G-000-106.25

34

FEED MATERIALS PRODUCTION CENTER ENVIRONMENTAL MONITORING SEMI-ANNUAL REPORT FOR SECOND HALF OF 1969 SUMMARY REPORT FOR 1969

02/01/70

NLCO-1055
NLO/AEC
14
REPORT

[redacted]

34 G-000-106.25

110.019 B

NLCO-1055
Special
[redacted]

FEED MATERIALS PRODUCTION CENTER

ENVIRONMENTAL MONITORING SEMI-ANNUAL REPORT

FOR
SECOND HALF
OF 1969
SUMMARY REPORT FOR 1969

PROPERTY OF
U.S. DEPT. OF ENERGY
REFERENCE MATERIAL

DO NOT REMOVE

Prepared by

HEALTH AND SAFETY DIVISION

NATIONAL LEAD COMPANY OF OHIO
P. O. Box 39158
Cincinnati, Ohio 45239

Contract No. AT(30-1)-1156

Date of Issuance: February, 1970

UNITED STATES ATOMIC ENERGY COMMISSION
CINCINNATI AREA

G-000-0034 34

NLCO-1055
Special

G-000-106.25

FEED MATERIALS PRODUCTION CENTER

ENVIRONMENTAL MONITORING SEMI-ANNUAL REPORT

FOR
SECOND HALF
OF 1969
SUMMARY REPORT FOR 1969

Prepared by

HEALTH AND SAFETY DIVISION

NATIONAL LEAD COMPANY OF OHIO
P. O. Box 39158
Cincinnati, Ohio 45239

Contract No. AT(30-1)-1156

Date of Issuance: February, 1970

UNITED STATES ATOMIC ENERGY COMMISSION
CINCINNATI AREA

CONTENTS

Page No.

ABSTRACT 3

INTRODUCTION 4

ENVIRONMENTAL MONITORING DATA 4

Figure 1, Area Map of Relative Locations 4

Part I – Monitoring of Water 6

Figure 2, Flow Diagram of Chemical Waste and Disposal Process 6

Figure 3, Water Sampling Locations 7

A. Water Monitoring Results 7

Table I, Water Sampling Results for the Second Half of 1969 8

B. Annual Water Monitoring Data for 1969 9

Table II, Water Sampling Results for 1969 9

Part II – Monitoring of Air 10

Figure 4, Air Sampling Locations 11

A. Air Monitoring Results 11

Table III, Perimeter Air Sampling Results for the Second Half of 1969 12

Table IV, Off-Site Air Sampling Results for the Second Half of 1969 12

B. Annual Air Monitoring Data for 1969 13

Table V, Perimeter Air Sampling Results for 1969 13

Table VI, Off-Site Air Sampling Results for 1969 13

CONCLUSIONS 14

ABSTRACT

The environmental monitoring program for the sampling of air and water during the second half of 1969 and a summary report for 1969, in the vicinity of the Feed Materials Production Center, Fernald, Ohio is presented. The amount of materials released to the environment was small in comparison to the maximum permissible levels recommended in AEC Manual Chapter 0524 and the State of Ohio.

INTRODUCTION

ENVIRONMENTAL MONITORING DATA

The following report concerns the environmental monitoring data collected by the Feed Materials Production Center (FMPC). The FMPC is operated by the National Lead Company of Ohio (NLO) for the United States Atomic Energy Commission. The project is located in a valley near Fernald in southwestern Ohio. The production area of FMPC covers an area of 136 acres, and is located approximately in the center of a 1050 acre government-owned site. Most of the site, including the entire production area, is located within Hamilton County, Ohio, but approximately 200 acres are situated in southern Butler County. Adjacent to the site are the small villages of Fernald, New Baltimore, Ross, and Shandon, all being located one mile or more from the project. The larger nearby communities of Cincinnati and Hamilton are 20 and 10 air miles away, respectively. (For relative locations see Figure 1).

