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MISCELLANEOUS FOLDER OF INFORMATION ON CLINCH RIVER WATER STUDY–BETA (1962-1963)

A. F. Becher
and
N. B. Schultz

July 1962

UNION CARBIDE NUCLEAR COMPANY
Operating Contractor
for the U.S. ATOMIC ENERGY COMMISSION

This document has been approved for ...
by
for A S Quist 11/24/96

Questionnaires received from the field:

7/25	-	Technical Division	-	25
7/26	-	Finance & Materials	-	19
7/27	-	Operations Analysis	-	32

UNION CARBIDE

INTERNAL CORRESPONDENCE

UNION CARBIDE NUCLEAR COMPANY • POST OFFICE BOX P. OAK RIDGE, TENNESSEE

To (Name) Dr. C. A. Garrett
Company Mr. J. H. Hildebrand
Location Mr. D. M. Lang

Date July 16, 1962

Originating Dept.

Answering letter date

Copy to Mr. J. S. Lyon

Subject Sampling of the ORGDP Population

Attached are copies of the questionnaire to be completed by salaried employees in the administration area as discussed with you earlier. Screening of the employees selected by this method will avoid unnecessary labor cost where the employee's background precludes using his bio-assay data in this program.

We would appreciate receiving the completed forms by July 25, 1962, to permit selection of the participants in the bio-assay evaluation program by July 30, 1962.

A. F. Becher
A. F. Becher
Safety and Health Physics Department

AFB:mh

Attachment:
Questionnaire on ORGDP
Personnel (35 copies)

No RC

QUESTIONNAIRE ON ORGDP PERSONNEL

1. Name _____ Badge Number_____ Age _____

2. City of Residence Since Employed in Atomic Energy Business _____

_____

3. Length of Time Lived There _____

4. Years of Employment:

	ORGDP	X-10	Y-12	Other Atomic Energy Establishments
1 to 3 years	( )	( )	( )	( )
3 to 5 years	( )	( )	( )	( )
5 to 10 years	( )	( )	( )	( )
10 to 15 years	( )	( )	( )	( )
15 to 20 years	( )	( )	( )	( )

5. Plant Duties

Has your work ever involved the use of radioactive materials?
If answer is "yes," describe briefly

6. Number of Glasses of Milk Drunk per Day

( ) 0 glasses
( ) 1 glass
( ) 2 glasses
( ) 3 glasses
( ) more than 3 glasses

7. Number of Meals per Week Purchased at Plant Cafeteria

( ) 0 meals
( ) 1 meal
( ) 2 meals
( ) 3 meals
( ) 4 meals
( ) 5 meals

8. Amount of Water Consumed per Day (Including Coffee, Tea, and Soft Drinks)

	At Plant	At Home
0 glasses	( )	( )
1 glass	( )	( )
2 glasses	( )	( )
3 glasses	( )	( )
4 or more glasses	( )	( )

QUESTIONNAIRE ON ORGDP PERSONNEL con't

9. Amount of Green Vegetables Consumed per Day

	At Plant	At Home
0 servings	( )	( )
1 serving	( )	( )
2 servings	( )	( )
3 or more servings	( )	( )

10. Amount of Bread Eaten per Day (Including corn bread, cereal and other grain)

( ) White - 1 to 2 slices
( ) White - 2 to 4 slices
( ) White - more than 4 slices

( ) Dark - 1 to 2 slices
( ) Dark - 2 to 4 slices
( ) Dark - more than 4 slices

11. Amount of Locally Caught Fish Eaten per Week

	Caught Upstream of Oak Ridge	Caught Downstream of Oak Ridge
0 - 1/2 lb fish	( )	( )
1/2 - 1 lb fish	( )	( )
1 - 2 lb fish	( )	( )
3 or more lbs fish	( )	( )

UNION CARBIDE

INTERNAL CORRESPONDENCE

UNION CARBIDE NUCLEAR COMPANY • POST OFFICE BOX P, OAK RIDGE, TENNESSEE

To (Name) Mr. K. E. Cowser

Company

Location Bldg. 3504, ORNL

Date September 5, 1962

Originating Dept.

Answering letter date

Copy to

Subject Proposed Sampling of ORGDP Water Systems

For the study program involving the use of potable water and industrial water from the Clinch River, the following are suggested as sampling points in the various ORGDP water supply systems:

A. Sanitary Water Supply (Process Steam Plant; make-up water)

1. Boiler scale (deposit on boiler tube)
2. Heat exchange tube scale (make-up water side)
3. Dead end of sanitary water distribution systems.

B. Cooling Water Supply

1. Elevated tank sludge (Fire Water Supply)
2. Heat exchange tube scale (Coolant Cooler in Cascade)
3. Dead end of recirculating water distribution systems.

C. Generating Station Water Supply

1. Boiler scale (deposit in 54" or 60" drums)
2. Heat exchange tube scale (feed-water heaters)
3. Mud drum
4. Regeneration of softener.

These samples will be collected on only one occasion, and this at such time as routine maintenance requires cleanout.

The following information may be helpful in evaluating the results of sample analysis:

A. The average daily production of each supply:

1. 3,000,000 gallons per day
2. 312,000,000 gallons per day
3. 192,000,000 gallons per day

B. The treatment provided each supply:

1. The ORGDP sanitary water is treated with hot lime-soda softeners, filtered with pressure filter, and added to the condensate to provide feed water for the process steam plant.

2. Daily chemical additions include:

   a. 750# of "Orocol," composed of 60% sodium dichromate, 35% calgon, and 5% zinc sulfate.

   b. 1000 pounds of "ferrofloc" (ferric sulfate coagulant)

   c. 7500 pounds of quick-lime

   d. 500 gallons of sulfuric acid

   e. 72 pounds of calgon

3. Approximately 200 pounds of chlorine are added to the generating station circulating and service water each day. In addition, for the boiler water, 1-1/2 pounds of sodium sulfite, 1/4 pound of sodium hydroxide, and 4 pounds of sodium sulfate are added each day.

4. The chemical quality of the boiler water is typically: pH, 10.6; NaOH, 15 ppm; PO_4, 7.5 ppm; Na_2SO_3, 2.8 ppm; Na_2SO_4, 90 ppm; SiO_2, 1.5 ppm; total dissolved solids, 158 ppm.

5. The chemical quality of the raw water, recirculating water, and make-up water is typically as shown on the attached form.

C. The information as to the volume of water having passed through the various boilers and heat exchangers to be sampled will be determined at the time the samples are taken.

We will continue to co-operate with you in this study, and additional information will be furnished upon your request.

for W. D. Barker
A. F. Becher
Safety and Health Physics Department

AFB:mh

Attachment

PROCESS UTILITIES LABORATORY

CHEMICAL ANALYSES REPORT

Health Physics

DATE June 18, 1962

TEST \ SAMPLE	MAKE UP WATER			RECIRCULATING WATER				
	CW-7	Raw Water	CW-3 891-A	Make Up A-LOOP	B-LOOP	C-LOOP	E-LOOP	G-LOOP
pH		8.1	7.9	6.5	6.7	6.2	6.0	5.8
Hardness Mg ppm		5	6	6	19	21	25	25
"M" Alk. (as $CaCO_3$) ppm		82	79	10	14	17	14	15
Total Hardness " "		104	94	56	228	290	348	310
Calcium " "		78	78	46	130	160	200	180
Magnesium " "		26	16	10	98	130	148	130
M-phosphate (as PO_4) "		—	1.5	1.0	0.5	3.0	3.5	4.0
O-phosphate (as PO_4) "		—	1.0	—	6.0	6.0	7.5	6.0
Iron (as Fe) "								
Copper (as Cu) "		0	0	0	2	0	0	.02
Sulphate (as SO_4) "		12	20	60	240	300	340	250
Turbidity (as SiO_2) "		40	44	6	89	55	54	55
Suspended Solids "		50	43	3	75	48	47	44
Dissolved Solids "		120	20	20	120	440	320	280
Total Solids "		170	63	23	195	488	367	326
Chromates as CrO_4 "	.016	—	.4	3.0	12.5	16.0	20.0	20.0
Zinc as Zn "		.08	.08	.25	.6	.9	1.1	1.0
Chlorides as Cl "		1	1	2	25	24	34	30

Signed W. W. George

WCX-748 (8-60) UTILITIES RC

M E M O R A N D U M

TO: Mr. A. F. Becher

SUBJECT: Environmental Monitoring, Beta Radioactivity in the Clinch River

During a 6-month period from October 18, 1962, through April 19, 1963, daily sampling of the beta radioactivity in the raw water and in the finished water at the ORGDP Sanitary Water Plant was conducted to monitor the possible effects of TVA operations upstream in the Clinch River. These activities included the dredging of navigational channels, the construction of Melton Hill Dam, and the initial impoundment of water behind this dam. Associated with these activities were fluctuations of Norris Dam discharge, which at times resulted in negligible Clinch River flow, with resultant minimization of the dilution factor for ORNL radioactive wastes. Under these conditions, the Watts Bar impoundment tends to flow upstream, and little can be predicted as to the probable dispersal of ORNL wastes in the Clinch River.

This opportunity was taken to (a) record both the gross beta activity and the strontium beta activity levels in the raw water (Clinch River) and in the finished water of the ORGDP Sanitary Water Treatment Plant (Table I); (b) compare the beta radioactivity levels during this period of stream-bottom silt disturbance and minimal river flow with the beta radioactivity levels noted in recent years at the same sampling points (Table II); (c) evaluate the possibility of a correlation between the total beta activity and the corresponding strontium beta activity present in the water (Table III); and (d) determine the beta radioactivity "cleanup" factor of the ORGDP Sanitary Water Treatment Plant (Table IV).

The data from this study indicate that:

(1) The average <u>total strontium</u> concentration in the Clinch River approximated the 10 μμc/liter (10^{-8} μc/cc) value suggested by the USPHS for 168-hour week, non-occupational exposure to <u>Strontium-90</u>. It should be noted that our previous checks have shown that the Strontium-90 contribution to the total Strontium beta activity in the Clinch River varies between 25% and 40%, and averages about 30%. For purposes of comparison, it is further noted that the NCRP MPC_w for 168-hour week, general population exposure for Strontium-90 is 10^{-7} μc/cc and the corresponding MPC_w for Strontium-89 is 3×10^{-5} μc/cc. During this six-month period the beta radioactivity represented about 15% of the MPC_w for this mixture of radionuclides.

