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**ORNL**  
**CENTRAL FILES NUMBER**  
  
ORNL/CF-83/23

DATE: February 7, 1983

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND EFFLUENT MONITORING REPORT FOR THE MONTH OF OCTOBER 1982

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks

This document has been approved for release to the public by:

*David R Hamrin* 7/15/96  
Technical Information Officer Date  
ORNL Site

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## SUMMARY

Operation of the Liquid and Gaseous Waste Systems for the month of October was routine. The total amount of  $^{90}\text{Sr}$  discharged into White Oak Lake from ORNL sources was 78 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 65% of this total. The Industrial Safety and Applied Health Physics Division measured a 70 mCi release of  $^{90}\text{Sr}$  at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as  $^{131}\text{I}$ ; the total release was less than 2 mCi.

## RADIOACTIVE EFFLUENTS

### Liquid Waste

#### Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of October was 0.1% of the  $MPC_W$  (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 27.4% of the  $MPC_W$  (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage  $MPC_W$  in the river that could result from ORNL waste releases.

During the month, 0.070 Ci of  $^{90}\text{Sr}$  passed over White Oak Dam.

#### White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Station 3 and 4 were  $53 \times 10^4$  and  $9 \times 10^4 \text{ m}^3$ , respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 77.0 mCi of  $^{90}\text{Sr}$  into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.5 mCi of  $^{90}\text{Sr}$  was released by the Process Waste Treatment Plant; 0.2 mCi of  $^{90}\text{Sr}$  was released from the 190 pond system; a total of 8.2 mCi of  $^{90}\text{Sr}$  was released from the sanitary system.

The following tabulation lists the measured amounts of  $^{90}\text{Sr}$  discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds 1, 3, and 4 (White Oak Creek), and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (Fig. 3).

White Oak Creek

	<u><sup>90</sup>Sr Discharge (mCi)</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	13.5	
190 Ponds	0.2	
Process Waste Treatment Plant	0.5	
Sewage Treatment Plant	<u>8.2</u>	
	22.4	
7500 Sampling Station	42.5	
Burial Grounds 1 and 3, and Floodplains		20.1
Station 3	54.4	
Burial Ground 4		11.9

Melton Branch

7900 Area (HFIR and TRU)	0.1	
7500 Area (NSPP and MSRE)	<u>4.9</u>	
	5.0	
Station 4	22.6	
Burial Ground 5		17.6

ILW Pit Disposal Area

East Weir	0.1	
West Weir	<u>1.3</u>	
	1.4	
Total <sup>90</sup> Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	78.4	
Total <sup>90</sup> Sr from Burial Grounds, Ground Disposal Area, and Floodplains		51.0
Percent <sup>90</sup> Sr from Burial Grounds, Ground Disposal Area, and Floodplains		65.0

Process Waste

A total of  $2.09 \times 10^4 \text{ m}^3$  of contaminated waste was chemically treated this month. Of this amount,  $2.01 \times 10^4 \text{ m}^3$  were released to the creek; the remainder was used for process operations such as backwashing of filters.

Monthly comparisons of the strontium activity released from the process waste system to White Oak Creek and process waste volumes are shown in Figs. 4 and 5. The main contributors to the system are listed in Table 2. A total of 31 ion exchange column runs were made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run Time (h)	44	12	33
Volume Treated ( $\text{m}^3$ )	779	207	674

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.51 m<sup>3</sup>/hr.

A summary of storage operations is given below:

	<u>m<sup>3</sup></u>
Total Volume Generated	426.6
Volume Transferred to Evaporators	378.3
South Tank Farm Inventory:	
Beginning of Month	823.8
End of Month	825.7
Service Tank Inventory:	
W-21, Beginning of Month	31.8
W-21, End of Month	68.0
W-22, Beginning of Month	18.6
W-22, End of Month	30.7
W-23, Beginning of Month	92.7
W-23, End of Month	110.9
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	764.3
Total Volume at End of Month	443.3

The third injection of resuspended sludge from the gunite tanks (W-5) was performed during the week of October 25-29; approximately 946 m<sup>3</sup> of resuspended sludge were injected.

A list of major contributors of intermediate level waste is given below. Figure 6 compares the volumes of ILW generated each month.

	<u>m<sup>3</sup></u>
Transuranium Processing Area	11.1
Building 3019	14.8
Building 3525	6.3
Radioisotopes Processing Area	33.7
ORR and BSR	11.1
High Flux Isotope Reactor	48.0
Fission Products Development Laboratory	14.3*
4500 Complex	14.0
Building 3544	37.3

#### Gaseous Waste

The ORNL Stacks discharged <2 mCi of gaseous <sup>131</sup>I this month. The total amount of active particulates released during the period was less than 384 µCi. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.5% and 0.8% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3; the total releases are compared on a monthly basis in Fig. 7.

\*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The pit can only be jetted to ILW since it was designed in this fashion.

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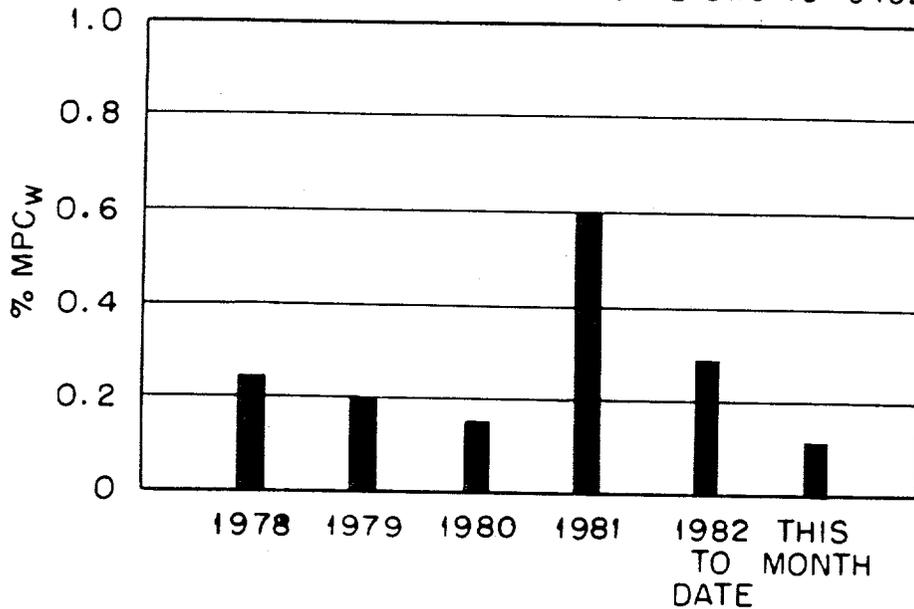


Fig. 1A. Calculated Percent of MPC<sub>w</sub> in Clinch River due to ORNL Discharges\* (ISAHP Measurements at White Oak Dam).