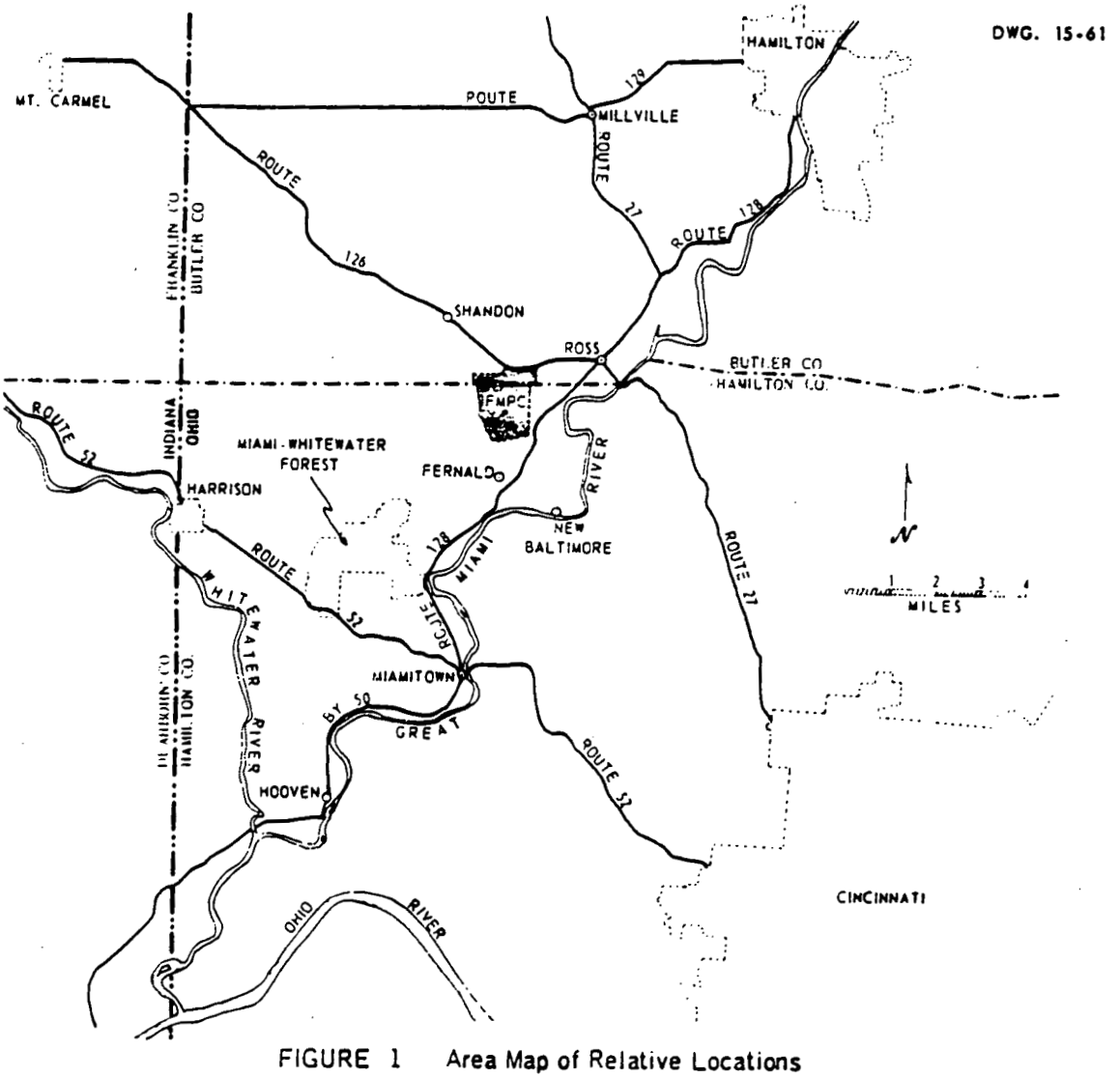

FIGURE 1 Area Map of Relative Locations

H

Operations at this project deal with the processing of high-grade uranium concentrates to produce metallic uranium. These processes include: acid digestion of the concentrates, organic phase extraction of uranyl nitrate, subsequent conversion of the uranyl nitrate to uranium oxides and tetrafluoride, reduction to uranium metal, and fabrication of the metal into fuel elements. The project also includes plants for sampling of the concentrates and recovery of uranium from various residues. The final product is used throughout the United States as a fuel for nuclear reactors.