(2) Even during this period of stream-bottom silt disturbance and minimal river flow, the beta radioactivity concentrations noted were well within the range of the beta radioactivity levels normally encountered at the ORGDP Sanitary Water Treatment Plant (CRM-14.5).

(3) There was no statistically significant correlation between the total beta activity and the corresponding Strontium beta activity in the Clinch River. Were such a correlation present, water plants using this stream for their raw water supply could routinely monitor for total beta activity and control on

this basis, until such time that relatively high gross beta levels would suggest the advisability of performing the costly, time consuming, and analytically demanding Strontium separation and analysis.

(4) The "cleanup" factor of beta radioactivity in water by the ORGDP Sanitary Water Treatment Plant, under normal operating conditions, varies from 0% to 36%, and averages 15% in the case of gross beta, with comparable figures for Strontium beta of 0% to 24%, and an average of 6%, respectively. In the event of emergency conditions, the purposeful use of additional water softeners and other flocculating chemicals would be expected to precipitate more of the calcium compounds and the adsorbed Strontium, and thus provide somewhat more effective reductions in the total beta radioactivity in the finished water.

As part of our continuing environmental monitoring program, these data indicate that no health problem was encountered during the extended period of reduced Clinch River flow and resultant decreased dilution of wastes stirred up from the stream-bottom or discharged by another plant upstream.

Neil B. Schultz
N. B. Schultz

NBS:mh

Attachment:
(Tables I, II,
III, and IV)

5/22/63

TABLE I

BETA RADIOACTIVITY IN THE CLINCH RIVER AND IN THE ORGDP SANITARY WATER

Date	Norris Dam Discharge (ft^3/sec/1000)	Clinch River (10^{-8} μc/cc) Gross β	Clinch River (10^{-8} μc/cc) Sr β	Sanitary Water (10^{-8} μc/cc) Gross β	Sanitary Water (10^{-8} μc/cc) Sr β
10/18/62	3.76	12	0.4	5	0.6
10/19/62	3.75	8	0.5	5	-
10/20/62	4.09	7	0.4	6	0.4
10/21/62	3.99	7	0.5	7	0.4
10/22/62	3.58	7	0.5	4	0.5
10/23/62	3.05	5	1.3	4	0.6
10/24/62	2.90	7	0.5	11	0.3
10/25/62	2.91	9	0.4	15	0.5
10/26/62	2.92	14	0.3	8	0.3
10/27/62	4.26	4	0.4	4	0.4
10/28/62	4.14	6	0.4	4	0.5
10/29/62	3.88	7	0.4	2	0.3
10/30/62	3.90	5	0.3	3	0.4
10/31/62	3.97	5	0.5	5	0.4
Average 10/62	3.47	6	0.5	6	0.4
11/1/62	4.02	9	0.5	4	0.5
11/2/62	4.35	21	0.4	8	0.2
11/3/62	4.71	9	0.5	10	0.4
11/4/62	4.06	9	0.4	8	0.4
11/5/62	4.69	9	0.5	13	0.3
11/6/62	4.91	8	0.4	8	0.4
11/7/62	4.98	10	0.4	7	0.5
11/8/62	4.91	7	0.5	8	0.5
11/9/62	5.30	18	2.1	6	1.3
11/10/62	0.00	120	2.5	60	1.1
11/11/62	0.00	76	2.8	120	2.5
11/12/62	0.00	120	3.2	41	1.4
11/13/62	0.00	130	2.6	53	1.3
11/14/62	0.81	140	2.8	62	1.7
11/15/62	0.93	110	2.4	100	1.4
11/16/62	2.13	120	2.4	99	2.4
11/17/62	1.56	120	2.7	120	2.3
11/18/62	0.44	27	2.0	56	2.2
11/19/62	0.62	110	2.2	44	1.9
11/20/62	1.38	200	2.3	140	2.1
11/21/62	2.43	190	1.8	210	1.9
11/22/62	2.67	---	---	---	---
11/23/62	1.58	240	2.3	160	1.9
11/24/62	1.47	61	1.7	60	1.4
11/25/62	1.06	42	1.6	63	1.7

TABLE I (Cont.)

Date	Norris Dam Discharge (ft^3/sec/1000)	Clinch River (10^{-8} μc/cc) Gross β	Clinch River (10^{-8} μc/cc) Sr β	Sanitary Water (10^{-8} μc/cc) Gross β	Sanitary Water (10^{-8} μc/cc) Sr β
11/26/62	0.71	48	2.0	43	--
11/27/62	2.72	49	1.5	46	1.9
11/28/62	2.21	50	1.4	46	1.5
11/29/62	4.44	26	1.3	22	1.1
11/30/62	5.12	23	1.1	19	1.1
Average 11/62	2.43	72	1.7	56	1.3
12/1/62	6.10	15	1.1	13	1.2
12/2/62	5.81	11	0.9	9	1.0
12/3/62	6.97	11	1.0	10	1.0
12/4/62	7.25	10	0.9	9	0.9
12/5/62	7.73	7	0.9	5	1.0
12/6/62	7.70	26	0.9	15	1.1
12/7/62	7.54	26	1.1	29	1.1
12/8/62	7.41	17	1.0	20	1.1
12/9/62	7.47	11	0.9	10	0.9
12/10/62	7.49	9	0.9	10	0.9
12/11/62	7.47	9	0.7	6	0.6
12/12/62	7.46	10	1.0	13	1.0
12/13/62	7.51	--	---	--	---
12/14/62	7.50	4	0.7	6	0.9
12/15/62	7.30	17	0.7	9	0.5
12/16/62	7.27	--	---	--	---
12/17/62	7.20	11	0.7	13	0.5
12/18/62	5.12	13	0.7	11	1.0
12/19/62	5.61	18	0.6	15	0.5
12/20/62	5.79	18	0.7	18	0.7
12/21/62	6.73	22	0.6	17	0.6
12/22/62	5.36	40	0.7	17	0.7
12/23/62	0.75	61	0.6	71	0.9
12/24/62	3.47	49	1.0	36	0.7
12/25/62	0.00	49	1.1	47	1.1
12/26/62	3.49	49	1.3	36	1.4
12/27/62	0.00	260	1.5	150	1.3
12/28/62	0.18	110	1.4	100	1.5
12/29/62	0.00	140	1.1	94	1.1
12/30/62	0.00	160	1.7	130	1.3
12/31/62	0.50	280	1.9	270	2.0
Average 12/62	5.17	50	1.0	41	1.0
1/1/63	0.00	120	1.3	160	1.5
1/2/63	4.84	96	1.1	86	1.4
1/3/63	5.88	69	1.1	53	1.2
1/4/63	1.12	15	0.8	18	1.0
1/5/63	3.07	18	0.7	16	0.8

TABLE I (Cont.)

Date	Norris Dam Discharge (ft^3/sec/1000)	Clinch River (10^{-8} μc/cc) Gross β	Clinch River (10^{-8} μc/cc) Sr β	Sanitary Water (10^{-8} μc/cc) Gross β	Sanitary Water (10^{-8} μc/cc) Sr β
1/6/63	4.46	25	0.9	17	0.7
1/7/63	5.92	33	0.8	35	1.0
1/8/63	5.84	24	0.9	21	0.9
1/9/63	6.63	17	0.7	20	1.0
1/10/63	7.40	13	0.6	14	0.7
1/11/63	7.29	16	1.1	10	0.9
1/12/63	2.83	49	---	19	1.4
1/13/63	2.23	45	1.1	50	1.4
1/14/63	4.77	64	1.0	59	1.0
1/15/63	3.73	29	1.0	71	1.1
1/16/63	7.29	21	1.0	21	1.2
1/17/63	5.19	12	0.5	11	1.0
1/18/63	1.91	14	0.7	11	0.8
1/19/63	0.00	27	0.8	12	0.8
1/20/63	0.00	56	0.9	36	0.9
1/21/63	1.96	150	2.1	90	1.2
1/22/63	0.00	170	1.7	240	2.3
1/23/63	2.57	41	1.0	76	1.4
1/24/63	5.85	39	1.7	32	1.5
1/25/63	0.58	14	1.3	53	1.5
1/26/63	0.00	14	1.2	12	1.1
1/27/63	5.87	22	1.0	15	1.0
1/28/63	6.80	28	1.1	18	1.2
1/29/63	5.92	--	---	18	1.1
1/30/63	0.58	8	0.9	6	1.0
1/31/63	2.46	41	1.1	17	1.1
Average 1/63	3.64	43	1.0	42	1.1
2/1/63	1.39	54	1.1	48	0.9
2/2/63	0.00	63	1.2	74	1.3
2/3/63	0.00	70	1.5	63	1.6
2/4/63	0.00	180	2.5	190	3.1
2/5/63	0.27	120	1.7	150	1.7
2/6/63	0.00	100	1.4	93	1.5
2/7/63	1.71	88	1.8	85	1.5
2/8/63	7.90	79	1.9	60	1.8
2/9/63	7.87	--	---	--	---
2/10/63	5.88	--	---	--	---
2/11/63	7.23	18	1.0	14	0.9
2/12/63	7.78	42	0.9	18	1.1
2/13/63	7.80	27	1.3	26	1.1
2/14/63	7.81	23	0.9	20	1.0
2/15/63	7.82	21	0.8	18	0.6

TABLE I (Cont.)