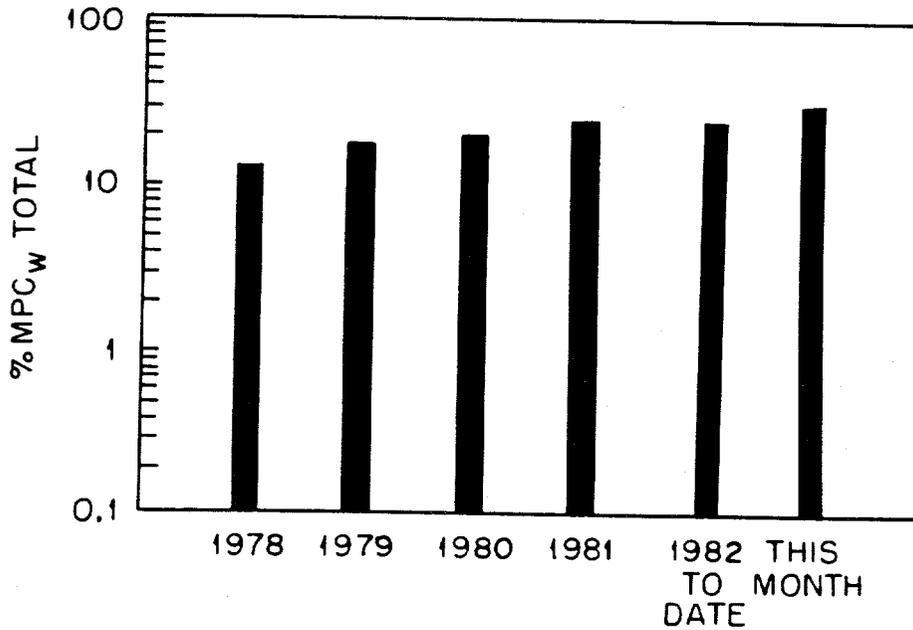


Fig. 1B. Measured Percent of MPC<sub>w</sub> in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

\* Tests show that complete mixing does not occur in the near reaches of the river.

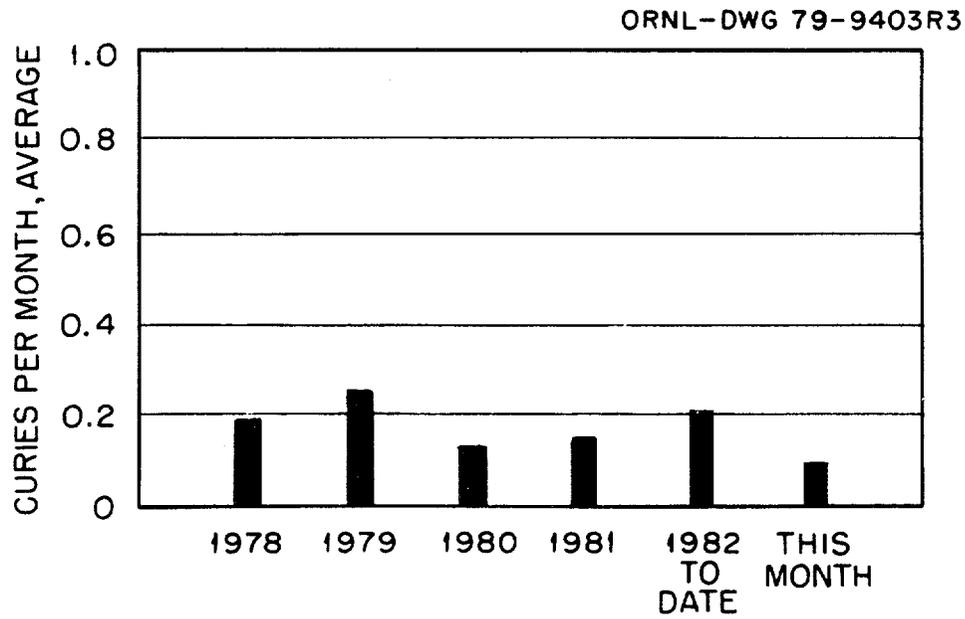


Fig. 2.  $^{90}\text{Sr}$  Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 3).