During the past two years the project has also processed thorium to produce purified oxide and metal. The processes are essentially the same as those used in producing uranium.

During the many involved reactions and processes that lead to the reactor fuels, various liquid and airborne wastes are generated. These wastes contain varying quantities of uranium and thorium. Various in-plant methods are used to curtail their release to the environment. Almost complete removal of the materials is accomplished by using dust collectors and waste treatment processes. An environmental monitoring program has been established to determine the concentration of plant materials in the water and air outside the project. The results of this program in past years and the present report indicated that the material released to the environs at this site is well within the maximum permissible concentrations (MPC) as recommended by the AEC and the State of Ohio regulations. The following pages contain results of the environmental sampling program during the period covered by this report.

Part I - Monitoring of Water

Each of the individual production plants on the project has collection sumps and treatment equipment to remove the uranium from the process wastewater. The effluents from the plants are collected at a general sump for additional treatment and settling. Clear water from the sump is pumped to the river. The solid portion is pumped to a chemical waste pit for further settling. The clear effluent from the pit is then combined with three other types of project wastewater and discharged to the river.

Water samples are taken to determine the effect of the site's liquid wastes upon the Great Miami River, into which all of the plant's liquid effluents pass. The results of the monitoring of liquid effluent have been reported to the Ohio Department of Health on a monthly basis since 1954 and duplicate samples are taken by a State Engineer and a National Lead Company of Ohio Industrial Hygienist. One sample every month is exchanged in order that each group can evaluate the other's sampling procedure and analytical results.