Date	Norris Dam Discharge (ft^3/sec/1000)	Clinch River (10^{-8} μc/cc) Gross β	Clinch River (10^{-8} μc/cc) Sr β	Sanitary Water (10^{-8} μc/cc) Gross β	Sanitary Water (10^{-8} μc/cc) Sr β
2/16/63	7.83	14	0.7	13	0.8
2/17/63	7.83	9	1.0	9	0.8
2/18/63	7.81	9	0.8	10	---
2/19/63	3.34	9	0.9	9	0.6
2/20/63	0.00	68	1.4	24	1.1
2/21/63	4.40	98	1.5	77	1.1
2/22/63	4.19	140	1.5	110	1.4
2/23/63	4.49	21	0.9	24	1.1
2/24/63	0.00	14	0.9	15	1.0
2/25/63	1.28	22	0.7	11	0.7
2/26/63	5.61	43	0.6	33	0.7
2/27/63	2.52	49	1.5	47	1.3
2/28/63	3.57	11	0.9	23	1.0
Average 2/63	4.15	54	1.2	49	1.2
3/1/63	0.91	14	1.0	9	1.0
3/2/63	0.00	22	1.1	18	1.0
3/3/63	0.00	82	1.2	53	1.2
3/4/63	0.00	54	1.1	66	1.5
3/5/63	0.00	80	1.6	55	0.8
3/6/63	0.74	120	2.4	55	1.6
3/7/63	8.13	38	2.1	42	2.2
3/8/63	8.53	29	1.9	20	2.0
3/9/63	8.59	11	0.7	9	0.9
3/10/63	7.72	--	---	--	---
3/11/63	6.35	--	---	--	---
3/12/63	8.63	82	1.7	14	1.1
3/13/63	10.99	15	2.1	11	2.5
3/14/63	20.50	9	1.3	8	1.7
3/15/63	25.08	9	1.0	5	1.2
3/16/63	25.05	7	0.8	5	1.1
3/17/63	25.01	9	0.9	6	1.1
3/18/63	25.10	9	1.0	8	0.8
3/19/63	25.34	8	1.1	5	0.9
3/20/63	25.28	10	1.3	5	1.0
3/21/63	25.24	14	1.1	13	1.3
3/22/63	25.20	9	0.9	6	0.5
3/23/63	25.11	7	1.0	4	0.3
3/24/63	25.06	5	1.0	3	0.8
3/25/63	24.95	7	0.9	5	0.3

TABLE I (Cont.)

Date	Norris Dam Discharge (ft^3/sec/1000)	Clinch River (10^{-8} μc/cc) Gross β	Clinch River (10^{-8} μc/cc) Sr β	Sanitary Water (10^{-8} μc/cc) Gross β	Sanitary Water (10^{-8} μc/cc) Sr β
3/26/63	22.03	5	1.0	3	0.8
3/27/63	14.92	5	0.9	2	1.1
3/28/63	9.68	8	0.6	5	0.5
3/29/63	4.81	9	0.9	6	0.9
3/30/63	0.00	-	---	-	---
3/31/63	0.00	24	1.0	15	1.0
Average 3/63	13.19	25	1.2	16	1.1
4/1/63	0.00	24	1.0	14	0.8
4/2/63	0.00	28	1.4	23	1.1
4/3/63	0.00	27	1.9	18	1.3
4/4/63	0.00	35	1.4	27	1.1
4/5/63	0.00	45	1.3	31	1.1
4/6/63	0.00	--	---	--	---
4/7/63	0.00	--	---	--	---
4/8/63	0.00	36	2.0	33	2.2
4/9/63	0.00	37	2.4	29	2.1
4/10/63	0.00	43	1.6	32	1.5
4/11/63	0.00	95	1.8	50	1.4
4/12/63	0.00	--	---	--	---
4/13/63	0.00	67	1.5	57	1.6
4/14/63	0.00	41	1.1	49	1.6
4/15/63	0.00	45	1.4	33	1.3
4/16/63	3.26	53	1.5	38	1.2
4/17/63	8.26	58	1.6	43	1.4
4/18/63	8.01	16	1.7	48	1.0
4/19/63	8.50	7	0.5	6	0.8
Average 4/63	1.48	41	1.5	33	1.3
SUMMARY					
Minimum	0.00	4	0.3	2	0.2
Average	5.01	44	1.2	37	1.1
Maximum	25.34	280	3.2	270	3.1

TABLE II

AVERAGE BETA RADIOACTIVITY LEVELS
(10^{-8} μc/cc)

Sample Period	Raw Water	Finished Water
Oct. 1962 - April 1963	44	37
1st Quarter - CY-1963	38	36
CY-1962	39	36
CY-1961	98	87
CY-1960	84	87
CY-1959	39	26
CY-1958	19	18

TABLE III

RATIO OF GROSS BETA RADIOACTIVITY TO
STRONTIUM BETA RADIOACTIVITY

Sampling Period	Raw Water	Finished Water
October	12.1	13.7
November	42.4	43.1
December	51.5	41.0
January	43.0	38.2
February	45.0	40.8
March	20.8	14.5
April	27.3	25.4
Total	37.1 ± 30.3	33.7 ± 21.3

TABLE IV

REDUCTION OF BETA RADIOACTIVITY BY ORGDP WATER TREATMENT PLANT

Sampling Period	Number of Samples	Average Beta Radioactivity ($\mu c/cc \times 10^{-8}$) Raw Water Gross β	Raw Water Sr β	Finished Water Gross β	Finished Water Sr β	Reduction of Beta Activity Gross β	Reduction of Beta Activity Sr β
October	18	6	0.5	6	0.4	0%	9%
November	29	72	1.7	56	1.3	22%	24%
December	29	50	1.0	41	1.0	18%	0%
January	30	43	1.0	42	1.1	2%	0%
February	26	54	1.2	49	1.2	9%	0%
March	28	25	1.2	16	1.1	36%	8%
April	16	41	1.5	33	1.3	20%	13%
Total	176	44	1.2	37	1.1	15% ± 24%	6% ± 17%

ORGDP ENVIRONMENTAL SAMPLING

CY	Beta in Drinking Water		Uranium							
			Local Streams				Airborne Alpha Activity			
			Poplar Creek		Clinch River		On-Plant		Off-Plant	
	REM	$\%MPC_w$*	uc/cc x10^{-7}	$\%MPC_w$**	uc/cc x10^{-7}	$\%MPC_w$**	c/m/ft^3	%MPC#	c/m/ft^3	%MPC##
1960	0.095	1.9%	0.48	0.3%	0.03	0.1%	0.14	7.0%	0.006	15.7%
1961	0.065	1.3%	0.63	0.3%	0.02	0.1%	0.08	4.0%	0.002	6.3%
1962	0.060	1.2%	0.38	0.2%	0.02	0.1%	0.08	2.5%	0.005	12.5%
1963	0.040	0.8%	0.37	0.2%	0.03	0.1%	0.09	4.5%	0.006	15.0%

* Maximum Permissible Concentration in Water for occupational exposure, 40 hour week. (Value varies with radionuclide distribution).

** Maximum Permissible Concentration in Water for continuous exposure of the general population ($2x10^{-5}$ uc/cc).

\# Maximum Permissible Concentration in Air for occupation exposure, 40 hour week. (10^{-10} uc/cc, or 2 alpha counts per minute per cubic foot)

\#\# Maximum Permissible Concentration in Air for continuous exposure of the general population ($2x10^{-12}$ uc/cc or 0.04 alpha counts per minute per cubic foot).

DRAFT, [illegible] MEM[illegible] [illegible]

To:

From: F. L. Parker

Subject: Measured Body Burdens from the Ingestion of Clinch River Water

During the course of the comprehensive study of the fate of radionuclides discharged to the Clinch River, it became obvious that the measured body burdens of people ingesting Clinch River water would be vital information. The nearest downstream water supply intake (ORGDP) is located at CRM 14.4, just 6.4 miles downstream from the confluence of the Clinch River and White Oak Creek.

The water at the intake is routinely monitored by the ORGDP as is the finished water in the pipelines. The total amount of radioactive material discharged from ORNL since 1944 through 1962 is estimated to be 13,360 curies.

Assuming complete dilution of the radionuclides in the water during this period, this would have amounted to an average concentration of radionuclides in the water of 150 μμc per liter at Clinch River Mile 14.4.

Assuming that all of the water intake by an individual at the ORGDP is derived from drinking water at the plant, this would have amounted to a body burden of 2.7 μc of Sr^{90} or 33×10^{-3} μc of Cs^{137} if the total activity were either Sr^{90} or Cs^{137}. Maximum permissible body burdens are 2 and 30 μc, respectively.

A better determination of the body burden would be obtained if it were possible to measure the body burden *in vivo*. Fortunately, the construction

of a whole body counting facility at ORNL in June 1960 has made this possible. Through the co-operation of the Health Physics Division of ORGDP and the Health Physics Technology Section of ORNL, it was possible to count selected ORGDP personnel in the In Vivo Gamma Ray Spectrometric Facility. The facility is a 10-ft-by-10-ft room, made of prewar 14-in. steel armor plate and lined with 1/8-in. low radioactivity lead. An 8-in.-by-4-in. sodium iodide crystal in an aluminum can was used to scan the personnel who were seated in the Standard Argonne Chair.

The main radionuclides of interest in Clinch River water are Sr^{90}, Cs^{137}, Ru^{106}, and Co^{60}. The permissible body burden, effective half life, and the detection limits in the whole body counter are given in Table 1.

It is obvious that none of the isotopes of interest that are gamma emitters have a long enough effective half life to enable them to be used as integrating monitors of the isotopes ingested for long periods of time. Therefore, the body burden should build up to equilibrium quickly. For example, Cs^{137} has a radioactive half life of 30 years, a biological half life of 70 days for the whole body, and an effective half life of 70 days. Assuming that the 2.2 liters of water of standard man intake per day is solely derived from the Clinch River and taking the maximum concentration of cesium measured at CRM 14.4 (80 μμc per liter) and further assuming that all of the cesium ingested is retained, then we would accumulate a body burden of 1.7×10^{-2} μc. The minimum detection limit of the whole body counter for Cs^{137} is 2.7×10^{-3} μc. However, the average concentration of Cs^{137} in the drinking water at the intake during the period of the study, November 1960 to June 1962, was 3.8 μμc per liter or equivalent to a body burden of 8.3×10^{-4} μc or the detectable limit.

Table 1.

