-4	1400	1100	33	1500	2.4
9-12	1400	1100	-	1300	
9-26	1400	1100	-	2600	2.9
10-2	1600	1100	-	2700	
10-10	1500	860	-	1200	-
10-16	1200	770	-	750	
10-24	1400	940	-	1000	
10-30	1200	940	-	1200	
11-7	1300	520	-	530	-
11-13	1300	440	59	-	
11-21	1600	450	56	160	
11-27	1900	550	57	160	
12-5	1500	680	87	130	8.3
12-11	1700	370	68	-	
12-19	1200	310	51	-	
12-27	1200	230	70	-	

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX C
TABLE 2 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MILK - 1962

Units of μμc/ℓ

Date	K^{40}	Zn^{65}	Cs^{137}	P^{32}	Sr^{90}
Reporting Limits*	300	80	30	100	2
Benton City					
1-8	1600	-	-	-	2.0
2-8	1400	-	-	-	-
3-6	1600	-	-	-	2.0
5-9	1500	-	37	-	11.9
6-5	1200	-	-	-	
7-12	-	-			
10-8	1400	-	38	-	3.7
10-31	1300	-	30	220	3.1
11-12	1700	-	41	1100	-
12-3	1200	-	-	-	-
Eltopia					
3-6	1300	-		-	-
4-3	2000	-	62	-	
4-11	1700	-	37	-	
4-17	1600	-	-	-	
4-25	1500	-	-	-	
5-1	1600	-	-	-	
5-8	1400	-	-	-	
5-15	1700	-	32	-	
5-23	1800	-	72	-	
5-29	1700	-	43	-	
6-12	1900		59	-	10.6
6-20	1700	-	73	-	
6-26	1300		-	180	
7-10	1500			-	3.4
7-18	1400		-	200	
7-24	1400		33	-	
8-1	1300	-	-	-	2.8
8-7	1500	-	-	-	
8-15	1400	-	-	-	
8-21	1200	-	-	-	
8-29	1400	-	-	120	
9-4	1400	-	37		4.2
9-26	1400	-	33	-	-

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX C
TABLE 2 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MILK - 1962

Units of μμc/ℓ

Date	K^{40}	Zn^{65}	Cs^{137}	P^{32}	Sr^{90}
Reporting Limits*	300	80	30	100	2
Eltopia (Continued)					
10-3	1600	-	-	120	
10-10	1600	-	34	-	-
10-16	1500	-	-	-	
10-24	1400	-	42	130	
10-30	1600	-	70	-	
11-7	1400	-	-	-	2.8
11-13	1600	-	43	-	
11-21	1600	-	51	-	
11-27	1500	-	40	-	
12-5	1400	-	36	-	3.8
12-11	1900	-	51	-	
12-19	1200	-	35		
12-27	560	-	40	-	
Mesa					
3-6	1300	-			-
4-3	2000	-	42	-	-
4-11	1800	-	42		
4-17	1800	-	46	300	
4-25	1600	-	-	-	
5-1	1500	-	35	-	
5-8	1600	-	42	-	
5-15	1800	-	40	-	
5-23	1800	-	53	-	
5-29	1900	-	63	-	
6-12	2100		67	-	7.9
6-20	1700		62	130	
6-26	1400		48	-	
7-10	1400			210	3.7
7-18	1500		31	-	
7-24	1400		35	-	
8-1	1400	-	37	-	-
8-7	1500	-	75	-	
8-15	1600	-	70	-	

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX C
TABLE 2 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MILK - 1962

Units of μμc/ℓ

Date	K^{40}	Zn^{65}	Cs^{137}	P^{32}	Sr^{90}
Reporting Limits*	300	80	30	100	2
Mesa (Continued)					
8-21	1300	-	42	-	
8-29	1400	-	-	200	
9-4	1400	-	30		11
9-26	1600	-	36	-	-
10-2	1500	-	38	-	
10-10	1600	-	53	-	3.3
10-16	1200	-	-	-	
12-24	1400	-	59	210	
10-30	1200	-	63	120	
11-7	1700	-	76	110	-
11-13	1700	-	66	1700	
11-21	1400	-	39	-	
11-27	1500	-	40	-	
12-5	4500	150	200	-	3.0
12-11	1300	-	47	-	
12-19	1400	-	85		
12-27	1500	-	65	-	
Local Purchase - Commercial Milk					
Brand A					
1-8	1500	-	-	-	2.9
2-8	1400	-	-	-	2.1
3-1	1200	-		-	3.2
5-10	1500	-	38	-	6.9
6-19	1800		73	-	10.7
7-17	1200		50	-	2.4
8-23	1500	-	44	240	-
9-17	1400	-	30	-	5.9
10-17	1600	-	-	-	-
11-28	1400	-	37	-	6.2
12-6	1600	120	71	-	5.1

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX C
TABLE 2 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN MILK - 1962

Units of μμc/ℓ

Date	K^{40}	Zn^{65}	Cs^{137}	P^{32}	Sr^{90}
Reporting Limits*	300	80	30	100	2
Local Purchase - Commercial Milk (Continued)					
Brand F					
1-8	1400	-	-	-	3.5
2-8	1600	-	-	-	10.6
3-1	1300	-		-	2.1
5-9	1700	-	37	-	11.5
6-19	1800	-	56	210	10.2
7-17	1300		-	400	3.0
8-23	1400	-	50	-	4.9
9-17	1500	-	-	-	-
10-17	1600	-	32	-	6.4
11-28	1800	-	44	-	5.8
12-6	1600	-	60	-	1.1
Brand H					
1-8	1600	-	-	-	7.0
2-8	1600	-	-	-	10.8
3-1	1300	-		-	5.2
5.9	1600	-	130	-	32.2
6-19	1700		180	120	
7-17	1400		68	-	10.9
8-23	1400	-	110	-	14.1
9-17	1400	-	91	-	-
10-17	1400	-	99	340	-
11-28	1800	-	98	-	-
12-6	1700	-	71	-	7.6

* Results less than the reporting limit are indicated by a (-). No entry indicates no analysis made.

APPENDIX C
TABLE 3

CONCENTRATIONS OF RADIONUCLIDES IN ALFALFA AND WHEAT - 1962

Units of μμc/g

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{31}	Ce^{144} -Pr^{144}	P^{32}	Ba^{140} -La^{140}	Sr^{89}	Sr^{90}
Reporting Limits*	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.1	5	0.004	0.002
Alfalfa											
11-21	24	0.11	6.7	1.6	6.3	-	33		-		
11-21	19	-	24	-	19	-	50		-		
11-21	24	-	3.0	0.16	3.1	0.13	5.8		-		
12-3	19	-	4.0	-	4.6	-	9.3		-		
12-5	24	-	6.4	0.14	7.0	-	27	0.37	-	0.47	0.087
12-5	7.0	-	39	-	39	-	66	0.58	8.2	0.029	0.003
12-5	12	-	25	-	13	-	47	0.53	5.9	0.72	0.05
12-11	19	-	1.9	1.5	5.6	0.14	15	0.58	-		
12-11	4.9	-	25	-	35	-	48		5.8		
12-11	14	-	5.4	0.07	5.1	-	12		-		
12-19	18	-	2.1	0.22	7.5	0.29	8.5		-		
12-19	6.8	-	4.7	-	6.9	-	11	0.18	-		
12-19	26	-	2.3	-	2.5	-	3.8		-		
12-19	8.9	-	6.1	-	12	-	16	0.36	-		
Wheat											
3-5	5.1	-		0.047						0.092	0.0068
3-5	3.6	-		-			19			0.033	-
3-5	4.3	-		-			1.1			0.051	-
3-6	4.3	2.2		-			-			0.042	0.011
8-23	4.0	-	0.11	0.091	-	-	-		-	0.025	0.0053
8-23	3.9	-	0.11	0.064	-	-	-		-	0.029	0.0021
8-23	3.8	-	-	-	-	-	-		-	0.026	0.0097