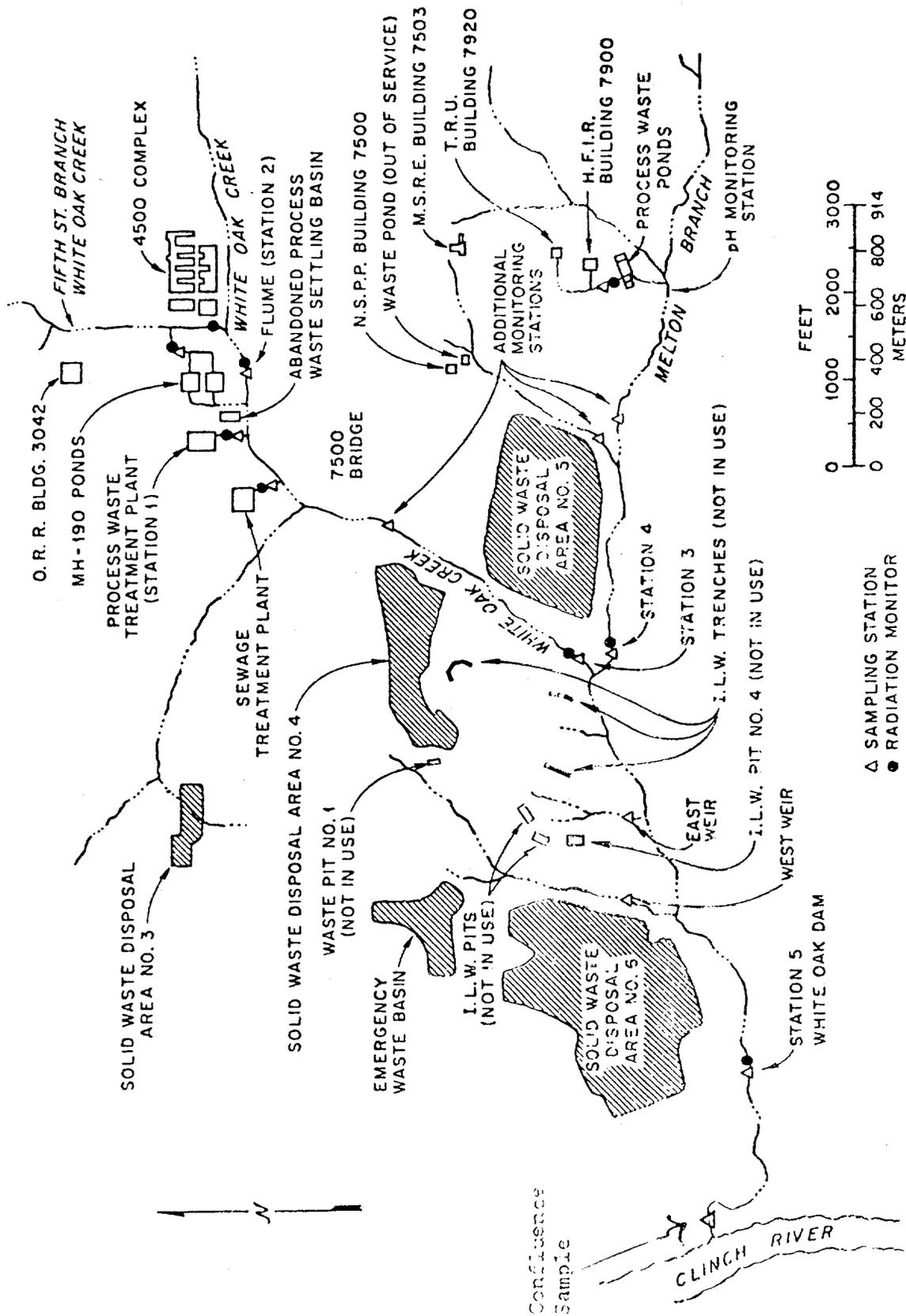


Fig. 3. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors

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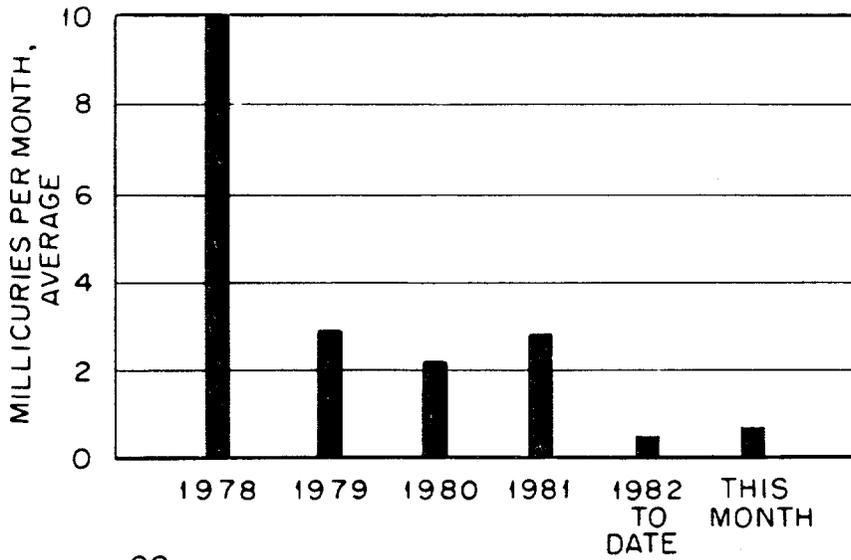


Fig. 4. <sup>90</sup>Sr Discharge in Process Waste to White Oak Creek

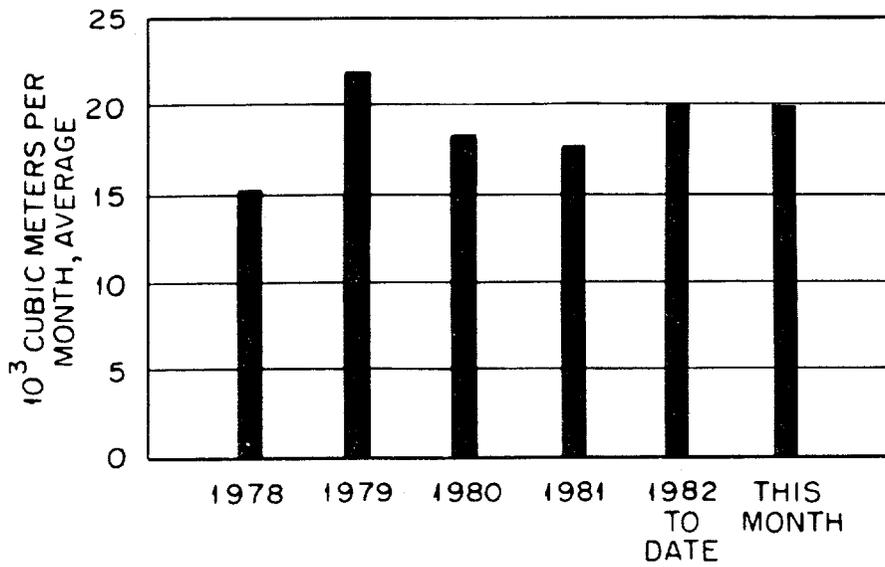


Fig. 5. Process Waste Volumes.

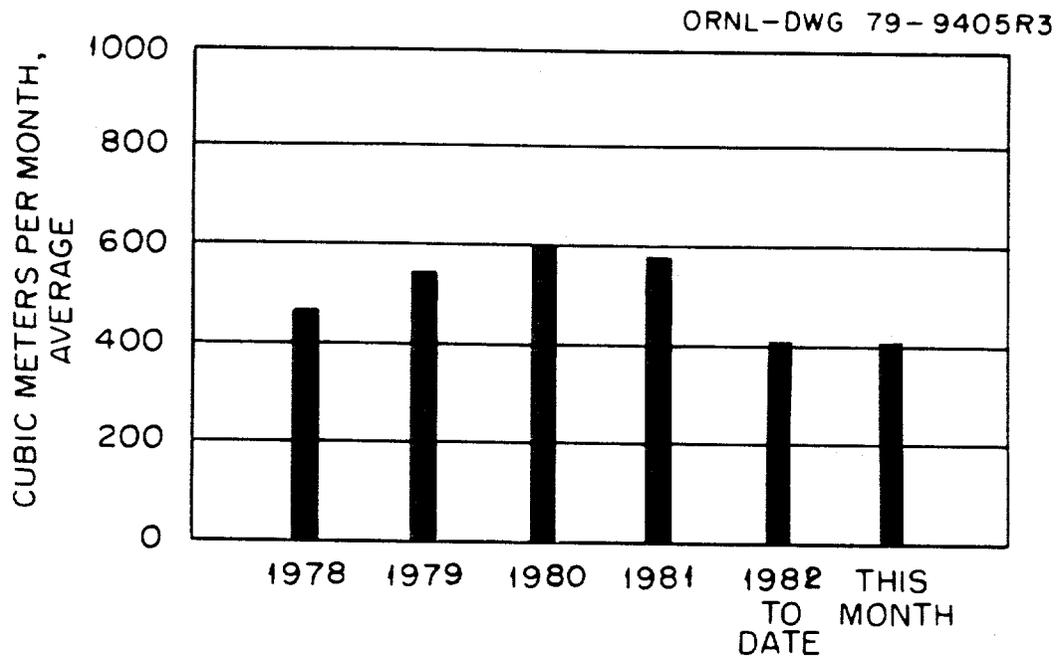


Fig.6. Intermediate-Level Waste Volumes.