Isotope	Permissible Body Burden (μc)	Effective Half-Life (days)	[illegible] Limit (μμc)	Occupational MPC_w ($\mu c/cm^3$)
Sr^{90}	2	6.4×10^5	0	10^{-6}
Cs^{137}	30	70	2.7×10^{-5}	2×10^{-4}
Co^{60}	10	9.5		5×10^{-4}
Ru^{106}	10	7.5		10^{-4}
Zr^{95}-Nb^{95}	20	55.5	1.03×10^{-3}	6×10^{-4}

Therefore, it was obvious that ingestion of drinking water alone would not allow sufficient Cs^{137} to be accumulated in the body to be detected by whole-body counting. However, there was additional Cs^{137} in the diet due to the incorporation of fallout nuclides in food stuffs. It was felt that the additional radioactive material in food stuffs might make it possible to detect differences in intake between those consuming Clinch River water and those who did not.

Consequently, it was felt that a summary of the eating habits of the employees involved would be necessary to determine the contribution of Clinch River water to the possible build-up of radionuclides in their bodies. The per cent contribution of foods to the yearly intake of Cs^{137} is shown in Table 2. The questionnaire shown in Appendix I was distributed to 105 monthly employees not engaged in uranium work by the Health Physics Division at ORGDP, and 75 answers were received. The answers were [illegible] by the Applied Statistics Section, under the direction of D. G. Cardwell, and listed by diet component. For a preliminary sample, five of those most likely to have a larger body burden and five of those least likely to have large body burdens were selected for whole-body analyses. Male uptake was considered to be equal to female uptake, though this is not quite true. Potentially large body burdens were based on total uptake of Clinch River water, milk, locally caught fish, and cereals.

The results of the counts of the ORGDP personnel are shown in Table [illegible]. These values are compared with the average counts of ORNL personnel during the same period and that of the author. The K^{40} content, of course, is a function of the body weight and is not indicative of the amount of radionuclides ingested.

Table 2. Estimated Mean Daily Intake of Cs^{137} in the Total Diet

	USA - 1956 and 1957		Canada - 1959	
	(μμc)	(%)	(μμc)	(%)
Milk and Milk Products	37	60	35	55
Vegetables, Except Potatoes	3.9	6	0.8	1
Potatoes	0		0.0	
Fruit	2.5	4	1.0	2
Meat	14.7	25	21.8	34
Fish	[illegible]			
Flour and Cereals	[illegible]	[illegible]	5.1	8
	61.9		65.7	

Table 3. Body Burdens of Selected ORGDP Workers

	Person	Cs^{137} (10^{-9} Curie)	I^{131} (10^{-9} Curie)	K^{40} (g)	Selected Group
1	A	9.13	1.672	152.6	[illegible]
2	B	9.1	4.848	123.4	[illegible]
3	C	6.69	4.497	109	[illegible]
4	D	6.4	1.145	120	[illegible]
5	E	[illegible]	1.062	115.5	[illegible]
6	F	[illegible]	1.070	122	[illegible]
7	G	4.5	1.087	82	[illegible]
8	H	[illegible]	1.589	131	[illegible]
9	I	[illegible]	1.454	123.0	[illegible]
10	J	[illegible]	1.112	90.5	[illegible]
11	K	[illegible]	0.8193	81.6	[illegible]
	Mean	$[illegible] \times 10^{-3}$ μc	1.86×10^{-3} μc	113.8	
	Maximum Permissible Body Burden	30 μc	30 μc		
	MP	8.955	2.174	175.8	
Aug. ORNL	Average ORNL Body Burden	7.808	1	100-160	

Results and Conclusions

It is obvious that none of the ORGDP employees are receiving significant radiation doses due to the build-up of radionuclides in the body from ingesting Clinch River water. The body burden of consumers of large amounts of water is not significantly greater than those who state they do not consume any Clinch River water. It is also obvious that greater concentrations of radionuclides than exist locally must be present in the ~~river water~~ potable water service in order to be able to detect the body burden from whole-body counting.

Acknowledgment

Acknowledgment to A. F. Bacher and E. E. Schultz of the ORGDP, Health Physics Department, for help in every phase of the study and, in particular, for help in polling the ORGDP personnel and enabling them to be counted in the whole-body facility. The statistical analysis of the questionnaires by Donald G. Gardiner and Applied Statistics Section of the Mathematics Panel and the counting of the ORGDP workers by P. M. Brown of the Health Physics Technology Section are gratefully acknowledged. Thanks are also due to Tom Hodge of the Radioactive Waste Disposal Section for assistance in every phase of the study.

CC: H. R. Schultz

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY: C. C. Fowler

BLDG. NO.: K-1101

PHONE: 8601

REQUEST NO.:

CHARGE: Total B Sr

U. M. NUMBER	DATE ~~RECEIVED~~ Sampled	DESCRIPTION	dis/min/100ml	B dis/min/l		
523B	3-27-63	Raw H_2O	12	20		
524B	"	Finished "	4	25		
533B	3-28-63	Raw "	18	14		
534B	"	Finished "	12	11		
535B	3-29-63	Raw "	19	20		
536B	"	Finished "	14	20		
537B	3-31-63	Raw "	54	22		
538B	"	Finished "	34	22		
539B	4-1-63	Raw "	53	22		
540B	"	Finished "	30	17		
541B	4-2-63	Raw "	63	31		
542B	"	Finished "	50	24		
543B	4-3-63	Raw "	59	42		
544B	"	Finished "	41	29		
545B	4-4-63	Raw "	78	31		
546B	"	Finished "	61	25		
560B	4-5-63	Raw "	101	29		
561B	"	Finished "	68	24		
563B	4-8-63	Raw "	80	44		
564B	"	Finished "	74	49		
565B	4-9-63	Raw "	82	54		
566B	"	Finished "	64	47		
575B	4-10-63	Raw "	96	35		
576B	"	Finished "	71	33		

DATE: 5-6-63

RESULTS APPROVED BY: A. R. Lyman

for L. F. Thomas

UCN-2813
(1 5-62)

CC: N. B. Shulte

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY: C. C. Faulkner

BLDG. NO.: K-1101

PHONE: 5601

REQUEST NO.:

CHARGE: Total β Sr

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	dis/min/1.00 ml		β dis/min/1.00 ml			
647B	5-13-63	K-1513 Raw with O	94		27			
683B	6-10-63	K-1513 Raw H_2O	13		12			

DATE: 8-26-63

RESULTS APPROVED BY: A R Flynn

UCN-2813 (1 4-61)

Health Physics

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URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY: N. B. Schultz

BLDG. NO.:

PHONE:

REQUEST NO.:

Date Sampled ~~U. M. NUMBER~~	DATE RECEIVED	DESCRIPTION	CHARGE Alpha dis/min /100 ml	Total Beta dis/min /100 ml	Sr^{90} β dis/min /l	Ru^{106} β dis/min /l
	8-13-62	Raw H_2O	0	30	10	
	"	Finished H_2O		28		
	8-20-62	Raw H_2O	0	10	5	
	"	Finished H_2O		36		
	9-4-62	Raw H_2O	0	9	13	39
	"	Finished H_2O		2		
	9-10-62	Raw H_2O	0	2	8	25
	9-17-62	Raw H_2O	0	19		
	"	Finished H_2O		28		
	10-1-62	Raw H_2O	0	44		
	"	Finished H_2O	0	87		
	10-10-62	Raw H_2O	0	77	21	406
	10-15-62	Raw H_2O	0	62	13	184
	"	Finished H_2O		71		
	10-18-62	Raw H_2O		26	8	
	"	Sanitary H_2O		10	13	
	10-19-62	Raw H_2O		17	12	
	"	Sanitary H_2O		10	Lost Sample	
10-19-62	10-22-62	Raw H_2O		15	8	
10-20-62	"	Finished H_2O		14	8	
10-21-62	"	Raw H_2O		16	10	
10-22-62	"	Finished		15	9	
"	"	Raw H_2O		16	12	
"	"	Finished H_2O		10	12	
10-23-62	10-23-62	Raw H_2O		12	27	

DATE: 11-1-62

RESULTS APPROVED BY: A R Flynn

UCN-2813
(1 5-62)

U. A. M. B. Schulz

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
C. C. Faulkner	K-1401	3601

REQUEST NO.	CHARGE
	Total B, Sr

U. M. NUMBER	DATE ~~RECEIVED~~ sampled	DESCRIPTION	dpm/min 100 ml	B dpm/min 1 l		
577B	4-11-63	Raw H_2O	210	40		
578B	"	Finished "	110	32		
594B	4-13-63	Raw "	148	33		
595B	"	Finished "	127	35		
596B	4-14-63	Raw "	91	25		
597B	"	Finished "	108	35		
598B	4-15-63	Raw "	101	31		
599B	"	Finished "	74	30		
600B	"	K-1513 Raw "	108	34		
609B	4-16-63	Raw "	117	34		
610B	"	Finished "	84	26		
612B	4-17-63	Raw "	128	36		
613B	"	Finished "	96	32		
614B	4-18-63	Raw "	35	37		
615B	"	Finished "	107	21		
616B	4-19-63	Raw "	15	12		
617B	"	Finished "	13	17		

DATE	RESULTS APPROVED BY
5-6-63	A. R. Fugua

for J. J. Fuller

UCN-2813
(1 5-62)

Copy to C. C. Foulkes

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY N. B. Schultz

BLDG. NO.

PHONE

REQUEST NO.