* Results less than reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 4

CONCENTRATIONS OF RADIONUCLIDES IN PASTURE GRASS - 1962

Units of μμc/g

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P32	Ba^{140} -La^{140}	Sr^{89}	Sr^{90}
Reporting Limits*	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.1	5	0.004	0.002
Ringold											
4-11	13	-	16	-	10	0.26	11				
4-17	12	0.80	23	-	16	-	14				
4-25	17	-	4.0	-	3.1	-	1.6	-		0.50	0.079
5-1	8.0	3.3	3.6	-	3.1	-	2.8	-			
5-8	9.2	-	11	-	7.1	-	10				
5-15	8.2	-	7.2	-	3.6	-	5.4	0.44			
5-23	5.5	-	13	-	6.1	-	15	0.26			
5-29	13	-	29	-	10	-	28	3.5			
6-6	11	-	5.7	-	2.9	-	4.4				
6-12	12		3.7	-	1.7	-	3.9	0.75		0.26	0.091
6-20	13	-	7.7		5.3	0.20	8.4	0.13			
6-26		-	5.5		5.6	-	8.2	0.82			
7-10	8.7	0.60	1.9		1.9	-	3.0	2.2		0.22	0.024
7-18	11	0.67	1.8		2.0	-	2.9	2.5			
7-24	12	3.4	1.6		1.5	-	2.6	1.7			
8-1	34	2.2	7.5	-	3.6	-	11	2.7	-	0.20	0.0046
8-7	23	2.9	33	-	2.0	-	46	1.1	5.4		
8-15	22	0.99	13	-	9.4	-	23	2.3	-		
8-21	17	1.2	6.4	-	2.6	-	11	0.39	-		
8-29	9.0	1.8	1.5	-	1.6	0.38	5.9	0.86	-		
9-4	11	-	3.5	-	5.8	1.8	18		-		
9-12	8.6	-	13	-	11	0.82	34	0.74	8.3		
9-20	1.9	-	3.4	-	32	1.4	28		-		
9-26	2.3	-	6.8	-	43	0.61	27	2.5	5.2		

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 4 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN PASTURE GRASS - 1962

Units of μμc/g

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Ba^{140} -La^{140}	Sr^{89}	Sr^{90}
Reporting Limits*	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.1	5	0.004	0.002
Ringold											
10-2	-	-	25	-	60	0.19	85	3.8	17		
10-10	-	-	24	-	52	1.1	110	1.8	19	3.2	0.045
10-16	3.1	-	31	1.3	16	0.12	33	1.3	16		
10-24	9.2	-	55	5.6	23	1.1	63	8.2	25		
10-30	9.9	5.3	53	2.9	22	1.1	37	4.4	17		
11-7	13	-	50	3.5	28	3.2	54	4.0	31	3.2	0.046
11-13	17	-	64	4.4	32	8.9	94	0.99	63		
11-21	4.7	-	31	2.3	19	2.1	37	2.7	23		
11-27	9.5	-	25	1.7	15	3.3	35	0.98	21		
12-5	0.76	-	88	3.4	45	0.30	66	1.4	37	6.1	0.17
12-11	3.4	-	100	5.5	38	-	51	1.6	31		
Riverview Irrigation District											
5-1	9.2	-	5.3	-	3.5	-	3.2	1.7		0.37	0.06
5-15	14	0.61	17	-	6.6	-	13	2.7			
5-23	8.6	1.6	12	-	3.6	-	12	14			
5-29	13	1.9	1.6	-	6.7	-	21	5.9			
6-6	11	3.2	9.2	-	3.4	-	7.6				
6-12	12	-	3.8	-	2.1	-	3.2	0.62		0.48	0.14
6-20	12	-	1.1	-	2.3	0.35	1.8	-			
6-26	14	-	4.6		6.2	-	8.3	31			

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 4 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN PASTURE GRASS - 1962

Units of μμc/g

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Ba^{140} -La^{140}	Sr^{89}	Sr^{90}
Reporting Limits*	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.1	5	0.004	0.002
Riverview Irrigation District (Continued)											
7-10	12	3.2	2.7		-	-	4.6	4.2		0.47	0.038
7-18	7.7	-	1.4		1.9	-	3.2	1.6			
7-24	11	1.6	3.3	-	3.2	-	5.3	2.8			
8-1	26	110	14	-	-	-	11	16	-	0.45	0.065
8-7	21	7.6	14	-	4.8	-	21	1.7	-		
8-15	12	2.9	3.3	-	0.60	-	4.5	1.2	-		
8-21	11	1.1	2.7	-	1.9	-	5.6	1.4	-		
8-29	8.4	2.0	1.3	-	1.1	0.30	5.4	2.3	-		
9-4	8.8	0.091	1.7	-	3.2	0.92	10	4.4	-	0.30	0.022
9-12	4.4	4.4	6.0	-	12	0.59	23	1.6	-		
9-20	5.4	-	7.4	-	12	0.78	27		-		
9-26	4.8	-	7.3	-	13	0.47	21	0.99	-		
10-2	9.4	1.6	13	-	12	-	32	2.0	5.7		
10-10	-	-	20	-	88	2.1	96	0.81	21	1.0	0.0049
10-16	5.1	-	17	1.1	9.5	0.53	16	0.86	9.9		
10-24	6.2	1.0	19	2.1	6.2	0.47	21	0.61	8.2		
10-30	5.5	-	6.1	0.52	6.0	0.50	5.3	0.41	-		
11-1	6.9	-	12	0.58	6.0	0.78	11	0.72	5.8		
11-7	12	-	48	3.8	26	3.4	47	25	6.2	0.045	
11-13	11	-	81	6.9	32	10	120	0.72	73		
11-21	2.0	-	70	3.1	27	1.7	55	0.61	36		
12-27	12	-	72	4.3	21	-	48	0.94	12		

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 4 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN PASTURE GRASS - 1962

Units of μμc/g

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Ba^{140} -La^{140}	Sr^{89}	Sr^{90}
Reporting Limits*	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.1	5	0.004	0.002
Benton City											
5-9	5.9	-	20	-	8.7	-	21			3.6	0.45
6-5	15	-	7.9	-	2.5	-	7.8				
6-20	13	-	20	-	15		18				
7-2	8.4		1.9		3.3	-	5.2				
7-6	7.1		8.9		8.5	-	15			0.38	0.083
7-12			5.2	-	7.0	-	9.8				
7-19	6.8		3.4		3.9	-	6.2				
7-27	5.9	-	9.4	-	8.2	-	15				
9-6	6.1	-	5.7	-	5.8	0.48	35		-	0.31	0.037
9-10	3.2	-	4.8	-	5.9	0.80	18		-		
9-14	4.0	-	5.9	-	12	1.6	25		5.5		
9-17	4.1	-	8.6	-	12	1.2	35		5.3		
9-18	7.7	-	6.1	-	9.8	1.1	28		-		
9-24	2.8	-	5.0	-	17	-	25		-		
9-25	4.6	-	8.2	-	11	0.40	27		-		
9-28	-	-	9.1	-	13	0.76	25		-		
10-1	1.9	-	6.5	-	17	0.60	31		-		
10-3	0.37	-	11	-	36	0.88	43		6.7		
10-4	5.6	-	5.4	-	14	1.0	29		-		
10-8	6.3	-	9.1	-	21	0.61	36		6.3		
10-10	0.63	-	11	-	26	0.48	44		5.6		
10-15	-	-	20	-	39	-	89		14		

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 4 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN PASTURE GRASS - 1962

Units of μμc/g

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Ba^{140} -La^{140}	Sr^{89}	Sr^{90}
Reporting Limits*	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.1	5	0.004	0.002
Benton City (Continued)											
10-22	6.4	-	29	2.3	14	1.6	35		18		
10-23	6.6	0.51	23	1.1	-	1.6	20		-		
10-24	-	-	16	-	29	0.68	79		9.6		
10-25	1.1	-	41	1.2	18	1.6	37		20		
10-26	14	0.20	31	2.3	15	2.2	-		14		
10-29	4.1	-	36	1.8	10	0.26	21		9.2		
10-30	3.2	-	47	3.1	17	1.1	43		20		
10-31	2.3	-	35	2.4	15	0.71	32		13		
11-1	3.3	-	39	1.6	16	0.45	40		17		
11-2	3.3	-	35	1.5	14	0.25	30		15		
11-5	13	-	15	1.7	12	2.2	26		11		
11-6	14	-	54	8.4	21	7.4	120		34		
11-7	13	-	44	5.3	18	5.8	74		24		
11-8	6.5	-	44	2.9	12	2.5	41		25		
11-9	7.1	-	33	3.2	10	2.7	47		25		
11-12	1.7	-	88	7.1	29	13	130		110		
11-13	20	-	41	5.0	16	8.6	89		52		
11-14	11	-	51	4.9	25	9.0	81		58		
11-15	12	-	56	5.7	27	9.7	100		64		
11-16	9.0	-	30	3.1	18	5.9	70		43		
11-19	5.8	-	37	2.1	21	5.7	66		44		
11-20	6.6	-	34	2.6	16	3.8	58		38		

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 4 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN PASTURE GRASS - 1962