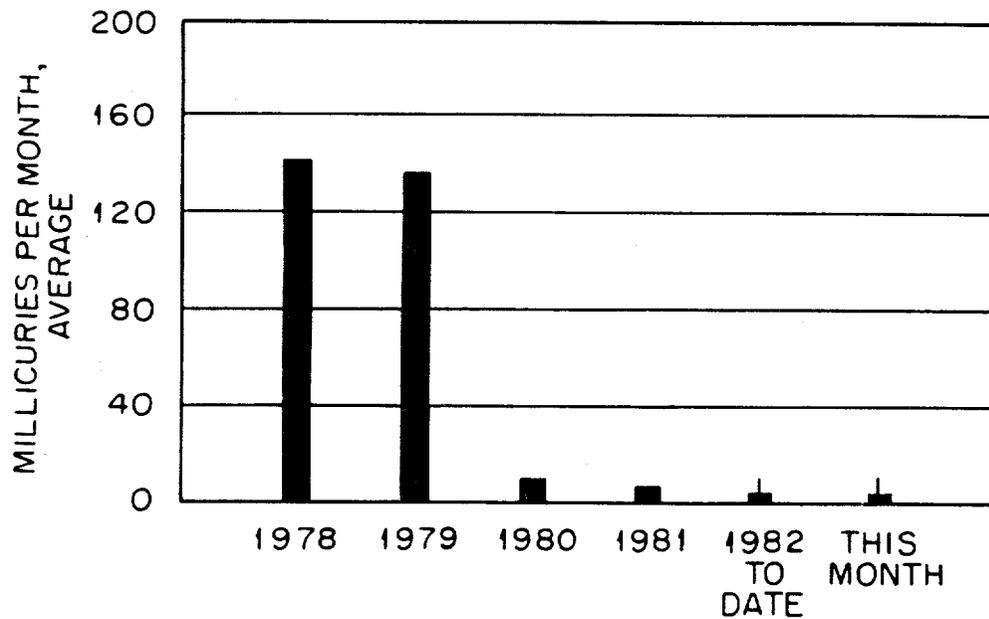


Fig.7). Total Activity Released in Gaseous Waste (Mainly  $^{131}\text{I}$ ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

Table 1. Activity Released to White Oak Lake

	Monitoring Station Number <sup>a</sup>	Total Sr, Ci	Gross Beta Ci/b
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.0544	0.172
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0226	0.079
Discharge from ILW Pits and Trenches	East Weir	0.0001	----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0013	----
Total discharge from all sources		0.0784	0.251
White Oak Dam to Clinch River (ISARP Measurement)		0.070	0.420

<sup>a</sup>Refers to Figure 3.

<sup>b</sup>Approximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of <sup>90</sup>Sr.

Table 2. Process-Waste Discharges

	<sup>90</sup> Sr Bq/l	<sup>90</sup> Sr		Volume	
		Cl	% of Total	10 <sup>3</sup> m <sup>3</sup>	% of Total
Radioisotopes Processing Area (MH234)	1300	0.125	14.5	3.55	16.0
Radioisotopes Processing Area (MH114 minus MH112)	---	0.044	3.8	0.81	3.7
Reactor Operations (MH112)	28	0.003	0.3	4.37	19.8
Buildings 3503 and 3508 (MH 229)	1.2	< 0.001	---	1.60	7.2
Buildings 3025 and 3026 (MH 149)	19	< 0.001	---	1.22	5.5
Building 3019 (MH 25)	6.3	< 0.001	---	2.32	10.5
Waste Evaporator, Bldg. 2531 (MH 243)	7500	0.429	49.6	2.12	9.6
Building 3525 (MH 235)	13	< 0.001	---	0.86	3.9
Building 2026 (MH 240)	5.4	0.001	---	1.51	6.8
Tank Farm Drainage	2600	0.264	31.8	3.76	17.0

<sup>a</sup>The activity entered the process-waste system with inleakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

Stack No.	Activity <sup>a</sup> (Ci)	Filterable Particulate Activity <sup>b</sup> ( $\mu$ Ci)
HR/LAL 2026	< 0.01	2
Central Radioactive Gas Disposal Facilities 3039	< 0.01	205
Radiochemical-Processing Pilot Plant 3020	< 0.01	24
MSRE 7512	< 0.01	1
HFIR and TRU 7911	< 0.01	152
Total Activity in Gases Released at X-10 Site	< 0.01	384
Chem. Tech. Division - Y-12 Area		(c)
Tritium Target Fabrication Building	1 ( <sup>3</sup> H)	
Building 4508 Ventilation Discharges Room 136		(c)
Room 265		$3.50 \times 10^{-4}$
Building 5505 Discharges Glove Box		$2.25 \times 10^{-3}$
Hood		$3.88 \times 10^{-2}$

<sup>a</sup>Activity primarily <sup>131</sup>I except as noted.

<sup>b</sup>These values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

<sup>c</sup>No data available at this time.

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**ORNL**  
**CENTRAL FILES NUMBER**

ORNL/CF-83/24

MAILED COPY

DATE: March 28, 1983

SUBJECT: RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL OPERATIONS AND EFFLUENT  
MONITORING REPORT FOR THE MONTH OF NOVEMBER 1982

TO: Distribution

FROM: L. C. Lasher and C. B. Scott

Sponsored by: J. H. Swanks 27

This document has been approved for release  
to the public by:

David R. Hammon 7/15/96  
Technical Information Officer Date  
ORNL Site

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SUMMARY

Operation of the Liquid and Gaseous Waste Systems for the month of November was routine. The total amount of  $^{90}\text{Sr}$  discharged into White Oak Lake from ORNL sources was 200 mCi; drainage from the burial grounds, contaminated floodplains, and the dormant pit disposal area accounted for 80% of this total. The Industrial Safety and Applied Health Physics Division measured a 209 mCi release of  $^{90}\text{Sr}$  at the White Oak Dam sample station during the period. The activity emitted with the gaseous wastes from the ORNL stacks remained low. The bulk of this contamination was identified as  $^{131}\text{I}$ ; the total release was less than 1 mCi.

RADIOACTIVE EFFLUENTS

## Liquid Waste

Release to Clinch River

The calculated radioactive contamination in the Clinch River resulting from contamination in White Oak Creek for the month of November was 0.4% of the MPC<sub>W</sub> (Fig. 1A). Samples taken at the confluence of White Oak Creek and the Clinch River indicated the radioactive contamination to be 48.5% of the MPC<sub>W</sub> (Fig. 1B). At this sample point, very little dilution from the river has occurred; therefore, this value represents the maximum percentage MPC<sub>W</sub> in the river that could result from ORNL waste releases.