CHARGE

~~Date Sampled~~ U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Total Beta dis/min/100ml	Sr 90 β dis/min/L		
10-23-62	10-23-62	Finished H_2O	10	14		
10-24-62	10-24-62	Raw H_2O	15	11		
"	"	Finished H_2O	25	6		
10-25-62	10-25-62	Raw H_2O	20	8		
"	"	Finished H_2O	34	12		
10-26-62	10-26-62	Raw H_2O	31	7		
"	"	Finished H_2O	18	6		
10-29-62	10-29-62	Raw H_2O	9	8		
"	"	Finished	9	8		
10-29-62	"	Raw H_2O	13	9		
"	"	Finished H_2O	8	10		
10-29-62	"	Raw H_2O	16	9		
"	"	Finished	4	7		
unknown	"	Raw H_2O	6	5		
10-30-62	10-30-62	Raw H_2O	11	7		
"	"	Finished H_2O	6	8		
10-31-62	10-31-62	Raw H_2O	11	10		
"	"	Finished H_2O	11	8		

Safety and Health Physics

NOV 5 11 4:00

DATE 11-1-62

RESULTS APPROVED BY A. R. Flynn

UCN-2813

Schultz

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY | BLDG. NO. | PHONE

REQUEST NO. | CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Sr d/M/L		
58 B	11-1-62	Raw H_2O		10		
59 B	11-1-62	Funeled H_2O		12		
60 B	11-2-62	Raw		9		
61 B	11-2-62	Funeled		4		
62 B	11-5-62	Raw H_2O (11-2)		12		
63 B	11-5-62	Funeled (11-3)		9		
64 B	11-5-62	Raw (11-4)		9		
65 B	11-5-62			9		
66 B	11-5-62			10		
67 B	11-5-62			7		
68 B	11-5-62			12		
69 B	11-6-62	Raw		9		
70 B	"	F		9		
71 B	11-7-62	Raw		9		
72 B	11-7-62	Funeled		10		
				Total Sr d/M/L		Sr^{90} d/M/L
22 B	Raw 10-23-62			27		11

DATE: 11-6-62

RESULTS APPROVED BY: G. S. Petit

UCN-2813
(1 5-62)

Schultz - FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY			BLDG. NO.		PHONE	
REQUEST NO.			CHARGE			
U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Sr^{89} d/m/L	Sr^{89}	Sr^{90} d/m/L	Sr^{89}/Sr^{90}
90 B	11-12-62	Raw Hrs 11-12	71	49	22	68
	11-13-62	Tap water	54	40	14	74
	Sample (30L) taken					
	in the lab.					
84B	11-9-62	RAW	46			
85B	11-9-62	FINISHED	30			
86B	11-12-62	11-10-62 RAW	56			
87B	11-12-62	11-10-62 FINISHED	24			
88B	11-12-62	11-11-62 RAW	60			
89B	11-12-62	11-11-62 FINISHED	52			
90B	11-12-62	11-12-62 RAW	71			
91B	11-12-62	11-12-62 Finished	32			
92B	11-13-62	11-13 RAW	58			
93B	11-13-62	11-13-FIN	30			
94B	11-14	RAW 11-14-62	62			
95B	11-14	Purified	37			
104B	11-15	RAW 11-11-	53			
105B	11-15	Finished	32			

DATE 11-21-62

RESULTS APPROVED BY G. S. Petit

UCN-2813

Schultz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY

BLDG. NO.

PHONE

REQUEST NO.

CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/ml			
108B	11-19-62	Raw 11-17	59			
109B	"	F. 11-17	52			
110B	11-19-62	Raw 11-18	44			
111B	11-19-62	F - 11-18	48			
112B	11-19-62	R - 11-19	48			
113B	11-19-62	F - 11-19	43			
114B	11-20-62	Raw 11-20	51	51		
115B	11-20-62	F, 11-20	46	46		
116B		Raw 11-21-62	40			
117B		F-11-21-62	43			
118B	11-26-62	RAW 11-23-62	57			
119B	11-26-62	F 11-23	43			
132B	11-26-62	Raw 11-24	38			
133B	11-26-62	F 11-24	30			
134B	11-26-62	R 11-25	36			
135B	11-26-62	F - 11-25	37			

DATE 11-21-62

RESULTS APPROVED BY G. S. Petit

UCN-2813
(1 5-62)

Copy to: N. B. Schultz
G. S. Petit

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
C. C. Fowlkes	K-1101	8601

REQUEST NO.

CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Total Beta Beta dis./min./100 ml.		Sr, Beta dis./min./l.	Sr^{90}, Beta dis./min./l.
	11-1-62	H_2O, Raw	19		10	
	"	" Finished	9		12	
	11-2-62	" Raw	46		9	
	"	" Finished	17		4	
	11-3-62	" Raw	20		12	
	"	" Finished	21		9	
	11-4-62	" Raw	20		9	
	"	" Finished	17		9	
	11-5-62	" Raw	19		10	
	"	" Finished	29		7	
	"	" Raw(K-1513)	46		12	
	11-6-62	" Raw	18		9	
	"	" Finished	18		9	
	11-7-62	" Raw	23		9	
	"	" Finished	16		10	
	11-8-62	" Raw	15		10	
	"	" Finished	18		10	
	11-9-62	" Raw	40		46	
	"	" Finished	14		30	
	11-10-62	" Raw	263		56	
	"	" Finished	134		24	
	11-11-62	" Raw	170		60	
	"	" Finished	274		52	
	11-12-62	" Raw	259		71	22
	"	" Finished	90		32	22

Sr

68

Safety and Health Physics

DATE

November 28, 1962

RESULTS APPROVED BY

A R Flynn

UCN-2813

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY			BLDG. NO.		PHONE	
REQUEST NO.			CHARGE			
U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Total Beta Beta dis./min./100 ml.		Sr, Beta dis./min./l.	Sr^{90}, Beta dis./min./l.	Ru, Beta dis. min. l.
	11-13-62	H_2O, Raw	285		58		
	"	" Finished	117		30		
	11-14-62	" Raw	317		62		
	"	" Finished	137		37		
	11-15-62	" Raw	241		53		
	"	" Finished	231		32		
	11-16-62	" Raw	272		54		
	"	" Finished	220		54		
	11-17-62	" Raw	273		59		
	"	" Finished	274		52 ~~32~~		
	11-18-62	" Raw	61		44		
	"	" Finished	125		48		
	11-19-62	" Raw	253		48		
	"	" Finished	97		43		
	11-20-62	" Raw	449		51		
	"	" Finished	300		46		
	9-17-62	Raw H_2O	19		48	18	41
	10-1-62	Raw H_2O	44		28	11	130
	10-23-62	Raw H_2O	12		27	11	

DATE

RESULTS APPROVED BY A R Flynn

UCN-2813
(1 5-62)

Flynn - Schultz

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
REQUEST NO.	CHARGE	

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Sr, d./m./l.			
136 B	11-26-62	Raw 11-26	42			
137 B	"	Raw 11-26	44			
138 B	"	Fin. 11-26	Lost sample			

DATE November 30, 1962

RESULTS APPROVED BY H. L. Petit

Health Physics

Schultz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY | BLDG. NO. | PHONE

REQUEST NO. | CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Std/ml		
143B	11-29-62	Raw 11-29-62		28		
144B	11-29-62	F - 11-29		24		
153B	12-3-62	R 11-30		25		
154B	12-3-62	F - 11-30		25		
155B	12-3-62	R 12-1		24		
156B	12-3-62	F 12-1		27		
157B	12-3-62	R 12-2		21		
158B	12-3-62	F 12-2		21		
159B	12-3-62	R 12-3		22		
160B	12-3-62	F 12-3-62		23		

Safety and Health Physics

DATE 12-15-62

RESULTS APPROVED BY G. S. Petit

UCN-2813
(1 5-62)

106B	11-16-62	Raw 11-16	54			
107B	11-16-62	F. 11-16	54			

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Std/M/L		
161B	12-4-62	Raw 12-4		20		
162B	12-4-62	F 12-4		20		

Health Physics

DATE 12-6-62

RESULTS APPROVED BY G. S. Petit

UCN-2813
(1 5-62)

Copy to C.C. Franklin

URANIUM MEASUREMENTS DATA

Physics

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
M. R. Schultz	K-1006	

REQUEST NO.

CHARGE 174474

Total Beta Sr

U. M. NUMBER	DATE ~~RECEIVED~~ Sampled	DESCRIPTION	dis/min/100ml	β dis/min/l
	11-21-62	Raw H_2O	424	40
	"	Finished H_2O	476	43
	11-23-62	Raw H_2O	531	51
	"	Finished H_2O	359	43
	11-24-62	Raw H_2O	135	38
	"	Finished H_2O	133	30
	11-25-62	Raw H_2O	94	36
	"	Finished H_2O	139	37
	11-26-62	K-1313 Raw H_2O	297	42
	"	Raw H_2O	107	44
	"	Finished H_2O	95	lost sample
	11-27-62	Raw H_2O	109	34
	"	Finished H_2O	103	43
	11-28-62	Raw H_2O	111	30
	"	Finished H_2O	103	33
	11-29-62	Raw H_2O	57	28
	"	Finished H_2O	49	24
	11-30-62	Raw H_2O	50	25
	"	Finished H_2O	43	25
	12-1-62	Raw H_2O	33	24
	"	Finished H_2O	28	27
	12-2-62	Raw H_2O	24	21
	"	Finished H_2O	20	21
	12-3-62	Raw H_2O	24	22
	"	Finished H_2O	22	23

DATE 12-6-62

RESULTS APPROVED BY A R Flynn

Flynn-Schultz

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Srd/ml			
171 B	12-5-62	Raw 12-5	19			
172B	12-5-62	F - 12-5	22			
173B	12-6-62	R - 12-6	21			
174B	12-6-62	F - 12-6	26			

Health Phys.