Units of μμc/g

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Ba^{140} -La^{140}	Sr^{89}	Sr^{90}
Reporting Limits*	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.1	5	0.004	0.002
Benton City (Continued)											
11-26	5.9	-	35	2.6	20	3.8	51		28		
11-27	2.9	-	110	5.4	42	6.1	120		67		
12-3	-	-	120	8.2	39	-	130		72		
12-4	-	-	140	11	34	-	120		62		
12-5	-	-	120	6.0	34	-	100		60		
12-6	2.5	-	37	2.5	15	0.96	44		23		
12-7	-	-	88	4.7	25	0.50	71		35		
12-10	4.6	-	55	4.1	15	0.51	48		16		
12-11	5.0	-	61	4.2	14	-	41		20		
12-12	3.3	-	48	2.9	17	-	32		19		
12-13	3.6	-	35	2.3	12	-	27		16		
12-14	2.3	-	52	3.6	17	-	37		17		
12-17	-	-	86	6.0	34	-	64		26		
12-18	0.76	-	56	4.9	25	0.22	47		18		
12-19	1.0	-	56	-	23	0.38	58		18		
12-20	6.1	-	50	4.0	17	-	38		15		
12-21	2.0	-	53	2.8	28	-	49		15		
12-26	7.3	-	60	5.0	23	0.13	64		16		
12-27	9.6	-	66	4.5	22	-	60		13		
12-28	7.1	-	180	6.9	42	-	120		31		
12-29	7.3	-	82	4.5	28	-	68		17		

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 4 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN PASTURE GRASS - 1962

Units of μμc/g

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Ba^{140} -La^{140}	Sr^{89}	Sr^{90}
Reporting Limits*	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.1	5.	0.004	0.002
Eltopia											
5-1	10	-	4.2	-	3.1	-	2.2			0.63	0.13
5-8	6.8	-	10	-	5.8	-	9.0			1.9	0.30
5-15	9.9	-	6.6	-	4.0	-	7.9				
5-23	6.5	-	9.4	-	3.9	-	12				
5-29	13	-	20	-	9.6	-	27				
6-6	7.2	-	15	-	7.8	-	16				
6-12	11		13		6.1	-	13	-		1.8	0.39
6-20	8.5	-	23		11		22	-			
6-26	7.2	-	1.3		1.2	-	2.6				
7-10	5.6		0.39		0.55	-	0.69	0.38		0.10	0.012
7-18	6.9		0.86		1.2	-	1.6	0.11			
7-24	8.1		0.94		1.0	-	1.5				
8-1	24	-	8.7	-	2.5	-	10	-	-	0.14	0.038
8-7	15	-	23	-	15	-	46		-		
8-15	13	-	12	-	3.2	-	18		-		
8-21	9.1	-	4.2	-	3.4	-	8.6		-		
8.29	7.1	-	1.1	-	1.7	0.52	7.2		-		
9-4	8.8	-	1.9	-	3.6	0.98	10		-	0.20	0.023
9-12	6.4	-	2.7	-	5.8	0.85	13	0.39	-		
9-18	2.7	-	3.2	-	21	1.9	37		6.4		
9-26	6.0	-	1.8	-	9.0	0.44	7.8	-	-		
10-2	0.86	-	11	-	16	0.40	41		7.3		
10-10	-	-	15	-	45	1.1	58	0.39	10	2.2	0.14

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 4 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN PASTURE GRASS - 1962

Units of μμc/g

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Ba^{140} -La^{140}	Sr^{89}	Sr^{90}
Reporting Limits*	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.1	5	0.004	0.002
Eltopia (Continued)											
10-16	2.0	-	43	1.9	28	1.8	53		22		
10-24	1.5	-	48	5.1	20	2.0	69		26		
10-30	5.4	-	2.9	0.15	2.0	0.32	0.38		-		
11-1	5.4	-	23	1.2	9.5	0.62	22		8.1		
11-7	13	-	57	8.1	23	7.4	140	0.45	54	7.2	0.035
11-13	11	-	19	2.2	12	4.2	43		26		
11-21	3.5	-	53	3.5	23	2.2	57		32		
11-27	4.7	-	57	3.6	31	4.2	76		42		
12-27	7.4	-	120	5.0	42	-	48		28		
Mesa											
4-25	9.8	-	3.7	-	2.7	-	2.3	3.2		0.47	0.068
5-1	9.7	-	8.9	-	6.5	-	4.7			2.3	0.28
5-8	6.8	-	14	-	8.9	-	15			1.7	0.24
5-15	9.8	-	22	-	12	-	24				
5-23	5.1	-	17	-	6.5	-	21				
5-29	17	-	22	-	11	-	27				
6-6	7.3	-	4.5	-	2.2	-	5.1				
6-12	10		7.4	-	2.9	-	7.4	0.10		1.1	0.25
6-20	9.7	-	14		9.2	0.30	17	-			
6-26	7.9		0.92		-	-	1.9	-			

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 4 (Continued)

CONCENTRATIONS OF RADIONUCLIDES IN PASTURE GRASS - 1962

Units of μμc/g

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Ba^{140} -La^{140}	Sr^{89}	Sr^{90}
Reporting Limits*	0.3	0.08	0.05	0.03	0.5	0.05	0.5	0.1	5.	0.004	0.002
Mesa (Continued)											
7-10	5.7		0.94		1.0	-	1.7			0.074	0.068
7-18	9.5	-	3.4		2.3	-	6.4	0.30			
7-24	6.8		0.43	-	0.51	-	0.60				
8-1	28	-	5.7	-	4.5	0.18	9.0	-	-	0.15	0.054
8-7	17	-	22	-	8.3	-	37		-		
8-15	13	-	9.9	-	3.4	-	11		-		
8-21	9.2	-	1.9	-	1.2	0.12	3.6		-		
8-29	8.3	-	5.9	-	-	0.072	10		-		
9-4	7.1	-	5.4	-	8.0	1.7	28		6.6	0.43	0.017
9-12	4.1	-	2.8	-	6.0	0.67	12	0.27	-		
9-18	1.3	-	4.6	-	36	1.6	39		6.0		
9-26	5.7	-	0.98	0.19	6.8	0.74	9.8	-	-		
10-2	-	-	10	-	30	1.0	50		9.7		
10-10	-	-	19	-	50	1.0	87	0.18	19	3.6	0.12
10-16	2.3	-	57	2.8	26	0.88	60		29		
10-24	5.8	-	26	2.7	17	1.7	46		18		
10-30	6.8	-	8.9	0.55	6.2	0.75	7.3		5.4		
11-1	3.6	-	32	1.2	15	0.97	32		14		
11-7	16	-	60	2.6	28	0.56	48	0.55	22	3.2	0.049
11-13	7.7	-	41	2.9	19	5.1	63		40		
12-27	7.4	-	120	5.0	42	-	83		23		

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 5

CONCENTRATION OF RADIONUCLIDES IN MISCELLANEOUS FARM PRODUCE - 1962

Units of μμc/g

Date	Product	K^{40}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Sr^{89}	Sr^{90}	Zn^{65}	Zr^{95} -Nb^{95}
Reporting Limits*		0.3	0.03	0.5	0.05	0.5	0.1	0.004	0.002	0.08	0.05
4-16	Asparagus	4.3	-	-	-	-		0.0200	0.0047	-	0.21
4-16	Rhubarb	3.8	-	-	-	-		0.0065	0.0055	0.27	0.13
4-16	Asparagus	4.5	-	0.53	-	-		0.022	0.141	-	0.32
4-17	Asparagus	4.0	-	-	-	-		0.126	0.013	-	0.21
4-17	Rhubarb	4.6	-	-	-	-		0.0063	0.0072	-	0.17
4-26	Ground Beef	2.8	-	-	-	-	0.11	0.0093	0.0093	14	-
6-20	Strawberries	2.4	-	-	-	-	0.30	0.073	0.0093	-	0.15
6-22	Strawberries	2.3		-		0.70	-	0.087	0.016	0.3	0.47
6-22	Asparagus	3.3					-	-	-	0.6	
6-27	Carrots	6.1	-	-	0.071	-		0.051	0.0086	0.9	0.080
6-27	Onions	1.9	-	-	-	-		-	0.012	0.5	-
6-27	Parsnips	7.9	-	0.54	-	0.53		0.065	0.045	0.8	0.51
6-27	Cherries	3.1	-	-	-	-		0.035	0.0026	0.4	-
6-27	Chicken	3.9	0.035	-	-	-	0.86	-	0.0053	0.7	
6-28	Raspberries	2.2	-	-	-	0.63				0.4	0.45
6-28	Cherries	2.9	-	-	-	-				0.3	0.58
6-28	Romaine Lettuce	4.1		0.73	0.077	1.5				0.6	0.73
6-28	Mustard Greens	3.2		0.97	-	2.9				0.7	1.7
6-28	Leaf Lettuce	2.9	-	4.4	0.72	0.73				0.7	0.41
6-28	Spinach	7.7	-	0.82	0.095	-				0.4	0.32
6-28	Red Cabbage	3.1	-	-	-	-				0.6	-
6-28	Asparagus	4.2		-	0.103	-				0.7	0.16
6-28	Lettuce	1.3			-	-					-
6-28	Parsley	7.9		1.6	-	5.0				0.7	2.6
6-28	Radish Tops	3.3	-	3.7	0.62	0.88				0.6	0.71
6-28	Onion Tops	3.7		-	0.12	-				0.6	0.11