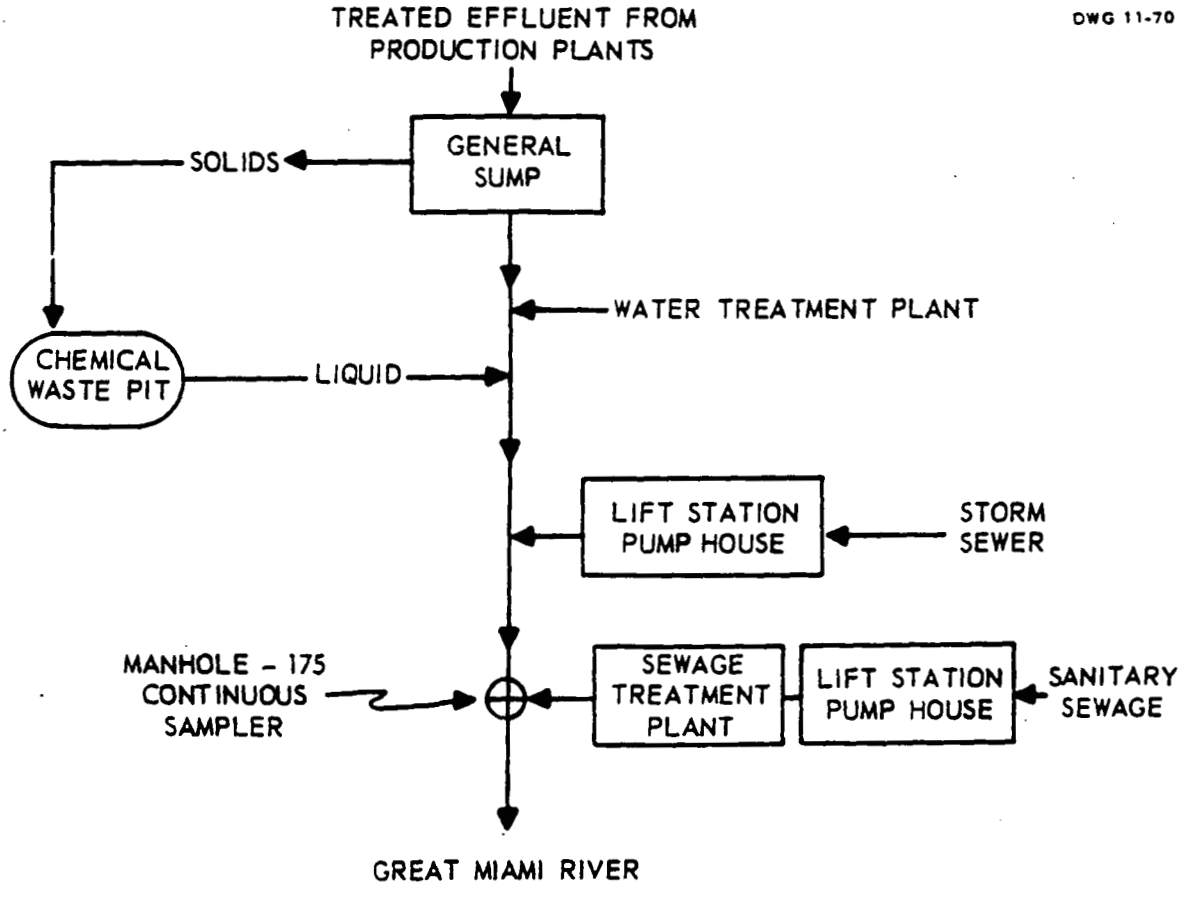

FIGURE 2 Flow Diagram of Chemical Waste and Disposal Process

The locations of the principal effluent and water sampling points are shown in Figure 3. A Parshal Flume type water sampler collects (at point B) samples of the combined effluent stream (see also Figure 2). This sample is collected and analyzed on a daily basis. Results of this analysis utilized with daily measurement of the river flow are the basis for calculating the contaminant concentration added to the river. At point A, upstream from the effluent discharge point, a weekly spot sample is taken for background analysis. At point C, downstream, a continuous sample is taken for a 24-hour period and at least one sample is analyzed each week. Samples of the storm sewer overflow are collected in an automatic flow integrated sampler when overflow occurs.

All of these samples are analyzed for uranium, total activity, chloride, fluoride, and nitrate. Samples taken at all sampling points are also analyzed for Ra^{228}, daughter of Th^{232}. This is the controlling nuclide in the thorium decay chain. Control of this activity and the total activity insure that all MPC's in the thorium decay chain are not exceeded.