DATE 12-11-62

RESULTS APPROVED BY G. S. Petit

UCN-2813
(1 5-62)

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
Flynn - Schultz		

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Sr, d./m./l.			
141 B	11-28-62	Raw 11-28	30			
142 B	11-28-62	Finished 11-28	33			

Industrial Health Physics

DATE	RESULTS APPROVED BY
December 11, 1962	G. S. Pettit

UCN-2813

Schultz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	[illegible]/M/L			
76B	12-[illegible]	Raw 12-[illegible]	25			
77B	12-10	F 12-7	21			
78B	12-10	R 12-[illegible]	22			
79B	12-10	F 12-8	24			
80B	12-10	R 12-9	20			
81B	12-10	F 12-9	20			
82B	12-10	R-12-12	19			
83B	12-10	F 12-10	20			

Health Physics

DATE	RESULTS APPROVED BY
12-13-6[illegible]	[illegible]

UCN-2813
(1 5-62)

Schultz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Sr d/m/L		
184B	12-11-62	Raw 12-11-62		15		
185B				14		
SNOW WATER		12-11-62		449		
186B	12-12-62	R 12-12		21		
187B	12-12-62	F 12-12		21		

Safety and Health Physics

DATE 12-20-62

RESULTS APPROVED BY V. L. Pelt

UCN-2813

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY: FLYNN — SCHWITZ

BLDG. NO.:

PHONE:

REQUEST NO.:

CHARGE:

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/m/L			
196B	12-14-62	RAW 12-14	15			
197B	12-14-62	F 12-14	20			
198B	12-15-62	R. 12-15	14			
199B	12-16-62	F 12-15	11			
200B	12-17-62	R 12-17	15			
201B	12-17-62	F 12-17	12			
208B	12-18-62	R 12-18	16			
209B	12-18-62	F 12-18	22			

Safety and Health Physics

DATE: 12-21-62

RESULTS APPROVED BY: G. S. Petit

UCN-2813
(1 5-62)

Schultz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/M/L			
217B	12-21-62	Raw 12-19-62	13			
218B	"	F 12-19	12			
220B	"	R. 12-20-62	16			
222B	12-26-62	R - 12-21-62	13			
224B	"	R 12-22-62	16			
226B	"	R 12-23-62	14			
229B	"	F 12-24-62	16			
234B	"	R 12-24-62	18			

Safety and Health Physics

DATE	RESULTS APPROVED BY
12-28-62	G. S. Petit

UCN-2813

SCHULTZ - FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/M/L		Std/M/gram	
221B	12-26-62	FIN 12-20-62	15			
223B	12-26-62	FIN 12-21-62	14			
225B	12-26-62	FIN 12-22-62	16			
227B	12-26-62	F 12-23-62	20			
228B	12-26-62	R 12-24-62	21			
230B	12-26-	R 12-25-62	25			
231B	12-26	F 12-25-62	24			
232B	12-27		28			
233B	12-27-62		30			
235B	12-27-62	R. 12-27	33			
236B	12-27-62	F 12-27	28			
240B	12-28-62	R. 12-28	30			
241B	12-28-62	F. 12-28	34			
SNOW	12-26-62	SNOW of 12-24.	99			
K1302 Blower					71	

Safety and Health Physics

DATE	RESULTS APPROVED BY
12-29-62	G. S. Petit

UCN-2813
(1 5-62)

SCHULTZ-FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/M/L			
242B	12-29-62	Raw 12-29	25			
243B	"	F 12-29	24			
244B	1-2-63	Raw 12-30-62	38			
245B	1-2-63	F 12-30-62	28			
246B	1-2-63	R .12-31-62	43			
247B	1-2-63	F-12-31-62	45			
248B	1-2-63	R. 1-1-63	28			
249B	1-2-63	F 1-1-63	33			
250B	1-2-63	R 1-2-63	25			
251B	1-2-63	F 1-2-63	31			
260B	1-3-63	R 1-3-63	25			
261B	1-3-63	F 1-3-63	27			

DATE	RESULTS APPROVED BY
1-5-63	G. S. Petit

UCN-2813

Copy sent to C. E. Fauver

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
N. B. Roberts	K-1006	

REQUEST NO.	CHARGE
	Total β / β

U. M. NUMBER	DATE ~~RECEIVED~~ Sampled	DESCRIPTION	dis/min/100 ml	β dis/min/L		
	12-4-62	Raw H_2O	22	20		
	"	Fin. H_2O	20	20		
	12-5-62	Raw H_2O	16	19		
	"	Fin. H_2O	12	22		
	12-6-62	Raw H_2O	52	21		
	"	Fin. H_2O	34	25		
	12-7-62	Raw H_2O	53	25		
	"	Fin. H_2O	65	25		
	12-8-62	Raw H_2O	37	22		
	"	Fin. H_2O	44	24		
	12-9-62	Raw H_2O	23	20		
	"	Fin. H_2O	22	20		
	12-10-62	Raw H_2O	20	19		
	"	Fin. H_2O	22	20		
	12-11-62	Raw H_2O	19	15		
	"	Fin. H_2O	14	14		
	12-12-62	Raw H_2O	21	21		
	"	Fin. H_2O	29	21		
	12-11-62	Snow		449		
	12-14-62	Raw H_2O	8	15		
	"	Fin. H_2O	14	20		
	12-15-62	Raw H_2O	38	14		
	"	Fin. H_2O	19	11		
	12-17-62	Raw H_2O	24	15		
	"	Fin. H_2O	29	12		

DATE	RESULTS APPROVED BY
1-3-63	A R Flynn

UCN-2813
(1 5-62)

Laser sent to D.O.F. Fluorimeter

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
N. B. Laurents	K-806	

REQUEST NO.	CHARGE
J	20-1.B

U. M. NUMBER	DATE ~~RECEIVED~~ Sampled	DESCRIPTION	dis/min/100 ml	B dis/min/l	B dis/min/gram	
	12-18-62	Raw H_2O	29	16		
	"	Fin. H_2O	24	22		
	12-19-62	Raw H_2O	39	13		
	"	Fin. H_2O	34	12		
	12-20-62	Raw H_2O	40	16		
	"	Fin. H_2O	39	15		
	12-21-62	Raw H_2O	49	13		
	"	Fin. H_2O	37	14		
	12-22-62	Raw H_2O	88	16		
	"	Fin. H_2O	36	16		
	12-23-62	Raw H_2O	135	14		
	"	Fin. H_2O	158	20		
K-1513	12-24-62	Raw H_2O	112	18		
	12-24-62	Raw H_2O	118	21		
	"	Fin. H_2O	79	16		
	12-25-62	Raw H_2O	107	25		
	"	Fin. H_2O	105	24		
	12-26-62	Raw H_2O	108	28		
	"	Fin. H_2O	81	30		
	"	Inner		99		
	12-27-62	Raw H_2O	573	33		
	"	Fin. H_2O	330	28		
	12-28-62	Raw H_2O	243	30		
	"	Fin. H_2O	222	34		
K-1302		Blower			71	

DATE	RESULTS APPROVED BY
1-3-63	A R Flynn

Health Physics

UCN-2813

SCHULTZ - FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/M/L			
269B		1-4-63 R	18			
270B		1-4-63 F	23			
271B	1-5-63	Raw 1-5-	15			
272B	"	F 1-5	18			
273B	1-7-63	RAW 1-6	19			
274B	1-7-63	F 1-6	16			
275B	1-7-63	R 1-7-63	17			
276B	"	F 1-7-63	21			

Safety and Health Physics
Oak Ridge
Pm 4:16

DATE	RESULTS APPROVED BY
1-9-63	G. S. Petti

UCN-2813
(1 5-62)

URANIUM MEASUREMENTS DATA

SCHULTZ - FLYNN

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Srd/ml			
277B	1-8-63	1-8-63 RAW	20			
278B	"	1-8-63 F.	19			
287B	1-9-63	1-9-63 R	15			
288B	"	" F	21			
291B	1-10-63	1-10-63 R	14			
292R	1-10-63	" F	15			

DATE	RESULTS APPROVED BY
1-14-63	G. S. Petit

UCN-2813

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY: M. R. Schulte | BLDG. NO. | PHONE

REQUEST NO. | CHARGE: Total β | Sr

U. M. NUMBER	DATE ~~RECEIVED~~ Sampled	DESCRIPTION	β disp/min/liter	β disp/min/liter		
	12-29-62	Raw H_2O	322	25		
	"	Fin. H_2O	209	24		
	12-30-62	Raw H_2O	355	38		
	"	Fin. H_2O	295	28		
	12-31-62	Raw H_2O	614	43		
	"	Fin. H_2O	595	45		
	1-1-63	Raw H_2O	265	28		
	"	Fin. H_2O	360	33		
	1-2-63	Raw H_2O	214	25		
	"	Fin. H_2O	192	31		
	1-3-63	Raw H_2O	153	25		
	"	Fin. H_2O	117	27		
	1-4-63	Raw H_2O	34	18		
	"	Fin. H_2O	41	23		
	1-5-63	Raw H_2O	39	15		
	"	Fin. H_2O	35	18		
	1-6-63	Raw H_2O	56	19		
	"	Fin. H_2O	38	16		
	1-7-63	Raw H_2O	74	17		
	"	Fin. H_2O	77	21		
	1-8-63	Raw H_2O	53	20		
	"	Fin. H_2O	47	19		
	1-9-63	Raw H_2O	37	15		
	"	Fin. H_2O	45	21		

DATE: 1-21-63 | RESULTS APPROVED BY: A R Flynn

UCN-2813 (1 5-62)

Safety and Health Physics

Schultz Flynn **URANIUM MEASUREMENTS DATA**

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		std/M/L		
302B	1-16-63	R-1-16-63		23		
303B	"	F "		26		
304B	1-17-63	R 1-17-63		19		
305B	"	F "		22		

DATE	RESULTS APPROVED BY
1-22-63	G. S. Petit

UCN-2813

Schultz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
REQUEST NO.	CHARGE	

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/m/L			
292B	1-11-63	R. 1-11-63	24			
293B	1-11-63	F-1-11-63	20			
294B	1-14-63	R 1-12-63	——	OPERATIONAL		ERROR.
295B	1-14-63	F-1-12-63	30			
296B	1-14-63	R 1-13-63	25			
297B	1-14-63	F 1-13-63	30			
298B	1-14-63	R 1-14-63	22			
299B	"	F 1-14-63	23			
300B	1-15-63	R 1-15-63	21			
301B.	1-15-63	F 1-15-63	24			

Safety and Health Physics

DATE 1-17-63

RESULTS APPROVED BY G. S. Petit

UCN-2813 (1 5-62)

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY Schultz - Flynn	BLDG. NO.	PHONE
REQUEST NO.	CHARGE	

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Sr-90/M/L		
314B	1-18-63	R 1-18-63		16		
315B	1-18-63	F-1-18-63		18		

DATE 1-22-63

RESULTS APPROVED BY G. S. Petit

UCN-2813
(1 5-62)

Schultz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Std/ML		
316B				18		
317B				17		
318B				20		
319B				20		
320B				46		
321B				27		
322B				21		
323B				37		
324B				50		
334B				23		
335B				30		

Health Physics

DATE	RESULTS APPROVED BY
1-25-63	G. S. Petit

UCN-2813
(1 5-62)

Copy sent to N. B. Schultz

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY: C. C. Foulkes

BLDG. NO.: K-1101

PHONE: 8601

REQUEST NO.:

CHARGE:

U. M. NUMBER	DATE ~~RECEIVED~~ Sampled	DESCRIPTION	Total U disp/min/100 ml	Se disp/min/1 L		
	1-10-63	Raw H_2O	29	14		
	"	Fin. H_2O	32	15		
	1-11-63	Raw H_2O	35	24		
	"	Fin. H_2O	21	20		
	1-12-63	Raw H_2O	108	O.E.		
	"	Fin. H_2O	43	30		
	1-13-63	Raw H_2O	100	25		
	"	Fin. H_2O	110	30		
	1-14-63	Raw H_2O	142	22		
	"	Fin. H_2O	131	23		
	1-15-63	Raw H_2O	64	21		
	"	Fin. H_2O	157	24		
	1-16-63	Raw H_2O	47	23		
	"	Fin. H_2O	47	26		
	1-17-63	Raw H_2O	27	11		
	"	Fin. H_2O	24	22		
	1-18-63	Raw H_2O	31	16		
	"	Fin. H_2O	24	18		
	1-19-63	Raw H_2O	61	18		
	"	Fin. H_2O	27	17		
	1-20-63	Raw H_2O	124	20		
	"	Fin. H_2O	80	20		
	1-21-63	Raw H_2O	339	46		
	"	Fin. H_2O	200	27		
K-7513	1-21-63	Raw H_2O	96	21		

DATE

RESULTS APPROVED BY: A R Flynn

UCN-2813

Schultz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Svd/M/L		
336B	1-24-63	1-24-63 R		37		
337B	1-24-63	1-24-63 F		33		
338B	1-25-63	1-25-63 R		29		
339B	1-25-63	" F		34		

DATE	RESULTS APPROVED BY
1-29-63	G. S. Petty

UCN-2813
(1 5-62)

SCHULTZ - FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Sp d/m/L			
341B	1-26-63	F. 1-26-63	25			
342B	1-27-63	F 1-27-63	23			
343B	1-27-63	R 1-27-63	21			
344B	1-28-63	R 1-28-63	25			
345B	1-28-63	F 1-28-63	27			

DATE	RESULTS APPROVED BY
1-31-63	G. S. Petit

UCN-2813

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Sp d/m/L		
340B	1-26-63	Raw 1-26-63		26		
346B	1-29-63	F 1-29-63		24		
348B	1-30-63	R 1-30-63		20		
349B	1-30-63	F 1-30-63		21		

Health Physics

DATE	RESULTS APPROVED BY
2-1-63	G. S. Petit

UCN-2813
(1 5-62)

Schultz - F14HN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Sr d/m/L		
357B	1-31-63	R-1-31-63		25		
358B	1-31-63	F1-31-63		25		

DATE	RESULTS APPROVED BY
2-4-63	G. L. Petit

UCN-2813

SCHULTZ - FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY			BLDG. NO.		PHONE	
REQUEST NO.			CHARGE			
U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Sr 4/M/L			Safety and Health Physics
359B	2-1-63	R-2-1-63	24			
360B	2-1-63	F-2-1-63	19			
361B	2-2-63	R-2-2-63	26			
362B	2-2-63	F-2-2-63	29			33
363B	2-3-63	R-2-3-63	34			
364B	2-3-63	F-2-3-63	35			
365B	2-4-63	R-2-4-63	56			
366B	2-4-63	F-2-4-63	68			
367B	2-5-63	R-2-4-63	38			
368B	2-5-63	F-2-5-63	38			
370B	2-6-63	R-2-6-63	31			
371B	2-6-63	F-2-6-63	34			

DATE: 2-8-63

RESULTS APPROVED BY: G. S. Petit

UCN-2813
(1 5-62)

SCHULTZ - FLYNN **URANIUM MEASUREMENTS DATA**

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Sr d/m/L			
380 B	2-7-63	R. 2-7-63	40			
381 B	2-7-63	F "	34			
382 B	2-8-63	R 2-8-63	44			
383 B	2-8-63	F "	40			
384 B	2-11-63	R "	23			
385 B	2-11-63	F "	19			

Health Physics

DATE	RESULTS APPROVED BY
2-14-63	G. S. Pettit

UCN-2813

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY: C. C. Foulkes
BLDG. NO.: K-1101
PHONE: 8601
~~REQUEST NO.~~: Copy sent to M. B. Schultz
CHARGE: 174474 Total β Sr

U. M. NUMBER	DATE ~~RECEIVED~~ sampled	DESCRIPTION	β dis/min 100 ml	β dis/min 1 l		
	1-22-63	Raw H_2O	382	37		
	"	Fin. H_2O	541	50		
	1-23-63	Raw H_2O	92	23		
	"	Fin. H_2O	168	30		
	1-24-63	Raw H_2O	87	37		
	"	Fin. H_2O	72	33		
	1-25-63	Raw H_2O	30	29		
	"	Fin. H_2O	117	34		
	1-26-63	Raw H_2O	32	26		
	"	Fin. H_2O	26	25		
	1-27-63	Raw H_2O	49	23		
	"	Fin. H_2O	34	21		
	1-28-63	Raw H_2O	63	25		
	"	Fin. H_2O	40	27		
	1-29-63	No Raw sample received				
	"	Fin. H_2O	41	24		
	1-30-63	Raw H_2O	18	20		
	"	Fin. H_2O	14	21		
	1-31-63	Raw H_2O	92	25		
	"	Fin. H_2O	37	25		
	2-1-63	Raw H_2O	121	24		
	"	Fin. H_2O	106	19		
	2-2-63	Raw H_2O	139	26		
	"	Fin. H_2O	165	29		

DATE: 2-18-63
RESULTS APPROVED BY: A R Flynn

Safety and Health Physics

UCN-2813

Schultz - Flynn URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY			BLDG. NO.		PHONE
REQUEST NO.			CHARGE		

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/m/L					
386 B	2-12-63	R-2-12-63	19					
387 B	2-12-63	F "	25					
388 B	2-13-63	R 2-13-63	28					
389 B	"	F "	24					
390 B	2-14-63	R 2-14-63	19					
391 B	"	F "	22					

Received 19 PM 2:20
Health and Health Physics

DATE 2-18-63

RESULTS APPROVED BY G. S. Petit

Schultz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
REQUEST NO.	CHARGE	

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Sp dpm/L					
393B	2-15-63	R-2-15-63	18					
394B	2-15-63	F-2-15-63	14					

DATE 2-20-63

RESULTS APPROVED BY G. S. Petit

UCN-2813

Schultz-Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/M/L					
403B	2-16-63	R-2-16	16					
404B	"	F "	17					
405B	2-17-63	R-2-17	21					
406B	"	F "	18					
407B	2-18-63	R 2-18	17					
408B	"	F "	Lost Sample					
409B	2-19-63	COMP. R 2-19	29					
410B	2-19-63	R "	20					
411B	2-19-63	F "	14					
420B	2-20-63	R 2-20	31					
421B	"	F "	25					
422B	2-21-63	R 2-21	33					
423B	"	F "	25					
SNOW	2-19-63	SNOW 2-19	182					

DATE	RESULTS APPROVED BY
2-27-63	G. S. Petit

UCN-2813

SCHULTZ - FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
REQUEST NO.	CHARGE	

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Std/M/L				
425B	2-22-62	B-2-22-62		34				
426B	"	F "		30				
427B	"	R 2-23		20				
428B	"	F 2-23		25				
429B	"	R 2-24		20				
430B	"	F 2-24		22				
431B	"	R 2-25		16				
432B	"	F 2-25		16				

Safety and Health Physics

DATE 2-28-63

RESULTS APPROVED BY G. S. Petit

UCN-2813

URANIUM MEASUREMENTS DATA

SCHULTZ - FLYNN

SAMPLE SUBMITTED BY			BLDG. NO.		PHONE			
REQUEST NO.			CHARGE					
U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/M/L					
433B	2-26-63	R-2-26	13					
434B	" "	F-2-26	16					

DATE 3-1-63

RESULTS APPROVED BY G. S. Petit

UCN-2813

URANIUM MEASUREMENTS DATA

SCHULTZ - FLYNN

SAMPLE SUBMITTED BY

BLDG. NO.

PHONE

REQUEST NO.

CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/M/L					
443B		R-2-27-63	34					
444B		F 2-27-63	29					
445B		R-2-28-63	20					
446B		F "	21					
447B		R 3-1-63	21					
448B		F 3-1-63	22					
449B		R 3-2-63	25					
450B		F "	21					
451B		R 3-3-63	27					
452B		F "	26					
453B		R 3-4-63	25					
454B		F "	34					
455B		R-3-5-63	35					
456B		F "	18					

DATE

3-8-63

RESULTS APPROVED BY

G. S. Petit

UCN-2813

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
C. C. Fowlkes	K-1101	8601

~~REQUEST NO.~~	CHARGE
Copy sent to N. C. Schultz	Total B Sr

U. M. NUMBER	DATE ~~RECEIVED~~ Sampled	DESCRIPTION	dis/min /100 ml	B dis/min /l		
	2-3-63	Raw H_2O	155	34		
	"	Fin. H_2O	140	35		
	2-4-63	Raw H_2O	409	56		
	"	Fin. H_2O	431	68		
	2-5-63	Raw H_2O	270	38		
	"	Fin. H_2O	333	38		
	2-6-63	Raw H_2O	227	31		
	"	Fin. H_2O	207	34		
	2-7-63	Raw H_2O	196	40		
	"	Fin. H_2O	189	34		
	2-8-63	Raw H_2O	175	44		
	"	Fin. H_2O	133	40		
	2-11-63	Raw H_2O	41	23		
	"	Fin. H_2O	30	19		
	2-12-63	Raw H_2O	93	19		
	"	Fin. H_2O	39	25		
	2-13-63	Raw H_2O	59	28		
	"	Fin. H_2O	58	24		
	2-14-63	Raw H_2O	51	19		
	"	Fin. H_2O	45	22		
	2-15-63	Raw H_2O	46	18		
	"	Fin. H_2O	39	14		
	2-16-63	Raw H_2O	30	16		
	"	Fin. H_2O	29	17		