*Results less than reporting limits are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 5 (Continued)

CONCENTRATION OF RADIONUCLIDES IN MISCELLANEOUS FARM PRODUCE - 1962

Units of μμc/g

Date	Product	K^{40}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Sr^{89}	Sr^{90}	Zn^{65}	Zr^{95} -Nb^{95}
Reporting Limits*		0.3	0.03	0.5	0.05	0.5	0.1	0.004	0.002	0.08	0.05
6-28	Beet Tops	5.3	-	9.8	1.8	3.9				0.6	1.9
6-28	Turnip Tops	6.5	-	1.5	-	2.7				0.6	1.2
6-28	Onion Tops	2.0		-	-	-				0.5	0.18
6-28	Cabbage	2.2		-	-	-				0.5	
6-28	Onions	3.3	-	-	-	-				0.9	-
6-28	Radishes	2.7	-	-	0.063					0.4	-
6-28	Turnips	3.4	-	-	0.148					0.5	0.10
6-29	Big Onions	1.3	-	-	0.065	-				0.5	-
6-29	Beets	3.9	-	-	0.088					0.5	0.12
6-29	Asparagus	2.9	-	-	-					0.5	-
6-29	Strawberries	1.8	-	-	-	-				0.3	0.24
6-29	Spinach	7.1	0.043	-	-	0.76				0.5	0.35
6-29	Lettuce	5.2		1.5	-	2.8				0.5	1.6
6-29	Cherries	3.3	-	-	-	-				0.3	0.20
6-29	Swiss Chard	9.5		-	-	1.1				0.1	0.50
6-29	Beet Tops	8.4	-	1.3	-	3.0				0.6	1.5
6-29	Raspberries	1.6	-	-	-	-				0.4	0.17
7-6	Cabbage	4.1		-	0.54	0.56				0.5	0.20
7-6	Rhubarb	3.3	-	-	-	-				-	
7-6	Cabbage	2.2			-	-				0.5	-
7-6	Parsnip Tops	7.6		1.8	-	2.3				-	1.3
7-6	Parsnip Roots	5.3		-	-	-				-	0.054
7-6	Romaine Lettuce	3.8		0.63	-	1.1				0.4	0.49
7-6	Swiss Chard	4.9	-	1.6	-	2.7				0.5	2.0
7-10	Beet Tops	8.7		-	-	0.63	-	0.042	0.011	-	0.37
7-10	Lettuce	6.7	-	0.63	0.13	1.4	0.39			0.83	0.28

*Results less than reporting limits are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 5 (Continued)

CONCENTRATION OF RADIONUCLIDES IN MISCELLANEOUS FARM PRODUCE - 1962

Units of μμc/g

Date	Product	K^{40}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Sr^{89}	Sr^{90}	Zn^{65}	Zr^{95} -Nb^{95}
Reporting Limits*		0.3	0.03	0.5	0.05	0.5	0.1	0.004	0.002	0.08	0.05
7-10	Apples	1.5		-	-	-	-	-	0.0022	-	-
7-10	Apricots	3.0		-	-	-	0.11	0.029	0.0053	0.097	0.10
7-10	Beet Tops	4.4		-	-	0.96				0.5	0.49
7-10	Lettuce	2.7		-	-	0.72				0.5	0.33
7-18	Peaches	2.2	-	-	-	-				-	-
7-18	String Beans	4.3	-	-	-	-				-	-
7-18	Beet Tops	13	-	0.96	-	2.4				0.085	1.0
7-18	Beets	6.5	-	-	-	-				-	-
7-18	Green Apples	1.2		-		-				0.5	-
7-24	Broccoli	3.6				-				0.6	-
7-24	Lettuce	7.3		-	-	0.69				0.13	0.40
7-24	Cucumbers	2.0	-	-	-	-				-	-
7-24	Peppers	1.9	-	-	0.082	-				-	-
7-24	Cabbage	2.9		-	-	-				-	-
7-30	Corn on Cob	3.1			-	-				0.4	-
7-30	Squash	2.4			-	-				0.4	
7-30	Tomatoes	2.2			-	-				0.4	
7-30	Cantaloupe	1.8	-		-	-				0.3	
7-30	Peaches	3.7	-	-	-	-				0.4	0.15
7-30	Peaches	2.8	-	-	-	-				0.3	-
8-1	Apples	1.9	-	-	0.15	-	-	0.025	-	-	-
8-1	Plums	2.6	-	-	0.10	-	-	-	-	-	-
8-1	Peaches	2.7	-	-	1.9	-	-	0.0081	0.0020	-	-
8-1	Beans	4.2	0.061	-	0.73	-	-	0.027	0.0052	-	-
8-1	Apricots	2.6	-	-	0.078	-	-	0.029	0.0071	-	0.10
8-1	Apples	1.6	-	-	0.61	-	-	0.0067	-	-	-

*Results less than reporting limits are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 5 (Continued)

CONCENTRATION OF RADIONUCLIDES IN MISCELLANEOUS FARM PRODUCE - 1962

Units of μμc/g

Date	Product	K^{40}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Sr^{89}	Sr^{90}	Zn^{65}	Zr^{95} -Nb^{95}
Reporting Limits*		0.3	0.03	0.5	0.05	0.5	0.1	0.004	0.002	0.08	0.05
8-1	Tomatoes	2.5	-	-	-	-	-	-	-	-	-
8-1	Cherries	3.4	0.046	-	0.086	-	0.13	0.034	0.090	-	0.11
8-15	Cabbage	2.5	-	-	-	-	-	-	0.0074	-	-
8-15	Dill	26	-	2.9	-	13	-			-	5.8
8-15	Lettuce	4.5	-	-	-	1.3	0.43	0.086	0.028	0.16	0.64
8-29	Cabbage	2.6	-	-	-	-	-	0.0088	0.0075	-	-
11-28	Honey	0.37	-	-	-	-		-	0.0033	-	-
11-28	Honey	0.33	-	-	-	-		0.0077	0.0024	-	-
12-5	Potatoes	4.4	0.034	-	-	-			0.0039	-	-
12-29	Ground Beef	2.8	0.12	0.91	0.23	-	0.17			27	-

*Results less than reporting limits are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 6

CONCENTRATION OF RADIONUCLIDES IN FOOD PURCHASED FROM LOCAL STORES - 1962

Units of μμc/g

Date	Product	K^{40}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Sr^{89}	Sr^{90}	Zn^{65}	Zr^{95} -Nb^{95}
Reporting Limits*		0.3	0.03	0.5	0.05	0.5	0.1	0.004	0.002	0.08	0.05
1-16	Ground Beef	3.5	-	-	-	-	-	0.0079	-	-	-
1-16	Ground Beef	3.7	-	-	-	-	0.10	-	-	-	-
3-1	Ground Beef	2.7				-	-	0.022	-	-	
3-1	Ground Beef	2.1				-	-	-	-	-	
4-6	Asparagus	4.7	0.037	-	-	-				-	0.059
4-6	Asparagus	5.2	0.037	-	0.100	-				-	0.31
4-6	Asparagus	4.3	0.058	-	0.070	-				0.11	-
4-16	Rhubarb	2.7	-	-	-	-		0.013	-	0.083	-
4-16	Rhubarb	2.3	-	-	0.063	-		0.029	0.0093	-	0.056
5-31	Ground Beef	3.1	0.23	-	-	-	-	-	0.0021	-	-
5-31	Ground Feef	3.7	0.071	-	-	-	-	-	-	-	-
6-25	Apricots	3.2	-	-	-	-	-	0.0068	-	0.3	-
6-25	Peaches	1.7	-	-	-	-	-	0.014	0.0021	-	
6-25	Grapes	2.2	-	-	-	-	-	0.0098	-	0.4	-
6-25	Lettuce	3.0	-	-	-	-	-	0.032	0.0064	0.5	0.13
6-23	Carrots	3.4		-	-	-	-	0.013	0.0034	0.18	
6-25	Apples	1.4	-	-	-	-	-	-	-	0.5	
6-25	Potatoes	6.0	0.064	-	-	-	-	-	0.0037	0.5	
6-25	Lettuce	2.2	-	-	0.14	-	-	0.018	0.0047	0.4	0.057
6-25	Beet Tops	13	-	19	2.3	9.3	0.19			0.5	2.3
6-25	Beet Roots	4.9	-	0.68	0.081	0.59	0.12	0.10	0.019		0.15
6-25	Mustard Greens	3.6	-	0.83	-	1.6	1.2	0.16	0.032	0.6	0.78
6-25	Carrots	2.6		-	-	-	0.22	-	0.0033	0.5	-
6-25	Potatoes	3.4	-	-	-	-	-	-	0.0026	0.4	-
6-25	String Beans	2.1			-	-	-	0.016	0.0098	0.6	0.051