During the month, 0.209 Ci of <sup>90</sup>Sr passed over White Oak Dam.

White Oak Creek Monitoring

The strontium and gross-beta activity measurements made at the sampling stations in the tributaries to White Oak Lake are listed in Table 1. A monthly comparison of the strontium released into White Oak Lake is shown in Fig. 2. The flows for White Oak Creek and Melton Branch as measured at Station 3 and 4 were  $91 \times 10^4$  and  $29 \times 10^4$  m<sup>3</sup>, respectively.

The White Oak Creek and Melton Branch watersheds discharged a total of 196.9 mCi of <sup>90</sup>Sr into White Oak Lake.

The controlled releases into the White Oak Creek during the period were normal: A total of 0.2 mCi of <sup>90</sup>Sr was released by the Process Waste Treatment Plant; 0.4 mCi of <sup>90</sup>Sr was released from the 190 pond system; a total of 12.1 mCi of <sup>90</sup>Sr was released from the sanitary system.

The following tabulation lists the measured amounts of <sup>90</sup>Sr discharged into the White Oak Creek and Melton Branch watershed and the discharge into White Oak Lake from the ILW pit disposal area. Contributions from

Burial Grounds 1, 3, and 4 (White Oak Creek) and Burial Ground 5 (Melton Branch) are calculated as the differences between the sums of the listed branch streams and the measurements at Stations 3 and 4 (see Fig.3).

	<u>White Oak Creek</u>	
	<u>By Measurement</u>	<u>By Difference</u>
Flume	16.0	
190 Ponds	0.4	
Process Waste Treatment Plant	0.2	
Sewage Treatment Plant	<u>12.1</u>	
	28.7	
7500 Sampling Station	88.1	
Burial Grounds 1 and 3, and Floodplains		59.4
Station 3	142.1	
Burial Ground 4		54.0
	<u>Melton Branch</u>	
7900 Area (HFIR and TRU)	0.9	
7500 Area (NSPP and MSRE)	<u>11.4</u>	
	12.3	
Station 4	54.8	
Burial Ground 5		42.5
	<u>ILW Pit Disposal Area</u>	
East Weir	0.1	
West Weir	<u>3.2</u>	
	3.3	
Total <sup>90</sup> Sr to White Oak Lake (Stations 3 and 4 plus Ground Disposal Area)	200.2	
Total <sup>90</sup> Sr from Burial Grounds, Ground Disposal Area, and Floodplains		159.2
Percent <sup>90</sup> Sr from Burial Grounds, Ground Disposal Area, and Floodplains		79.5

Process Waste

A total of  $2.27 \times 10^4 \text{ m}^3$  of contaminated waste were chemically treated this month. Of this amount,  $2.15 \times 10^4 \text{ m}^3$  were released to the Creek; the remainder was used for process operations such as backwashing of filters.

Monthly comparisons of the strontium activity released from the process waste system to White Oak Creek and process waste volumes are shown in Figs. 4 and 5. The main contributors to the system are listed in Table 2. A total of 36 ion exchange column runs were made. The following is a summary of the column operation experienced:

	<u>Maximum</u>	<u>Minimum</u>	<u>Average</u>
Run Time (h)	45	25	35
Volume treated ( $\text{m}^3$ )	801	443	631

Intermediate Level Waste

The Annex Waste Evaporator 2A-2 was operated during the reporting period. The average boildown rate was 0.48 m<sup>3</sup>/h.

The summary of storage operations is given below:

	<u>m<sup>3</sup></u>
Total volume generated	401.3
Volume transferred to evaporators	345.2
South Tank Farm Inventory:	
Beginning of Month	825.7
End of Month	921.3
Service Tank Inventory:	
W-21, Beginning of Month	68.0
W-21, End of Month	35.2
W-22, Beginning of Month	18.6
W-22, End of Month	107.5
W-23, Beginning of Month	110.9
W-23, End of Month	133.5
Melton Valley Waste Storage Facility Inventory:	
Total Volume at Beginning of Month	443.3
Total Volume at End of Month	998.5

The cleaning out of gunite tank W-5 continued during the month of November. Approximately 520 m<sup>3</sup> of solution containing resuspended sludge from W-5 were transferred to the Melton Valley Waste Storage Facility.

A list of major contributors of intermediate level waste is given below. Figure 6 compares the volumes of ILW generated each month.

	<u>m<sup>3</sup></u>
Transuranium Processing Area	11.9
Building 3019	38.0
Building 3525	13.5
Radioisotopes Processing Area	13.8
ORR and BSR	31.8
High Flux Isotope Reactor	37.0
Fission Products Development Laboratory	17.1*
4500 Complex	53.6
Building 3544	31.1

#### Gaseous Waste

The ORNL Stacks discharged <1 mCi of gaseous <sup>131</sup>I this month. The total amount of active particulates released during the period was less than 135 µCi. Inert gases released from the 3039 and 7911 Stacks averaged less than 1.3% and 0.4% of the calculated maximum permissible operating level for these stacks. Individual stack releases are listed in Table 3: the total releases are compared on a monthly basis in Fig. 7.

Work on the off-gas and cell ventilation systems in the 3039 Stack Area continued. Construction of the temporary by-pass ventilation system is underway by Rust Engineering; this system will provide ventilation during demolition of the old system and installation of the new system.

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\*The storage tank pit has an inleakage problem from groundwater and this is the volume of water jetted from the pit during the month. The "pit" can only be jetted to ILW since it was designed in this fashion.

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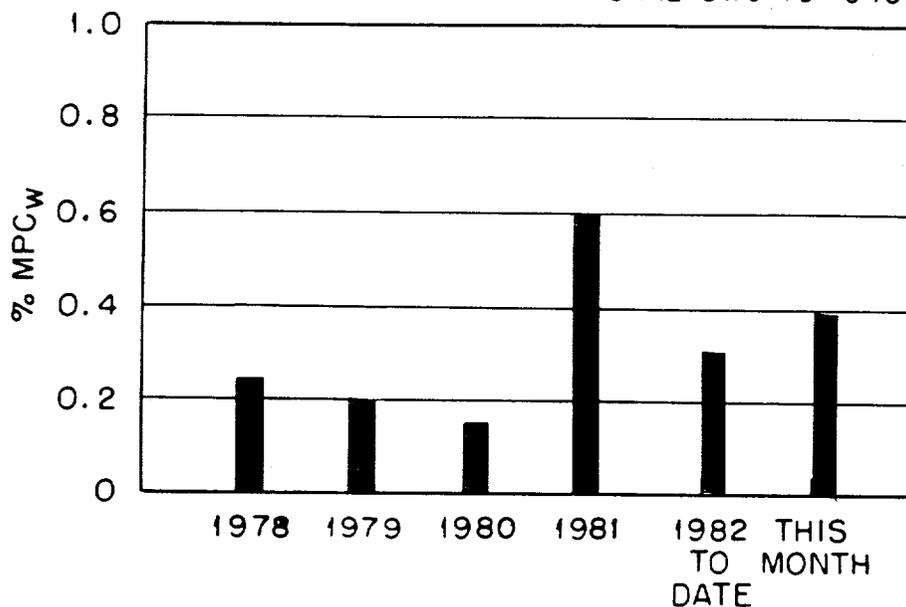


Fig. 1A. Calculated Percent of MPC<sub>w</sub> in Clinch River due to ORNL Discharges\* (ISAHP Measurements at White Oak Dam).