DATE	RESULTS APPROVED BY
3-7-63	A R Flynn

UCN-2813

Physics

SCHOLTZ - FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY			BLDG. NO.		PHONE			
REQUEST NO.			CHARGE					
U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/ml/L					
457B		R 3-6-63	53					
458B		F 3-6-63	36					

DATE 3-12-63

RESULTS APPROVED BY G. S. Petit

UCN-2813

Copy to: N. B. Schultz

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
C. C. Fowlkes	K-1101	8601

REQUEST NO.	CHARGE

U. M. NUMBER	DATE ~~RECEIVED~~ Sampled	DESCRIPTION	Total Beta dis./min./100 ml.		Sr, Beta dis./min./l.	
405 B	2-17-63	Raw H_2O	20		21	
406 B	"	Finished H_2O	19		18	
407 B	2-18-63	Raw H_2O	20		17	
408 B	"	Finished H_2O	21		Lost Sample	
409 B	"	K-1513 Raw H_2O Comp.	94		29	
410 B	2-19-63	RAW H_2O	19		20	
411 B	"	Finished H_2O	19		14	
Snow	"	Snow			182	
420 B	2-20-63	Raw H_2O	152		31	
421 B	"	Finished H_2O	53		25	
422 B	2-21-63	Raw H_2O	218		33	
423 B	"	Finished H_2O	170		25	
425 B	2-22-63	Raw H_2O	322		34	
426 B	"	Finished H_2O	246		30	
427 B	2-23-63	Raw H_2O	46		20	
428 B	"	Finished H_2O	54		25	
429 B	2-24-63	Raw H_2O	32		20	
430 B	"	Finished H_2O	33		22	
431 B	2-25-63	Raw H_2O	49		16	
432 B	"	Finished H_2O	25		16	
433 B	2-26-63	Raw H_2O	96		13	
434 B	"	Finished H_2O	74		16	
443 B	2-27-63	Raw H_2O	108		34	
444 B	"	Finished H_2O	105		29	
445 B	2-28-63	Raw H_2O	25		20	
446 B	"	Finished H_2O	51		21	

DATE	RESULTS APPROVED BY
3-13-63	A R Flynn

UCN-2813

Physics

P11 3 31

SCHULTZ - FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY			BLDG. NO.		PHONE		
REQUEST NO.			CHARGE				
U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Srd/μL			
468 B		R. 3-7-63		46			
469 B		F-3-7-63		49			
470 B		R-3-8-63		43			
471 B		F-3-8-63		45			
472 B		R-3-11-63		16			
473 B		F 3-11-63		19			
474 B		R-3-12-63		38			
475 B		F 3-12-63		25			

DATE 3-14-63

RESULTS APPROVED BY G. S. Petit

UCN-2813

Scheultz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
REQUEST NO.	CHARGE	

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Std/ml/L				
476B		R-3-13-63		46				
477B		F 3-13-63		52				

DATE	RESULTS APPROVED BY
3-20-63	G. S. Petit

SCHULTZ - FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Std/M/L				
478 B		R-3-14-63		30				
479 B		F-3-14-63		38				
488 B		R 3-15-63		22				
489 B		F 3-15-63		26				
493 B		R 3-17-63		24				
494 B		F 3-17-63		23				
495 B		R 3-18-63		23				
496 B		F 3-18-63		18				

Health Physics

DATE	RESULTS APPROVED BY
3-25-63	G. S. Petit

UCN-2813

CC: N. B. Schultz

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
C. C. Fowlkes	K-1101	8601

REQUEST NO.	CHARGE
	Total Beta dis./min./100 ml. Sr, Beta dis./min./l.

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Total Beta dis./min./100 ml.	Sr, Beta dis./min./l.		
447 B	3-1-63	Raw H_2O	32	21		
448 B	"	Finished H_2O	20	22		
449 B	3-2-63	Raw "	49	25		
450 B	"	Finished "	40	21		
451 B	3-3-63	Raw "	183	27		
452 B	"	Finished "	117	26		
453 B	3-4-63	Raw "	119	25		
454 B	"	Finished "	146	34		
455 B	3-5-63	Raw "	177	35		
456 B	"	Finished "	122	18		
457 B	3-6-63	Raw "	258	53		
458 B	"	Finished "	123	36		
468 B	3-7-63	Raw "	84	46		
469 B	"	Finished "	94	49		
470 B	3-8-63	Raw "	64	43		
471 B	"	Finished "	45	45		
472 B	3-9-63	Raw "	25	16		
473 B	"	Finished "	20	19		
474 B	3-12-63	Raw "	182	38		
475 B	"	Finished "	32	25		
476 B	3-13-63	Raw "	33	46		
477 B	"	Finished "	24	52		
478 B	3-14-63	Raw "	19	30		
479 B	"	Finished "	17	38		

DATE

RESULTS APPROVED BY A R Flynn

HCN-2813

Schultz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Std/M/L				
490 B		R-3-16-63		18				
491 B		F-3-16-63		24				
492 B		R-3-17-63		19				
497 B		R-3-19-63		25				
498 B		F-3-19-63		20				
500 B		R 3-20-63		30				
501 B		F 3-20-63		23				
502 B		R 3-21-63		24				
503 B		F-3-21-63		28				

DATE	RESULTS APPROVED BY
3-26-63	G. S. Petit

UCN-2813

URANIUM MEASUREMENTS DATA

Schultz - Flynn

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Std/ml/L				
512B		R 3-22-63		19				
513B		F 3-22-63		10				
514B		R 3-23-63		21				
515B		F 3-23-63		6				
516B		R 3-24-63		22				
517B		F 3-24-63		18				
518B		R 3-25-63		20				
519B		F 3-25-63		6				

DATE	RESULTS APPROVED BY
3-28-63	G. S. Petit

UCN-2813

SCHULTZ - FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY			BLDG. NO.		PHONE			
REQUEST NO.			CHARGE					
U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/m/L					
520B		R-3-26-63	21					
521B		F 3-26-63	17					
523B		R 3-27-63	20					
524B		F 3-27-63	25					
533B		R 3-28-63	14					
534B		F 3-28-63	11					

DATE 4-2-63

RESULTS APPROVED BY G. S. Petit

UCN-2813

CC: N. B. Schultz

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
C. C. Fowlkes	K-1101	8601

REQUEST NO.

CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Total Beta dis./min./100 ml.	Sr. Beta dis./min./l.		
488 B	3-15-63	Raw H_2O	19	22		
489 B	"	Finished H_2O	12	26		
490 B	3-16-63	Raw H_2O	16	18		
491 B	"	Finished H_2O	12	24		
492 B	3-17-63	Raw H_2O	19	19		
493 B	"	Finished H_2O	14	24		
494 B	3-18-63	~~K-1513~~ Raw H_2O	43	23		
495 B	"	Raw H_2O	20	23		
496 B	"	Finished H_2O	17	18		
497 B	3-19-63	Raw H_2O	17	25		
498 B	"	Finished H_2O	10	20		
500 B	3-20-63	Raw H_2O	23	30		
501 B	"	Finished H_2O	10	23		
502 B	3-21-63	Raw H_2O	31	24		
503 B	"	Finished H_2O	29	28		
512 B	3-22-63	Raw H_2O	19	19		
513 B	"	Finished H_2O	14	10		
514 B	3-23-63	Raw H_2O	15	21		
515 B	"	Finished H_2O	8	6		
516 B	3-24-63	Raw H_2O	12	22		
517 B	"	Finished H_2O	6	18		
518 B	3-25-63	Raw H_2O	15	20		
519 B	"	Finished H_2O	10	6		
520 B	3-26-63	Raw H_2O	12	21		
521 B	"	Finished H_2O	7	17		

DATE April 3, 1963

RESULTS APPROVED BY A R Flynn

UCN-2813

Health and Physics

File No. 15

URANIUM MEASUREMENTS DATA

SCHULTZ-FLYNN

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Std/ML				
535B		R 3-29-63		20				
536 B		F-3-29-63		20				
537 B		R 3-31-63		22				
538 B		F 3-31-63		22				
539 B		R-4-1-63		22				
540 B		F-4-1-63		17				

DATE	RESULTS APPROVED BY
4-4-63	G. S. Petit

UCN-2813

URANIUM MEASUREMENTS DATA

SCHOLTZ-FLYNN

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		SR 4/ML				
541B		R. 4-2-63		31.				
542B		F 4-2-63		24				
543B		R 4-3-63		42				
544B		F 4-3-63		29				

DATE 4-9-63

RESULTS APPROVED BY G. S. Petit

SCHULTZ - FLYNN

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE
REQUEST NO.	CHARGE	

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Sr/d/M/L				
545		R-4-4-63		31				
546		F-4-4-63		25				
560B		R-4-5-63		29				
561B		F-4-5-63		24				

DATE 4-9-63

RESULTS APPROVED BY G. S. Petit

UCN-2813

URANIUM MEASUREMENTS DATA

SCHULTZ-FLYNN

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Std/ml				
563		R-4-8-63	44				
564		F-4-8-63	49				
565		R-4-9-63	54				
566		F 4-9-63	47				
575		R 4-10-63	35				
576		F 4-10-63	33				
577		R 4-11-63	40				
578		F 4-11-63	32				
594		R 4-13-63	33				
595		F 4-13-63	35				
596		R 4-14-63	25				
597		F 4-14-63	35				

DATE	RESULTS APPROVED BY
4-19-63	L. S. Pelt

UCN-2813

Schulz - Flynn

URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION	Sr dl/L				
598		R-4-15-63	31				
599		F-4-15-63	30				
600	Raw Weekly composite		34				
609		R-4-16-63	34				
610		F-4-16-63	26				

DATE	RESULTS APPROVED BY
4-24-63	G. S. Petit

UCN-2813

SCHULTZ-FLYNN URANIUM MEASUREMENTS DATA

SAMPLE SUBMITTED BY	BLDG. NO.	PHONE

REQUEST NO.	CHARGE

U. M. NUMBER	DATE RECEIVED	DESCRIPTION		Sr d/m/L				
612		R 4-17-63		36				
613		F 4-17-63		32				
614		R 4-18-63		37				
615		F 4-18-63		21				
616		R-4-18-		12.				
617		F 4-19		17				

DATE 5-3-63

RESULTS APPROVED BY G. S. Petit