*Results less than reporting limits are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 6 (Continued)

CONCENTRATION OF RADIONUCLIDES IN FOOD PURCHASED FROM LOCAL STORES - 1962

Units of μμc/g

Date	Product	K^{40}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Sr^{89}	Sr^{90}	Zn^{65}	Zr^{95} -Nb^{95}
Reporting Limits*		0.3	0.03	0.5	0.05	0.5	0.1	0.004	0.002	0.08	0.05
6-25	Apricots	2.6	-	-	0.13	0.55	0.10	0.055	0.0033	0.3	0.21
6-25	Peaches	1.5		-	-	-	-	0.0047	0.0022	0.3	-
6-25	Apples	1.2	-	-	-	-	-			0.5	-
6-25	Grapes	2.6	-	-	-	-	-	-	-	0.4	-
6-25	Beet Tops	10		22	2.6	9.1	0.31	1.01	0.063	0.5	2.8
6-25	Beet Roots	5.0	-	0.66	0.10	-	-				0.29
6-25	Carrots	3.2	-	-	-	-	-	-	-	0.5	-
6-25	Potatoes	4.4		-	-	-	-	-	0.0023	0.4	-
6-25	Peas	2.7		-	-	-	-	-	-	0.5	-
6-25	Peaches	1.6	0.031	-	-	-	0.11	0.0047	-	0.3	
6-25	Apples	1.3	-		0.079	-	-	0.0048	-	0.5	-
6-25	Grapes	2.3	-	-	-	-	0.22	-	0.0025	0.4	-
6-25	Lettuce	1.7		-	-	-	0.22	0.0048	0.0025	0.4	-
7-17	Beets	4.5	-	-	-	-					
7-17	Beet Tops	7-4	-	1.2	-	1.6				0.7	0.78
8-7	Baby Food-Mixed Veg.	1.4	-	-	-	-				-	-
8-7	Carrot Tops	29	-	0.91	-	6.7		0.39	0.048	-	3.3
8-7	Head Lettuce	1.9	-	-	0.32	-	-	0.0072	0.0053	0.10	-
8-7	Leaf Lettuce	6.8	-	-	-	-	0.12	0.032	0.015	-	0.11
8-7	Radishes	5.5	-	0.97	-	2.7	-	0.14	0.069	-	1.6
8-10	Similac Liquid	1.5	-	-	0.74	-		0.020	0.046	-	-
8-23	Ground Beef	2.4	0.053	-	-	-	0.25	-	0.021	-	-
8-23	Ground Beef	2.1	-	-	-	-	-	0.0083	-	-	-
9-28	Ground Beef	2.8	0.10	-	-	-	-	-	-	-	-
9-28	Ground Beef	2.8	0.060	-	-	-	0.47	-	-	-	-

*Results less than reporting limits are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 6 (Continued)

CONCENTRATION OF RADIONUCLIDES IN FOOD PURCHASED FROM LOCAL STORES - 1962

Units of μμc/g

Date	Product	K^{40}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Sr^{89}	Sr^{90}	Zn^{65}	Zr^{95} -Nb^{95}
Reporting Limits*		0.3	0.03	0.5	0.05	0.5	0.1	0.004	0.002	0.08	0.05
10-22	Ground Beef	3.0	0.12	-	0.054	-	0.19	-	-	-	-
10-22	Ground Beef	3.4	0.066	-	-	-	-	-	-	-	-
11-28	Ground Beef	3.3	0.12	-	-	-	-		0.0040	-	-
11-28	Ground Beef	3.1	0.14	-	0.070	-	-		0.0049	-	-
11-29	Gerbers Strained Applesauce	0.65	-	-	-	-			-	-	-
11-29	Gerbers Apple Juice	0.90	-	-	-	-			-	-	-
11-29	Berbers Prunes	1.4	-	-	-	-			-	-	-
11-29	Gerbers Orange Juice	1.8	-	-	-	-			0.118	-	-
11-29	Gerbers Orange-Apple Juice	1.4	-	-	-	-			0.0026	-	-
11-29	Gerbers Pears	1.1	-	-	-	-			-	-	-
11-29	Gerbers Apricots	1.4	-	-	-	-			-	-	-
11-29	Gerbers Peaches	1.7	-	-	-	-			0.0023	-	-
11-29	Gerbers Peas	1.2	-	-	-	-			-	-	-
11-29	Gerbers Carrots	-	-	-	-	-			-	0.20	-
11-29	Gerbers Grn. Beans	1.2	-	-	-	-				-	-
11-29	Gerbers Garden Veg.	1.9	-	-	-	-			0.0099	-	-
11-29	Gerbers Oatmeal	0.53	-	-	-	-			-	-	-
11-29	Gerbers Dry Rice Cereal	1.8	0.076	-	0.30	-			-	-	-
11-29	Gerbers Hi-Protein Cereal	42	0.28	-	-	0.71			0.0071	-	-
11-29	Gerbers Mixed Dry Cereal	2.8	-	0.70	0	0			0.017	-	-

*Results less than reporting limits are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 6 (Continued)

CONCENTRATION OF RADIONUCLIDES IN FOOD PURCHASED FROM LOCAL STORES - 1962

Units of μμc/g

Date	Product	K^{40}	Cs^{137}	Ru^{103} +Ru^{106}	I^{131}	Ce^{144} -Pr^{144}	P^{32}	Sr^{89}	Sr^{90}	Zn^{65}	Zr^{95} -Nb^{95}
Reporting Limits*		0.3	0.03	0.5	0.05	0.5	0.1	0.004	0.002	0.08	0.05
11-29	Gerbers Dry Barley Cereal	3.8	0.057	0.23	-	-			0.0061	-	0.15
11-29	Pet Milk	3.0	-	-	-	-		-	0.0068	-	-
11-29	Gerbers Cereal egg and Bacon	-	-	0.13	-	-				-	-
11-29	Gerbers Oatmeal, Bananas & Apples	0.62	-	0.11	-	-			-	-	-
11-29	Del Monte's Prune Juice	2.1	-	0.17	-	-			0.0023	-	-
11-30	Karo Syrup	2.0	-	-	-	-		0.0098	-	-	-
12-5	Bread	0.91	-	-	0.086	-		0.016	0.007	-	-
12-29	Ground Beef	2.6	0.045	-	-	-	0.14			-	-
12-29	Ground Beef	2.4	0.12	-	-	-	-		-	-	-

*Results less than reporting limits are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 7

CONCENTRATIONS OF RADIONUCLIDES
IN OYSTERS, WILLAPA BAY, WASHINGTON - 1962

Units of μμc/g of Oysters

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	Ce^{144} -Pr^{144}	P^{32}	Co^{58}	Co^{60}
Reporting Limits*	0.3	0.1	0.05	0.03	0.5	0.5	0.1	0.7	0.6
1-10	0.54	83	-	-	-	-	1.3		
1-26	1.0	112	-	-	-	0.83	1.2		
2-7	1.1	89	-	-	-	2.0	2.7		
2-21	1.2	118	0.22	-	-	-	4.0		
3-7							1.1		
3-26	2.7	85	-	-	-	-			
4-5	1.5	115	-	-	-	-			
4-19	2.4	102	-	-	-	-			
5-7	2.6	101	-	-	-	-	2.0		
5-18	2.0	114	-	-	-	-	2.8		
6-1	0.35	92					5.5		
6-13	0.39	104					15		
7-3	2.7	111					6.6		
7-13	3.0	84					5.3		
7-27	3.4	116					1.8		
8-9	2.9	92	-	-	-	-	1.7		
8-22	2.6	110					2.0		-
9-6	2.6	93					0.93		-
9-25	4.9	76		1.1			1.0		
10-3	6.0	65		1.1			0.77	1.2	-
10-18	1.6	70		0.95			1.2	0.97	-

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

APPENDIX C
TABLE 7 (Continued)

CONCENTRATIONS OF RADIONUCLIDES
IN OYSTERS, WILLAPA BAY, WASHINGTON - 1962

Units of μμc/g of Oysters

Date	K^{40}	Zn^{65}	Zr^{95} -Nb^{95}	Cs^{137}	Ru^{103} +Ru^{106}	Ce^{144} -Pr^{144}	P^{32}	Co^{58}	Co^{60}
Reporting Limits*	0.3	0.1	0.05	0.03	0.5	0.5	0.1	0.7	0.6
11-1	1.0	64		0.80			2.0	1.0	-
11-16	1.8	75							-
11-30	2.0	79					2.2		
12-13	1.8	64					2.1	0.97	-
12-28	1.5	62		0.78			1.0		

* Results less than the reporting limit are indicated by a (-).
No entry indicates no analysis made.