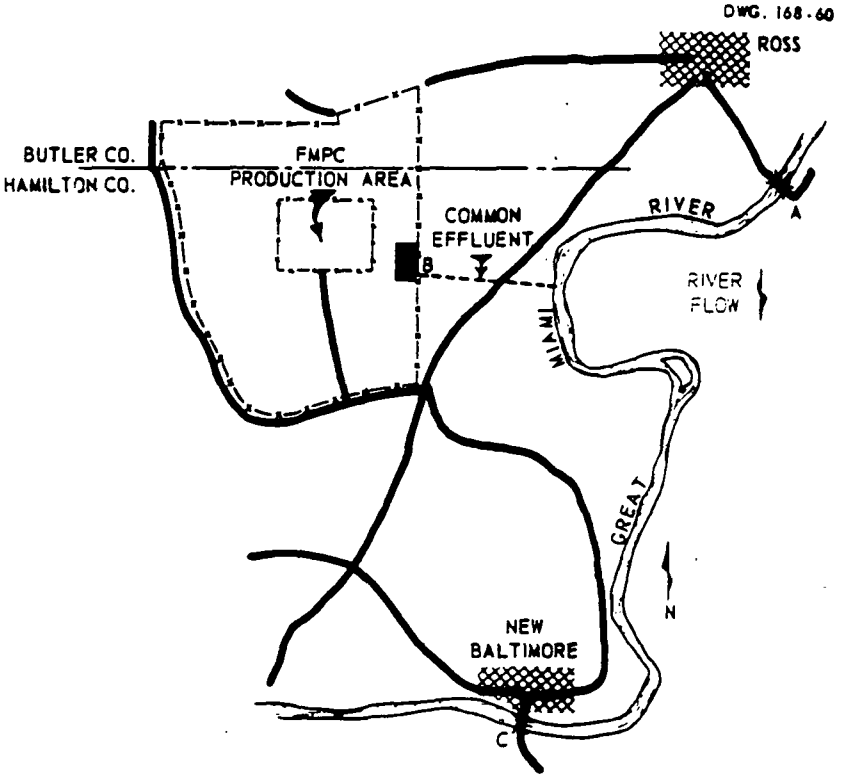

FIGURE 3 Water Sampling Locations (Fernald Area, Feed Materials Production Center and Surrounding Area)

A. Water Monitoring Results

Table I indicates the high, average, and low concentrations of the calculated and sampled contaminants during the second half of 1969. The applicable MPC's and the percent of each MPC are also indicated for comparison.

TABLE I Water Sampling Results for the Second Half of 1969

Location(1)	No. of Samples	Uranium ($\times 10^{-6}$ µCi/ml)(2)				Total Activity ($\times 10^{-6}$ µCi/ml)(2)			
		High	Low	Avg.	%MPC	High	Low	Avg.	%MPC
B (FMPC Outfall - Calculation Concentration in River)	184	<.01	<.01	<.01	<.1	.26	<.01	.01	0.3
A (Upstream Concentration)	28	.09	<.01	.015	<.1	.49	<.01	<.01	0.3
C (Downstream Concentration)	28	.01	<.01	.003	<.1	.10	<.01	<.01	0.3
	(3) MPC	20×10^{-6} µCi/ml				3×10^{-6} µCi/ml			
		Nitrate (ppm)(5)				Chloride (ppm)(5)			
B	184	8	<1	2	4	2	<1	1	<1
A	28	21	5	10	23	69	15	43	17
C	28	22	8	14	32	68	15	44	18
	(4) MPC	44 ppm				250 ppm			
		Fluoride (ppm)(5)							
B	184	<.1	<.1	<.1	8				
A	28	1.4	.3	.7	58				
C	28	1.1	.3	.7	58				
	(4) MPC	1.2 ppm							
		$Ra^{228} \times 10^{-10}$ µCi/ml(2)							
B	22	23.5	.5	7.0	2.3				
A	7	22.7	4.5	10.9	3.6				
C	7	22.7	4.5	12.7	4.2				
	(3) MPC	300×10^{-10} µCi/ml							

(1) See Figure 3
(2) µCi/ml – Microcuries per milliliter
(3) AEC Manual Chapter 0524
(4) NLO – State
(5) ppm – parts per million
NOTE: Figures marked < are taken as the whole figure in averaging.

The above table indicates that the average calculated concentrations (B) of all liquid waste discharged to the river were 8% MPC or less. The difference between upstream and downstream concentration (C - A), essentially the same figure as B arrived at by river sampling, revealed that liquid discharged for all contaminants averaged 9% MPC or less.

The average concentrations of all sampled contaminants at the downstream position (C) indicates each contaminant was well below the applicable MPC's. It may be concluded from sampling and calculations that the FMPC effluent produced little change in the river's quality.

B. Annual Water Monitoring Data for 1969

Table II is a summary of both Semi-annual reports in regard to effluent concentrations at the FMPC site.