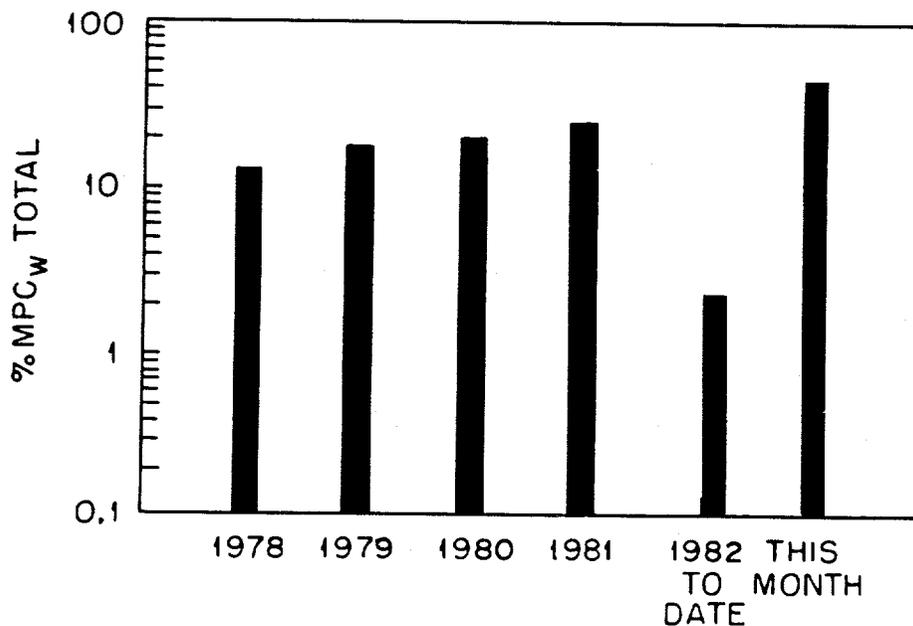


Fig. 1B. Measured Percent of MPC<sub>w</sub> in Clinch River due to ORNL Discharges (ISAHP Samples at Confluence of White Oak Creek and the Clinch River).

\* Tests show that complete mixing does not occur in the near reaches of the river.

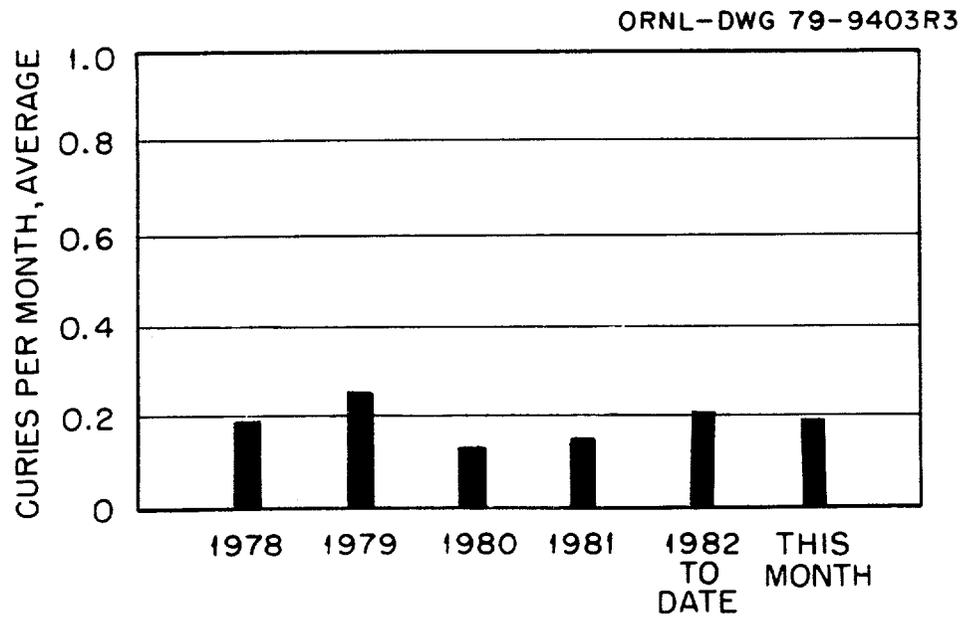


Fig. 2.  $^{90}\text{Sr}$  Released to White Oak Lake as Measured at Sampling Stations 3 and 4 (See Fig. 3).