XI. APPENDIX D

EXTERNAL RADIATION EXPOSURE RESULTS

APPENDIX D
TABLE 1

IONIZATION CHAMBER MEASUREMENTS FOR THE HANFORD RESERVATION AND RICHLAND - 1962

Measurement Period	Mr/Day		Measurement Period	Mr/Day	
	Hanford	Richland		Hanford	Richland
12/29-1/2	0.51	0.57	3/2-3/5	0.50	0.48
1/2-1/5	0.44	0.44	3/5-3/7	0.54	0.35
1/5-1/8	0.46	0.54	3/7-3/9	0.50	0.34
1/8-1/10	0.44	0.44	3/9-3/12	0.50	0.42
1/10-1/12	0.54	0.53	3/12-3/14	0.49	0.46
1/12-1/15	0.54	0.53	3/14-3/16	0.51	0.37
1/15-1/17	0.49	0.54	3/16-3/19	0.55	0.64
1/17-1/19	0.51	0.60	3/19-3/21	0.68	0.36
1/19-1/22	0.79	0.65	3/21-3/23	0.42	0.34
1/22-1/24	0.55	0.56	3/23-3/26	0.52	0.59
1/24-1/26	0.51	0.58	3/26-3/28	0.41	0.37
1/26-1/29	0.47	0.57	3/28-3/30	0.52	0.45
1/29-1/31	0.62	0.57	3/30-4/2	0.54	0.45
1/31-2/2	0.61	0.54	4/2-4/4	0.46	0.33
2/2-2/5	0.56	0.54	4/4-4/6	0.43	0.43
2/5-2/7	0.51	0.49	4/6-4/9	0.47	0.44
2/7-2/9	0.55	0.48	4/9-4/11	0.43	0.38
2/9-2/13	0.49	0.49	4/11-4/13	0.50	0.42
2/13-2/16	0.51	0.48	4/13-4/16	0.47	0.47
2/16-2/19	0.51	0.47	4/16-4/18	0.43	0.40
2/19-2/21	0.53	0.39	4/18-4/20	0.45	0.42
2/21-2/23	0.47	0.43	4/20-4/23	0.49	0.46
2/23-2/26	0.57	0.49	4/23-4/25	0.48	0.56
2/26-2/28	0.55	0.45	4/25-4/27	0.47	0.39
2/28-3/2	0.51	0.38	4/27-4/30	0.47	0.46

APPENDIX D
TABLE 1 (Continued)

IONIZATION CHAMBER MEASUREMENTS FOR THE HANFORD RESERVATION AND RICHLAND - 1962

Measurement Period	Mr/Day		Measurement Period	Mr/Day	
	Hanford	Richland		Hanford	Richland
4/30-5/2	0.46	0.33	7/2-7/6	0.47	0.47
5/2-5/4	0.44	0.42	7/6-7/9	0.48	0.48
5/4-5/7	0.47	0.42	7/9-7/11	0.49	0.46
5/7-5/9	0.51	0.44	7/11-7/13	0.40	0.43
5/9-5/11	0.46	0.38	7/13-7/16	0.41	0.48
5/11-5/14	0.45	0.41	7/16-7/18	0.39	0.44
5/14-5/16	0.38	0.38	7/18-7/20	0.40	0.48
5/16-5/18	0.42	0.42	7/20-7/23	0.45	0.48
5/18-5/21	0.49	0.36	7/23-7/25	0.35	0.38
5/21-5/23	0.49	0.46	7/25-7/27	0.31	0.40
5/23-5/25	0.53	0.46	7/27-7/30	0.42	0.50
5/25-5/28	0.48	0.46	7/30-8/1	0.38	0.38
5/28-6/1	0.50	0.48	8/1-8/3	0.46	0.52
6/1-6/4	0.48	0.55	8/3-8/6	0.53	0.44
6/4-6/6	0.45	0.46	8/6-8/8	0.38	0.51
6/6-6/8	0.48	0.45	8/8-8/10	0.40	0.38
6/8-6/11	0.52	0.47	8/10-8/13	0.43	0.42
6/11-6/13	0.51	0.46	8/13-8/15	0.43	0.41
6/13-6/15	0.51	0.47	8/15-8/17	0.43	0.40
6/15-6/18	0.49	0.31	8/17-8/20	0.44	0.42
6/18-6/20	0.47	0.50	8/20-8/22	0.34	0.38
6/20-6/25	0.52	0.43	8/22-8/24	0.42	0.44
6/25-6/27	0.49	0.51	8/24-8/27	0.41	0.41
6/27-6/29	0.44		8/27-8/29	0.39	0.39
6/29-7/2	0.46	0.45	8/29-8/31	0.39	0.40

APPENDIX D
TABLE 1 (Continued)

IONIZATION CHAMBER MEASUREMENTS
FOR THE HANFORD RESERVATION AND RICHLAND - 1962

Measurement Period	Mr/Day		Measurement Period	Mr/Day	
	Hanford	Richland		Hanford	Richland
8/31-9/4	0.43	0.39	10/31-11/2	0.57	0.68
9/4-9/7	0.45	0.46	11/2-11/5	0.44	0.40
9/7-9/10	0.47	0.46	11/5-11/7	0.39	0.35
9/10-9/12	0.37	0.37	11/7-11/9	0.45	0.41
9/12-9/14	0.40	0.42	11/9-11/12	0.43	0.39
9/14-9/17	0.45	0.44	11/12-11/14	0.45	0.43
9/17-9/19	0.44	0.45	11/14-11/16	0.45	0.37
9/19-9/21	0.45	0.46	11/16-11/19	0.55	0.42
9/21-9/24	0.45	0.41	11/19-11/21	0.54	0.36
9/24-9/26	0.48	0.43	11/21-11/23	0.35	0.35
9/26-9/28	0.40	0.47	11/23-11/26	0.35	0.35
9/28-10/1	0.47	0.32	11/26-11/28	0.39	0.35
10/1-10/3	0.41	0.44	11/28-11/30	0.44	0.43
10/3-10/5	0.38	0.29	11/30-12/3	0.37	0.50
10/5-10/8	0.42	0.40	12/3-12/5	0.40	0.39
10/8-10/10	0.42	0.37	12/5-12/7	0.41	0.39
10/10-10/12	0.44	0.42	12/7-12/10	0.44	0.43
10/12-10/15	0.46	0.36	12/10-12/12	0.39	0.48
10/15-10/17	0.44	0.43	12/12-12/14	0.46	Not read
10/17-10/19	0.51	0.44	12/14-12/17	0.46	0.44
10/19-10/22	0.41	0.42	12/17-12/19	0.46	0.42
10/22-10/24	0.46	0.75	12/19-12/21	0.43	0.38
10/24-10/26	0.54	0.48	12/21-12/26	Off scale	
10/26-10/29	0.50	0.46	12/26-12/28	0.51	0.44
10/29-10/31	0.49	0.46	12/28-12/31	0.42	0.19