TABLE II Water Sampling Results for 1969

Location(1)	No. of Samples	Uranium ($\times 10^{-6}$ μCi/ml)(2)				Total Activity ($\times 10^{-6}$ μCi/ml)(2)			
		High	Low	Avg.	%MPC	High	Low	Avg.	%MPC
B	365	<.01	<.01	<.01	<.1	.26	<.01	.01	0.3
A	51	.09	<.01	.011	<.1	.49	<.01	.01	0.3
C	53	.02	<.01	.003	<.1	.12	<.01	.01	0.3
	(3) MPC	20×10^{-6} μCi/ml				3×10^{-6} μCi/ml			
		Nitrate (ppm)(5)				Chloride (ppm)(5)			
B	365	8	<1	1	2	2	<1	1	1
A	51	34	5	13	29	69	15	36	14
C	53	39	8	16	36	68	15	37	15
	(4) MPC	44 ppm				250 ppm			
		Fluoride (ppm)(5)							
B	365	<.1	<.1	<.1	8				
A	51	1.4	.2	.5	43				
C	53	1.1	.1	.5	43				
	(4) MPC	1.2 ppm							
		$Ra^{228} \times 10^{-10}$ μCi/ml(2)							
B	27	23.5	.4	6.3	2.1				
A	14	22.7	.4	8.9	3.0				
C	14	22.7	.4	13.2	4.4				
	(3) MPC	300×10^{-10} μCi/ml							

(1) See Figure 3
(2) μCi/ml – Microcuries per milliliter
(3) AEC Manual Chapter 0524
(4) NLO – State
(5) ppm – parts per million

The MPC's for nitrate, chloride, and fluoride were established by the National Lead Company of Ohio and the State of Ohio as a guide for waste effluent operations. The NLO-State values refer to a time-weighted average concentration and not to daily outputs. The average concentrations found downstream were 16 ppm nitrate, 37 ppm chloride, and 0.5 ppm fluoride, all of which are well below the respective MPC's.

The results of the monitoring of liquid effluents in 1969 indicate they averaged well below the maximum permissible concentrations for uranium, radium-228, total radioactivity, chloride, fluoride, and nitrate. The results for 1969 are of the same magnitude as they have been in past years.

Part II – Monitoring of Air

During the many involved processes performed at this project various airborne dusts are generated. In order to collect the valuable material, the project uses dust collectors which remove almost all of the generated airborne material. The dust collectors, such as bag collectors, electrostatic precipitators and scrubbing towers are specially designed for each operation and precede all stacks. Air sampling of these exhaust stacks is maintained on a continuous schedule.

An environmental air sampling program has been established to determine the amount of material which is in the air surrounding the project. Air samples are collected around the 1000-acre plant and at points as far away as 10 miles. The sampling of airborne particulate matter provides a good indication of the amount of material released into the atmosphere by the project. A known quantity of air is drawn through a filter medium which is then analyzed for uranium and radioactivity. An analysis for thorium is not considered necessary because of the small amount of thorium handled on the project.

The environmental air samples are divided into two classifications: Perimeter air samples; and "off-site" air samples. There are four permanent air sampling stations at the corners of the production area. These air sampling stations are shown in Figure 4. Samples from these perimeter stations are collected each week and analyzed for uranium and total activity. The off-site samples are collected by air sampling equipment which has been installed in a motor vehicle. These samples are also analyzed for uranium and total activity. The location at which the air

samples will be taken is determined by local meteorological conditions on the day of sampling. Approximately 80% of all samples are taken downwind of the plant. Replicate samples are taken at each sampling point and averaged to obtain a representative concentration for that location.