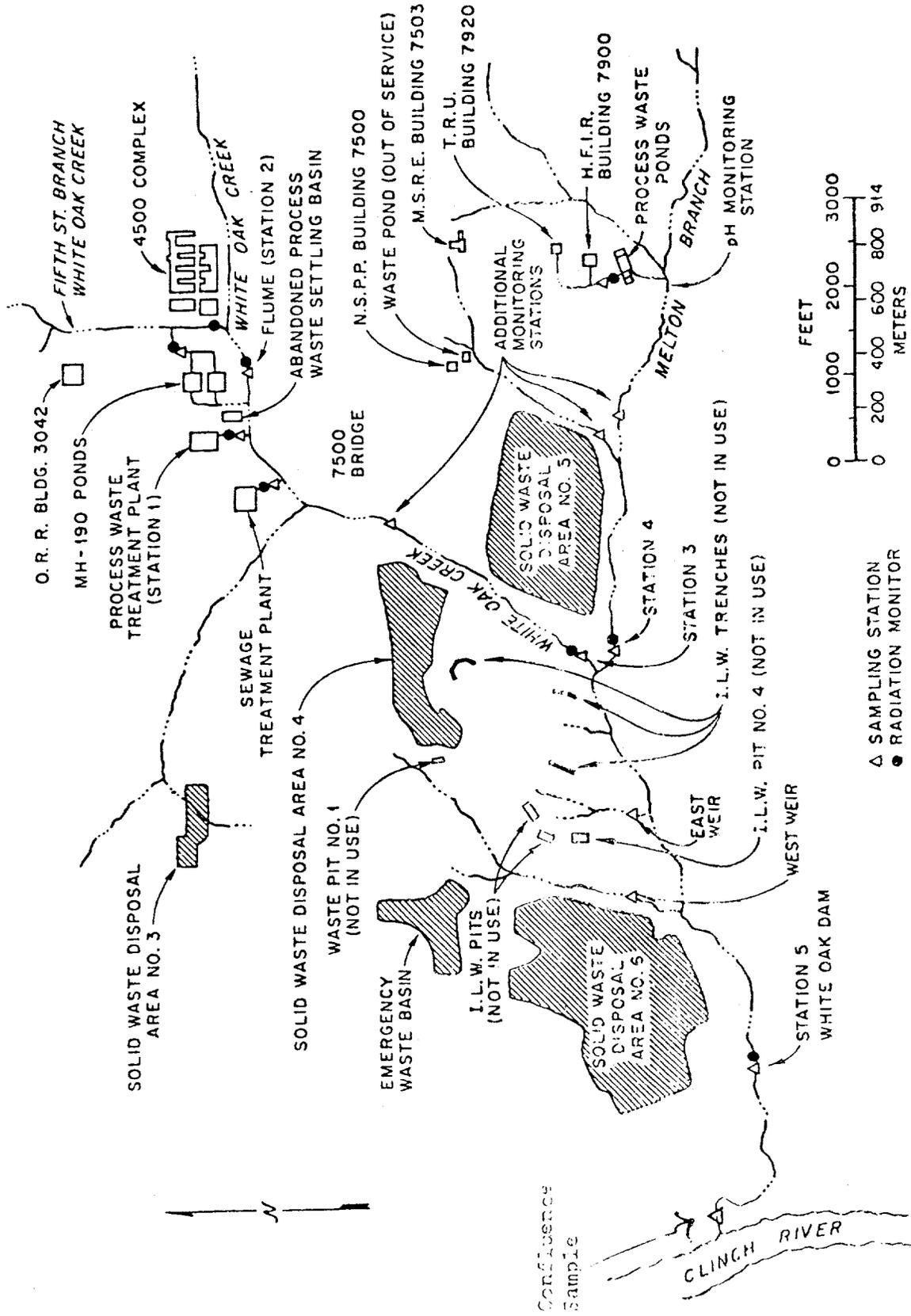


Fig. 3. Location Plan for White Oak Creek Sampling Stations and Radiation Monitors.

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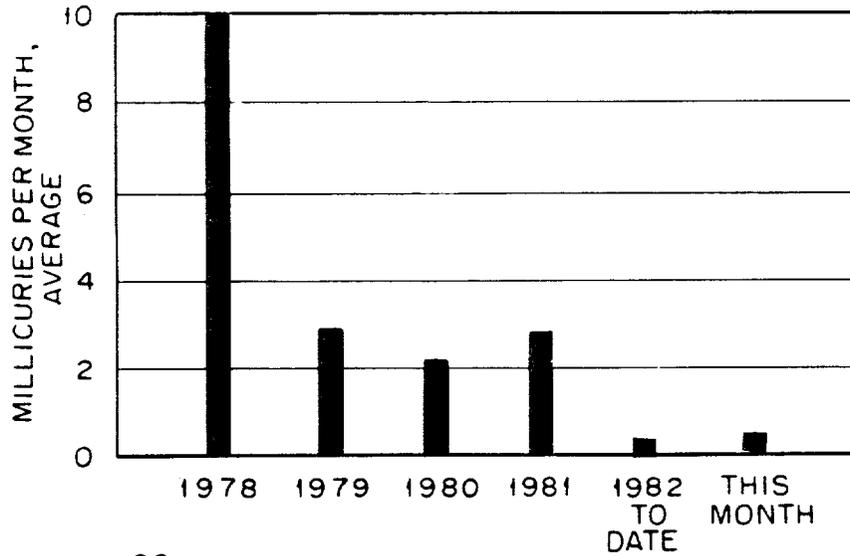


Fig. 4. <sup>90</sup>Sr Discharge in Process Waste to White Oak Creek.

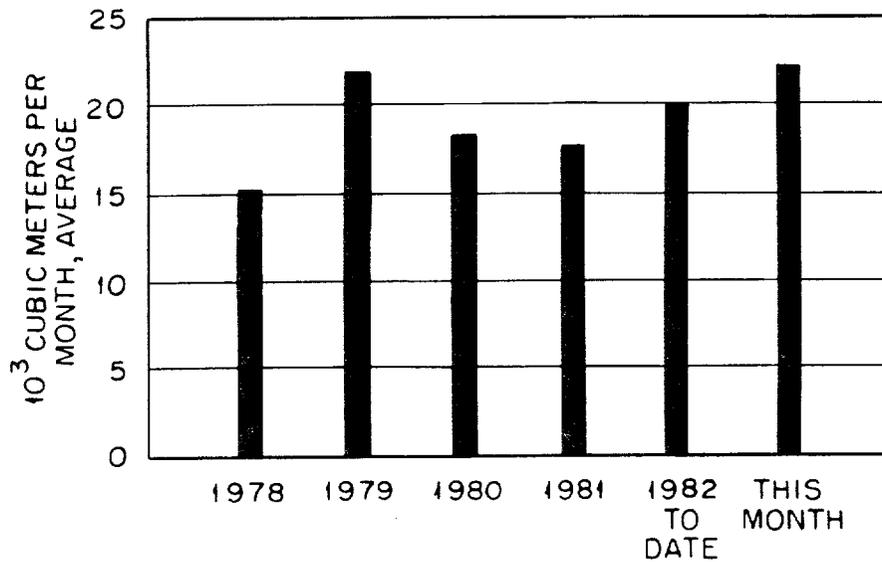


Fig. 5. Process Waste Volumes.