APPENDIX D
TABLE 2

IONIZATION CHAMBER MEASUREMENTS
OF IMMERSION DOSE IN THE COLUMBIA RIVER - 1962

Measurement Period	Mr/Day	Measurement Period	Mr/Day	Measurement Period	Mr/Day
Vernita Ferry					
12/29/61-1/4/62	0.89	5/18-5/25	0.47	9/14-9/21	0.84
1/4-1/12	0.52	6/4-6/8	0.80	9/21-9/28	0.44
1/12-1/19	0.67	6/8-6/15	0.87	9/28-10/5	0.76
1/19-2/2	0.43	6/15-6/22	0.64	10/5-10/12	1.1
2/2-2/16	0.60	6/22-6/29	Lost	10/12-10/19	0.44
2/16-3/2	0.34	6/29-7/6	0.85	10/19-10/26	0.39
3/2-3/16	0.50	7/6-7/13	0.27	10/26-11/2	0.43
3/16-3/23	0.53	7/20-7/27	1.1	11/2-11/16	Lost
3/23-3/30	1.0	7/27-8/3	0.52	11/16-11/21	1.3
3/30-4/6	0.57	8/3-8/10	0.79	11/21-12/7	0.25
4/6-4/13	0.88	8/10-8/17	0.66	12/7-12/14	0.90
4/13-4/27	Lost	8/17-8/24	0.99	12/14-12/21	0.21
4/27-5/4	0.44	8/24-8/31	0.60	12/21-12/28	0.67
5/4-5/11	0.59	8/31-9/7	0.58	12/28-1/4/63	0.79
5/11-5/18	0.64	9/7-9/14	0.90		
Hanford Ferry					
12/29/61-1/4/62	2.1	3/30-4/6	7.0	7/20-7/24	6.3
1/4-1/12	5.9	4/6-4/10	5.1	7/24-7/27	6.1
1/12-1/19	7.1	4/10-4/13	12	7/27-7/31	8.1
1/19-1/26	6.4	4/13-4/20	7.1	7/31-8/3	3.7
1/26-1/30	7.2	4/20-4/27	Lost	8/3-8/7	7.0
1/30-2/2	7.6	4/27-5/4	2.6	8/7-8/10	6.0
2/2-2/6	8.9	5/4-5/11	3.1	8/10-8/17	5.9
2/6-2/9	5.9	5/11-5/18	4.8	8/17-8/21	6.7
2/9-2/13	7.9	5/18-5/22	5.4	8/21-8/24	7.0
2/13-2/16	4.1	5/22-5/25	9.7	8/24-8/28	2.8
2/16-2/20	5.5	5/25-6/1	5.4	8/28-8/31	2.9
2/20-2/23	5.6	6/1-6/8	3.7	8/31-9/4	3.9
2/23-2/27	4.8	6/8-6/15	2.7	9/4-9/7	4.0
2/27-3/2	5.8	6/15-6/22	6.3	9/7-9/11	4.6
3/2-3/6	5.8	6/22-6/26	6.1	9/11-9/14	5.2
3/6-3/9	6.2	6/26-6/29	5.8	9/14-9/18	4.2
3/9-3/13	7.7	6/29-7/3	4.9	9/18-9/21	4.0
3/13-3/16	6.6	7/3-7/6	7.6	9/21-9/25	3.6
3/16-3/20	7.4	7/6-7/10	6.4	9/25-9/28	3.4
3/20-3/23	12	7/10-7/13	2.0	9/28-10/2	3.7
3/23-3/27	10	7/13-7/17	6.8	10/2-10/5	2.4
3/27-3/30	10	7/17-7/20	7.0	10/5-10/9	4.1

APPENDIX D
TABLE 2 (Continued)

IONIZATION CHAMBER MEASUREMENTS
OF IMMERSION DOSE IN THE COLUMBIA RIVER - 1962

Measurement Period	Mr/Day	Measurement Period	Mr/Day	Measurement Period	Mr/Day
Hanford Ferry					
10/9-10/12	2.6	10/30-11/2	2.4	11/21-11/30	2.7
10/12-10/16	4.1	11/2-11/6	3.5	11/30-12/7	2.9
10/16-10/19	4.3	11/6-11/9	5.4	12/7-12/14	4.8
10/19-10/23	3.8	11/9-11/16	3.8	12/14-12/19	4.8
10/23-10/26	2.8	11/16-11/21	2.8	12/19-12/21	3.0
10/26-10/30	3.5				
300 Area Dock					
12/29/61-1/4/62	1.3	4/27-5/4	2.4	9/14-9/21	2.6
1/4-1/12	4.1	5/4-5/11	2.7	9/21-9/28	2.6
1/12-1/19	2.4	5/11-5/18	3.2	9/28-10/5	2.3
1/19-1/26	4.4	5/18-5/25	3.1	10/5-10/12	3.2
1/26-2/2	3.6	5/25-5/29	3.8	10/12-10/19	3.0
2/2-2/9	3.6	5/29-6/29	Wet	10/19-10/26	2.6
2/9-2/16	3.6	6/29-7/6	3.8	10/26-11/2	3.2
2/16-2/23	2.6	7/6-7/13	1.8	11/2-11/9	3.7
2/23-3/2	3.0	7/13-7/20	3.2	11/9-11/16	3.0
3/2-3/9	3.4	7/20-7/27	2.4	11/16-11/21	2.8
3/9-3/16	3.3	7/27-8/3	3.7	11/21-11/30	2.2
3/16-3/23	3.6	8/3-8/10	2.8	11/30-12/7	2.4
3/23-3/30	4.4	8/10-8/17	3.4	12/7-12/14	3.3
3/30-4/6	4.0	8/17-8/24	3.1	12/14-12/21	3.4
4/6-4/13	2.8	8/24-8/31	2.2	12/21-12/28	3.6
4/13-4/20	3.8	8/31-9/7	2.2	12/28-1/4/63	3.7
4/20-4/27	4.2	9/7-9/14	2.7		
Pasco Pump House					
12/29/61-1/4/62	2.7	5/11-5/18	1.1	9/14-9/21	1.8
1/4-1/12	2.2	5/18-5/25	1.1	9/21-9/28	0.97
1/12-1/19	4.0	5/25-6/1	1.8	9/28-10/5	1.3
1/19-1/26	2.4	6/1-6/8	2.7	10/5-10/12	1.2
1/26-2/2	1.4	6/22-6/29	1.4	10/12-10/19	1.2
2/2-2/16	0.85	6/29-7/6	1.4	10/19-10/26	0.99
2/16-2/23	1.5	7/6-7/13	1.1	10/26-11/2	1.2
2/23-3/2	1.6	7/13-7/20	1.1	11/2-11/9	1.8
3/2-3/9	2.1	7/20-7/27	1.3	11/9-11/16	2.0
3/16-3/23	2.8	7/27-8/3	1.9	11/16-11/21	0.92
3/23-3/30	1.6	8/3-8/10	1.5	11/21-11/30	1.2
3/30-4/6	1.8	8/10-8/17	1.6	11/30-12/7	1.9
4/6-4/13	1.2	8/17-8/24	2.0	12/7-12/14	1.3
4/13-4/27	Lost	8/24-8/31	1.3	12/14-12/21	Lost
4/27-5/4	0.59	8/31-9/7	1.4	12/21-12/28	1.3
5/4-5/11	1.6	9/7-9/14	1.4	12/28-1/4/63	1.2

APPENDIX D
TABLE 2 (Continued)

IONIZATION CHAMBER MEASUREMENTS
OF IMMERSION DOSE IN THE COLUMBIA RIVER - 1962

Measurement Period	Mr/Day	Measurement Period	Mr/Day	Measurement Period	Mr/Day
Columbia Park Marina					
12/29/61-1/4	1.6	5/11-5/18	1.6	9/7-9/14	0.81
1/4-1/12	1.4	5/18-5/25	4.8	9/14-9/21	1.1
1/12-1/19	1.5	5/25-6/1	2.0	9/21-9/28	0.66
1/19-2/2	0.81	6/1-6/8	0.94	9/28-10/5	0.90
2/2-2/9	1.8	6/8-6/15	1.7	10/5-10/12	0.81
2/9-2/16	0.73	6/15-6/22	0.80	10/12-10/19	Wet
2/16-2/23	0.56	6/22-6/29	Lost	10/19-10/26	2.8
2/23-3/2	0.59	6/29-7/6	Wet	10/26-11/2	0.55
3/2-3/9	2.1	7/6-7/13	0.57	11/2-11/9	1.5
3/9-3/16	Lost	7/13-7/20	0.66	11/9-11/16	0.90
3/16-3/23	0.78	7/20-7/27	3.1	11/16-11/21	1.2
3/23-3/30	2.7	7/27-8/3	0.99	11/21-11/30	0.60
3/30-4/6	1.0	8/3-8/10	2.5	11/30-12/7	4.2
4/6-4/13	0.91	8/10-8/15	2.0	12/7-12/14	0.63
4/13-4/20	1.0	8/15-8/24	1.7	12/14-12/21	0.60
4/20-5/4	Lost	8/24-8/31	0.78	12/21-12/28	0.53
5/4-5/11	0.81	8/31-9/7	1.1	12/28-1/4/63	0.39
Richland Marina					
12/29/62-1/4	2.4	5/4-5/11	2.1	9/7-9/14	1.8
1/4-1/12	2.2	5/11-5/18	2.8	9/14-9/21	1.9
1/12-1/22	1.9	5/18-5/25	2.1	9/21-9/28	1.7
1/22-1/26	1.8	5/25-6/1	3.2	9/28-10/5	1.6
1/26-2/2	2.0	6/1-6/8	1.1	10/5-10/12	2.1
2/2-2/9	2.4	6/8-6/22	Lost	10/12-10/19	2.0
2/9-2/16	2.3	6/22-6/29	1.8	10/19-10/26	1.9
2/16-2/23	1.7	6/29-7/3	2.0	10/26-11/2	Lost
2/23-3/2	2.2	7/6-7/13	1.5	11/2-11/9	2.1
3/2-3/9	2.5	7/13-7/20	2.0	11/9-11/16	2.5
3/9-3/16	3.2	7/20-7/27	Lost	11/16-11/21	1.5
3/16-3/23	Missing	7/27-8/3	1.6	11/21-11/30	1.8
3/23-3/30	2.8	8/3-8/10	Lost	11/30-12/7	1.2
4/6-4/13	2.0	8/10-8/17	2.6	12/7-12/14	2.0
4/13-4/20	3.5	8/17-8/24	2.6	12/14-12/21	2.0
4/20-4/27	2.9	8/24-8/31	1.2	12/21-12/28	2.6
4/27-5/4	1.9	8/31-9/7	Lost	12/28-1/4/63	2.0