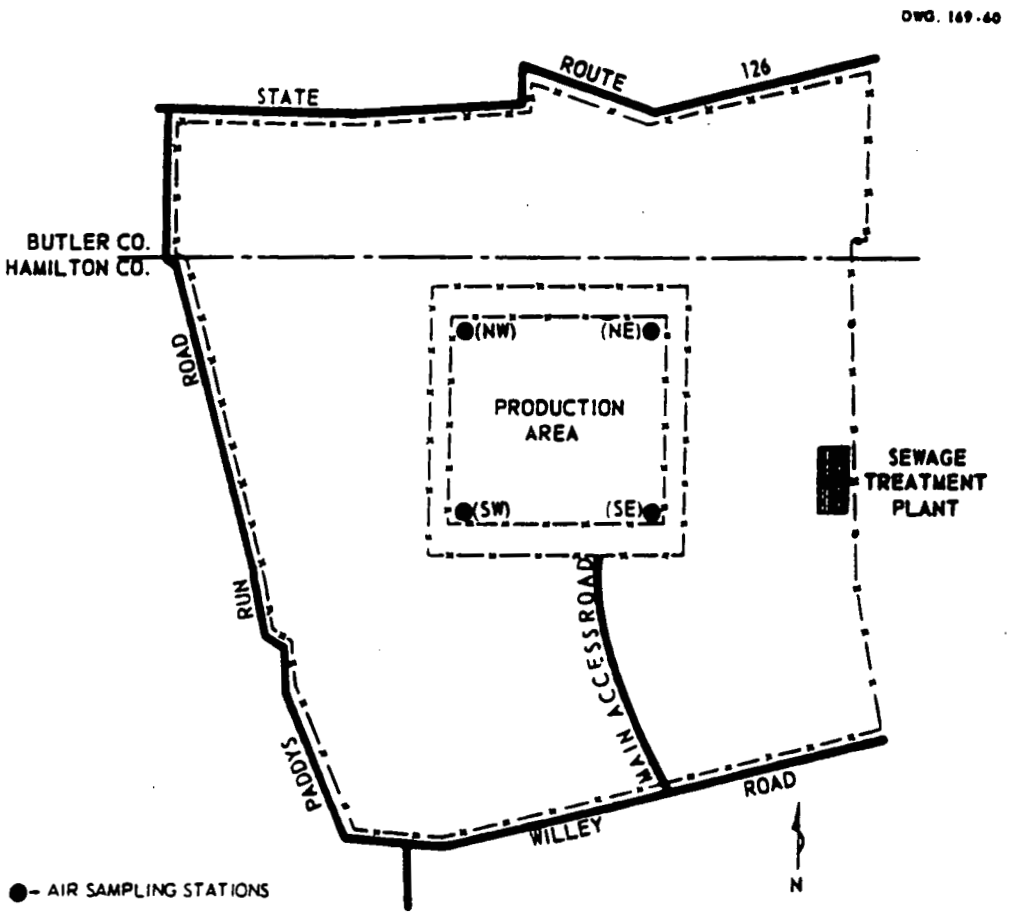

FIGURE 4 Air Sampling Locations (Fernald Area, Feed Materials Production Center and Surrounding Area)

A. Air Monitoring Results

Table III shows the high, average, and low concentrations for perimeter air sampling during the second half of 1969. The MPC's and the per cent of the MPC are listed for comparison. The results of sampling indicate that even well within the project area controlled by the AEC, the concentrations averaged only 5% of the MPC for uranium and 0.2% of the MPC for total radioactivity.

TABLE III Perimeter Air Sampling Results for the Second Half of 1969

Location(1)	No. of Samples	Uranium × 10^{-12} μCi/ml(2)				Total Activity × 10^{-12} μCi/ml(2)			
		High	Low	Avg.	%MPC	High	Low	Avg.	%MPC
SW	22	.2	<.1	<.1	5	.6	<.1	.2	.2
NW	24	.1	<.1	<.1	5	1.1	<.1	.2	.2
NE	24	.4	<.1	.1	5	.8	<.1	.2	.2
SE	23	.2	<.1	.1	5	.5	<.1	.2	.2
Average Concentration		NA(3)	NA	.1	5	NA	NA	.2	.2
(4) MPC		2 × 10^{-12} μCi/ml				100 × 10^{-12} μCi/ml			

(1) See Figure 4
(2) μCi/ml – Microcuries per milliliter
(3) NA – Not Applicable
(4) AEC Manual Chapter 0524

All of the off-site air samples taken during the second half of 1969 are tabulated in groups depending upon the sampling distance from the project. Table IV indicates the high, low and average concentration for the off-site samples in each of the four groups. The MPC's and the per cent of the MPC are listed for comparison. The results of sampling indicate that the off-site concentrations averaged only 5% of the MPC for uranium and 0.2% for total radioactivity.