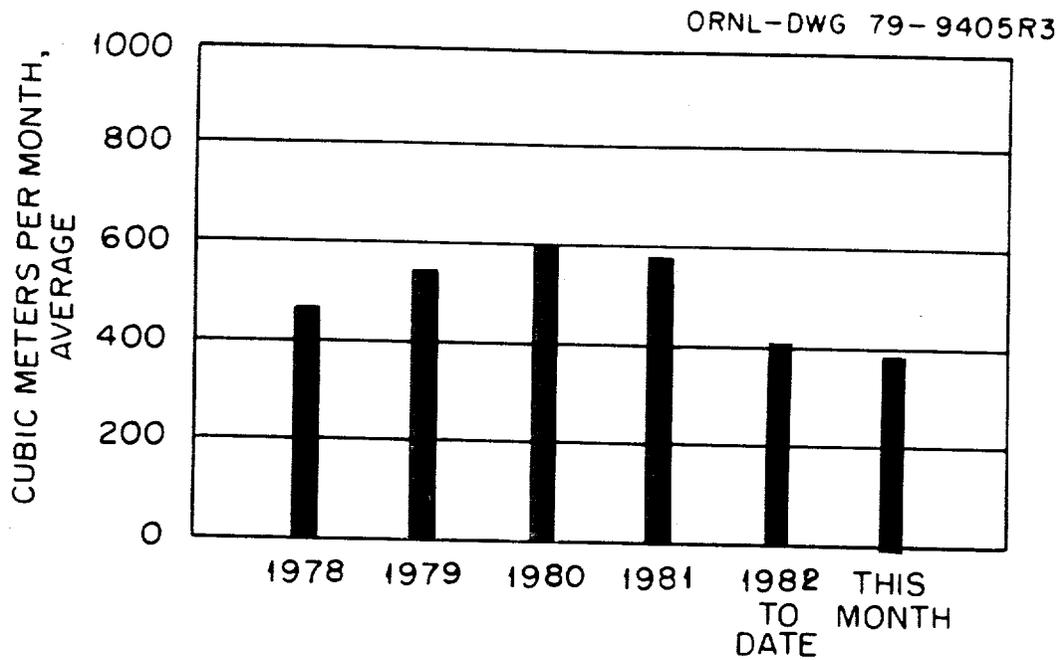


Fig.6. Intermediate-Level Waste Volumes.

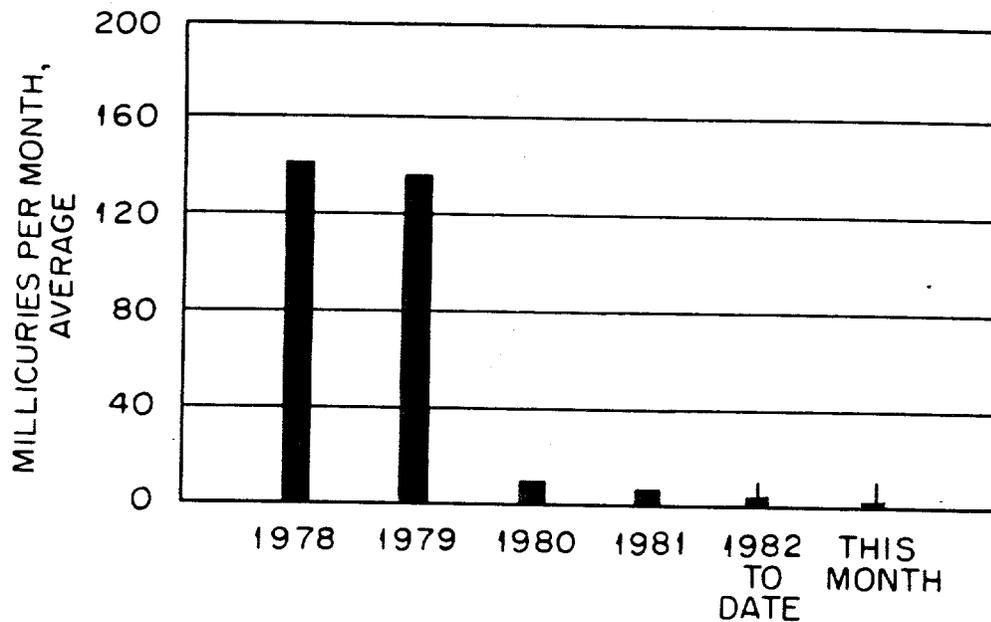


Fig.7). Total Activity Released in Gaseous Waste (Mainly  $^{131}\text{I}$ ; Does not Include Rare Gases or Other Non-Adsorbable Species). ORNL'S Maximum Permissible Operating Level is 13 curies per Quarter.

Table I. Activity Released to White Oak Lake

	Monitoring Station Numbers	Total Sr, Ci	Gross Beta Ci <sup>b</sup>
Discharge from Bethel Valley Operations and Burial Ground No. 4	3	0.1421	0.466
Discharge from Melton Valley Operations and Burial Ground No. 5	4	0.0548	0.162
Discharge from ILW Pits and Trenches	East Weir	0.0001	-----
Discharge from ILW Pits and Burial Ground No. 6	West Weir	0.0032	-----
Total discharge from all sources		0.2002	0.628
White Oak Dam to Clinch River (ISAHF Measurement)		0.209	0.863

<sup>a</sup>Refers to Figure 3.

<sup>b</sup>Approximation based on an estimated average counting efficiency for a mixture of radionuclides normally present in White Oak Creek discharges to the Clinch River. The method of analysis used in determining gross-beta activity is not sensitive to energies below that of <sup>90</sup>Sr.

Table 2. Process-Waste Discharges

	<sup>90</sup> Sr Bq/l	<sup>90</sup> Sr		Volume	
		Ci	% of Total	10 <sup>3</sup> m <sup>3</sup>	% of Total
Radioisotopes Processing Area (MH234)	2200	0.212	21.1	3.56	16.1
Radioisotopes Processing Area (MH114 minus MH112)	---	0.283 <sup>a</sup>	28.2	1.44	6.5
Reactor Operations (MH112)	47	0.005	0.5	3.90	17.6
Buildings 3503 and 3508 (MH 229)	0.74	< 0.001	---	1.28	5.8
Buildings 3025 and 3026 (MH 149)	31	< 0.001	---	1.12	5.1
Building 3019 (MH 25)	10	< 0.001	---	2.18	9.8
Waste Evaporator, Bldg. 2531 (MH 243)	1900	0.111	11.0	2.16	9.8
Building 3525 (MH 235)	1.8	< 0.001	---	0.95	4.3
Building 2026 (MH 240)	2.3	0.001	---	1.50	6.8
Tank Farm Drainage	3600	0.394	39.2	4.06	18.2

<sup>a</sup>The activity entered the process-waste system with inleakage of contaminated groundwater under Building 3047. The value given was obtained by difference in measurements in manholes 112 and 114.

Table 3. Activity Released in Gaseous Wastes

Stack No.	Activity <sup>a</sup> (Ci)	Filterable Particulate Activity <sup>b</sup> ( $\mu$ Ci)
2026	< 0.01	3
3039	< 0.01	102
3020	< 0.01	17
7512	< 0.01	1
7911	< 0.01	13
Total Activity in Gases Released at X-10 Site		
Chem. Tech. Division - Y-12 Area		
Tritium Target Fabrication Building		
18 ( <sup>3</sup> H)		
Building 4508 Ventilation Discharges		
Room 136		
Room 265		
6.33x10 <sup>-2</sup>		
1.05x10 <sup>-3</sup>		
Building 5505 Discharges		
Glove Box		
Hood		
6.76x 10 <sup>-3</sup>		
1.16x10 <sup>-1</sup>		

<sup>a</sup>Activity primarily <sup>131</sup>I except as noted.

<sup>b</sup>These values were obtained by allowing the filter papers used in the samplers to decay for a period of four days and then measuring the activity.

<sup>c</sup>No data available at this time.