XII. APPENDIX E

ANALYTICAL METHODS

XII. APPENDIX E

ANALYTICAL METHODS

1. Water Analyses

Water samples are analyzed for alpha emitters, beta emitters, and selected radionuclides. Alpha emitters are extracted with diethyl ether from 9N nitric acid. The gross alpha activity is measured with a zinc sulfide (ZnS) scintillation counter. Gross beta activity is determined by evaporating a sample to dryness and counting the residual salts on a gas-flow proportional beta counter operated in the proportional region.

Rare earths plus Y, Si^{31}, I^{131}, P^{32}, Sr^{89}, and Sr^{90} are measured by beta counting after chemical separation. The rare earths are isolated as a group by hydroxide, fluoride, and oxalate precipitations; silicon is collected as an insoluble residue after partial distillation with HCl; iodine is isolated by carbon tetrachloride extraction and precipitation as silver iodide; phosphorous by extraction of phosphomolybdic acid with butane in diethyl ether or by direct precipitation as the phosphomolybdic; and strontium by successive precipitation of the nitrate and the carbonate. Y^{90}, separated from the strontium as the oxalate and ignited to the oxide after secular equilibrium is established, is measured to determine Sr^{90}. Beta decay curves are extrapolated to sampling time to determine the initial activity levels and to check separation effectiveness.

Mn^{56}, Zn^{69}, and Ga^{72} are determined by measurement of their characteristic gamma peaks with a multichannel gamma energy spectrometer using a 3- by 3-inch thallium-activated sodium iodide (NaI(Tl)) scintillation crystal detector. The measurements are made after the following chemical separations; manganese by precipitation as the dioxide, zinc by precipitation as the phosphate and ion exchange purification, and gallium by extraction with isopropyl ether and precipitation as the hydroxide. Na^{24}, Np^{239}, Cr^{51}, and Sc^{46} are also determined using a multichannel gamma energy spectrometer, but are determined from a direct count of residual salts from an evaporated sample, without chemical separations.

Cu^{64} is determined from gamma-gamma coincidence counting measurements of the annihilation photons produced by positron emission. Sc^{46} is measured by gamma-gamma coincidence counting of the 0.885 and 1.12 Mev photons after 2 weeks decay. Zn^{65} and Sc^{46} are determined from counting plates previously used for Na^{24} and Cu^{64} determinations. The Sc^{46} 0.89 and 1.12 Mev photons are counted by coincidence counting using 5- and 3-inch NaI crystals and a Sc^{46} reference sample for adjustments. Zn^{65} is determined by counting with a 5-inch NaI crystal and using the scandium results for correction.

Cu^{64} is determined from gamma-gamma coincidence counting measurements of the annihilation photons produced by positron emission. Sc^{46} is measured by gamma-gamma coincidence counting of the 0.885 and 1.18 Mev photons.

As^{76} is determined by evaporation of 500–1000 ml of sample to 50–75 ml and then acidifying with 9N HCl. It is then extracted into benzene, back extracted into water and precipitated as the metal, dried, weighed and counted on a gas flow proportional counter.

Uranium concentrations are determined with a fluorophotometer, using standard techniques.

2. Vegetation and Produce Analyses

Samples of pasture grass and farm products, including milk, are analyzed with a multichannel energy spectrometer for selected nuclides. A weighed amount, approximately 250–300 grams, of shredded samples are packed into a 16-ounce counting jar and gamma scanned using a 9-inch diameter well type NaI (Tl) scintillation crystal. Background analysis includes the effects of the jar which contains minute amounts of radioactivity. Weighed amounts of sample are used for chemical separation. Analysis for I^{131} in milk is routinely accomplished with a detection capability of approximately 2 μμc/l when 3-gallon aliquots are used. Analyses are performed in the following manner:

Iodine carrier and sodium bisulfite are added to the sample and then deaerated by cautiously applying vacuum. The sample is passed

through an ion exchange column (polyethylene cup 2-1/2 x 4-1/2 inches) containing 345 ml of Dowex 1 x 8 20-50 mesh Cl^- form at a flow rate of 100 ml per minute. The resin is rinsed thoroughly with distilled water and then washed into a 500 ml polyethylene bottle for counting in a 9-inch NaI (Tl) well crystal. Recoveries of 90% or better in the resin column have been accomplished with sample sizes up to 12 gallons.

Analysis for radiostrontium is performed in the following manner: barium and strontium carriers are added to 500 gram samples of produce and 1000 gram samples of milk. The produce samples are then ashed at 500 to 650 C from 4 to 6 hours and the ash is then dissolved in nitric acid. The alkaline earths are precipitated from all samples as carbonates on addition of NaOH. Strontium and alkaline earth metals are then precipitated with fuming nitric acid. Calcium is separated by washing with acetone. Strontium and remaining alkaline earths are dissolved and reprecipitated with fuming nitric acid. The rare earths are removed from an aqueous solution of the nitrates by a Fe (OH_3) precipitation and barium is removed as the chromate. Strontium is precipitated as the carbonate and then dried in a 1-inch stainless steel counting dish to constant weight. The strontium mixture is counted from 10 minutes to 1 hour in a low background (anticoincidence) gas-flow proportional beta counter.

Sr^{90} is allowed to reach secular equilibrium with its daughter, Y^{90}, which is then extracted with buffered TTA. Y^{90} is counted in the same manner as the strontium mixture. The Sr^{90} content of the original sample is calculated from the Y^{90} counting rate, and the Sr^{89} content from the difference in counting rates of total strontium and Sr^{90}.

The chemical separation for radiophosphorous is performed on samples of sufficient size to yield 40-50 mg of phosphorous.

The sample is wet ashed with nitric acid. Phosphorous is precipitated from the acid solution as ammonium phosphomolybdate. The precipitate is dissolved in ammonium hydroxide, ammonium citrate is added to complex most of the remaining interfering elements, and the

phosphorous is precipitated as magnesium ammonium phosphate. After dissolving the precipitate in hydrochloric acid, ammonium citrate is again added and phosphorous is reprecipitated with NH_4OH as magnesium ammonium phosphate.

The precipitate is dried in a 1-1/2-inch stainless steel counting dish under heat lamps and counted over a period of 2 weeks in a gas-flow proportional beta counter.

3. Air Sample Analyses

Airborne concentrations of radioactive materials are measured principally by I^{131} scrubber samplers. These samplers consist of a calibrated, electrically-driven vacuum pump which draws 1.75 cfm of air through one liter of 0.1 normal NaOH solution. A balancing platform and siphon arrangement permits introduction of distilled water into the scrubber at a rate equal to the rate of evaporation. This water feeder helps maintain constant liquid head, air flow rates, and scrubber efficiency.

After 1 week of operation, the scrubber bottle is replaced and taken to the radiochemical analysis laboratory for determination of the I^{131} content. The analytical procedure used provides for the addition of an iodine carrier and bisulfite to the scrubber solution which is then acidified, the iodine precipitated with $AgNO_3$ and filtered. The radiation from the I^{131} on the filter is measured by a gas proportional counter. Atmospheric concentrations of I^{131} are then calculated from these counting rates by applying factors for counter calibration, chemical recovery of the I^{131}, scrubber efficiency and the volume of air sampled.

Measurements for concentrations of radioactive particulates in the atmosphere are made by drawing 2.5 cfm of air through a 2 x 4-inch HV-70 filter paper with a vacuum pump. The filters are changed on either a daily or weekly schedule, allowed to decay for 48 hours, and then counted with a gas proportional counter for gross beta radioactivity and with a ZnS scintillation counter for gross alpha radioactivity.

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