TABLE IV Off-Site Air Sampling Results for the Second Half of 1969

Group	Distance from FMPC	No. of Samples	Uranium × 10^{-12} μCi/ml(1)				Total Activity × 10^{-12} μCi/ml(1)			
			High	Low	Avg.	%MPC	High	Low	Avg.	%MPC
I	0 – 2 mi.	32	.3	<.1	.1	5	1.5	<.1	.3	.3
II	2 – 4 mi.	35	<.1	<.1	<.1	5	.5	<.1	.2	.2
III	4 – 8 mi.	39	.1	<.1	<.1	5	.6	<.1	.2	.2
IV	8 – 12 mi.	10	<.1	<.1	<.1	5	.7	<.1	.3	.3
Average Concentration			NA(2)	NA	.1	5	NA	NA	.2	.2
(3) MPC			2 × 10^{-12} μCi/ml				100 × 10^{-12} μCi/ml			

(1) μCi/ml – Microcuries per milliliter
(2) NA – Not Applicable
(3) AEC Manual Chapter 0524

B. Annual Air Monitoring Data For 1969

Table V indicates the high, average, and low concentrations for perimeter air sampling during 1969. The MPC's and the per cent of the MPC are listed for comparison. The results of sampling indicate that even well within the project area owned and controlled by the AEC, the concentrations averaged only 5% of the MPC for uranium and 0.3% of the MPC for total radioactivity.

TABLE V Perimeter Air Sampling Results for 1969

Location(1)	No. of Samples	Uranium × 10^{-12} μCi/ml(2)				Total Activity × 10^{-12} μCi/ml(2)			
		High	Low	Avg.	%MPC	High	Low	Avg.	%MPC
SW	47	1.0	<.1	.2	10	1.8	<.1	.4	.4
NW	49	.2	<.1	.1	5	1.1	<.1	.2	.2
NE	49	.4	<.1	.1	5	.8	<.1	.2	.2
SE	48	.3	<.1	.1	5	.5	<.1	.2	.2
Average Concentration		NA(3)	NA	.1	5	NA	NA	.3	.3
(4) MPC		2 × 10^{-12} μCi/ml				100 × 10^{-12} μCi/ml			

(1) See Figure 4
(2) μCi/ml – Microcuries per milliliter
(3) NA – Not Applicable
(4) AEC Manual Chapter 0524

All of the off-site air samples taken during 1969 are tabulated in groups depending upon the sampling distance from the project. Table VI indicates the high, low and average concentration for the off-site samples in each of the four groups. The MPC's and the per cent of the MPC are listed for comparison. The results of sampling indicate that the off-site concentrations averaged only 5% of the MPC for uranium and 0.3% for total radioactivity during 1969.

TABLE VI Off-Site Air Sampling Results for 1969

Group	Distance from FMPC	No. of Samples	Uranium × 10^{-12} μCi/ml(1)				Total Activity × 10^{-12} μCi/ml(1)			
			High	Low	Avg.	%MPC	High	Low	Avg.	%MPC
I	0 – 2 mi.	66	2.3	<.1	.2	10	8.0	<.1	.7	.7
II	2 – 4 mi.	71	.2	<.1	<.1	5	.7	<.1	.2	.2
III	4 – 8 mi.	69	.3	<.1	<.1	5	.7	<.1	.2	.2
IV	8 – 12 mi.	24	<.1	<.1	<.1	5	.7	<.1	.2	.2
Average Concentration			NA(2)	NA	.1	5	NA	NA	.3	.3
(3) MPC			2 × 10^{-12} μCi/ml				100 × 10^{-12} μCi/ml			

(1) μCi/ml – Microcuries per milliliter
(2) NA – Not Applicable
(3) AEC Manual Chapter 0524

CONCLUSIONS

During the second half of 1969, the amount of material released to the air and water remained at the low level that it had during previous years. The results of monitoring for 1969 are of the same magnitude as they have been in the past years. The average concentrations of material present in the air and water environ surrounding the FMPC project was well below their respective MPC's. It therefore may be concluded from this report that the Fernald Area Operations added insignificant amounts of material to the surrounding community environment.