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FEED MATERIALS PRODUCTION CENTER ENVIRONMENTAL MONITORING QUARTERLY REPORT JULY - AUGUST - SEPTEMBER 1960

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REPORT

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FEED MATERIALS PRODUCTION CENTER
ENVIRONMENTAL MONITORING QUARTERLY REPORT

JULY - AUGUST - SEPTEMBER

1960

Prepared by

HEALTH AND SAFETY DIVISION

NATIONAL LEAD COMPANY OF OHIO
P. O. Box 158
Cincinnati 39, Ohio

Contract No. AT(30-1)-1156

Date of Report: November 10, 1960
Date of Issuance: November 22, 1960

UNITED STATES ATOMIC ENERGY COMMISSION
FERNALD AREA

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ABSTRACT

The environmental monitoring program for the sampling of air and water during the third quarter of 1960 in the vicinity of the Feed Materials Production Center, Fernald, Ohio is presented. The amount of material released to the environment was very small in comparison to the maximum permissible levels recommended by the National Committee on Radiation Protection and Measurements and the State of Ohio.

INTRODUCTION

ENVIRONMENTAL MONITORING DATA

The following report concerns the environmental monitoring data performed in the Fernald Area 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. Operations at this project deal with the processing of high-grade uranium ores and ore concentrates to produce metallic uranium. These processes include: acid digestion of the ores and concentrates, organic phase extraction of uranyl nitrate, subsequent conversion of the 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 ores and 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 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. Various in-plant methods are used to curtail their release into the environment surrounding the plant. Almost complete removal of the materials is accomplished by using dust collectors and waste treatment processes. In order to establish what concentrations reach the area surrounding the project an environmental survey program has been established which consists of water, soil, and air sampling of the environs and performing those analyses on the samples that are indicative of released material from the plants. The results of this program indicates that the control of material released to the environs at this site is well within the maximum permissible concentrations (MPC) as recommended by the National Committee on Radiation Protection and Measurements and the State of Ohio. The following pages contain results of the third quarter sampling.

Part I – Monitoring of Water

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 often taken by a State Engineer and an NLO Industrial Hygienist. In some cases, samples are exchanged in order that each group can evaluate the other's sampling procedure and analytical results.

Each of the individual production plants on the project has collection sumps and treatment equipment to remove the uranium from the waste waters. The waters are then collected at a central point for equalization. The effluent passes to a chemical waste pit, as seen in Figure 1, which serves as a settling basin for removal of any remaining settleable solids from the water. The flow which is decanted to the clear-well portion of the pit is virtually free of solids and radioactivity. The effluent is then combined with three other types of plant wastes and discharged to the river.

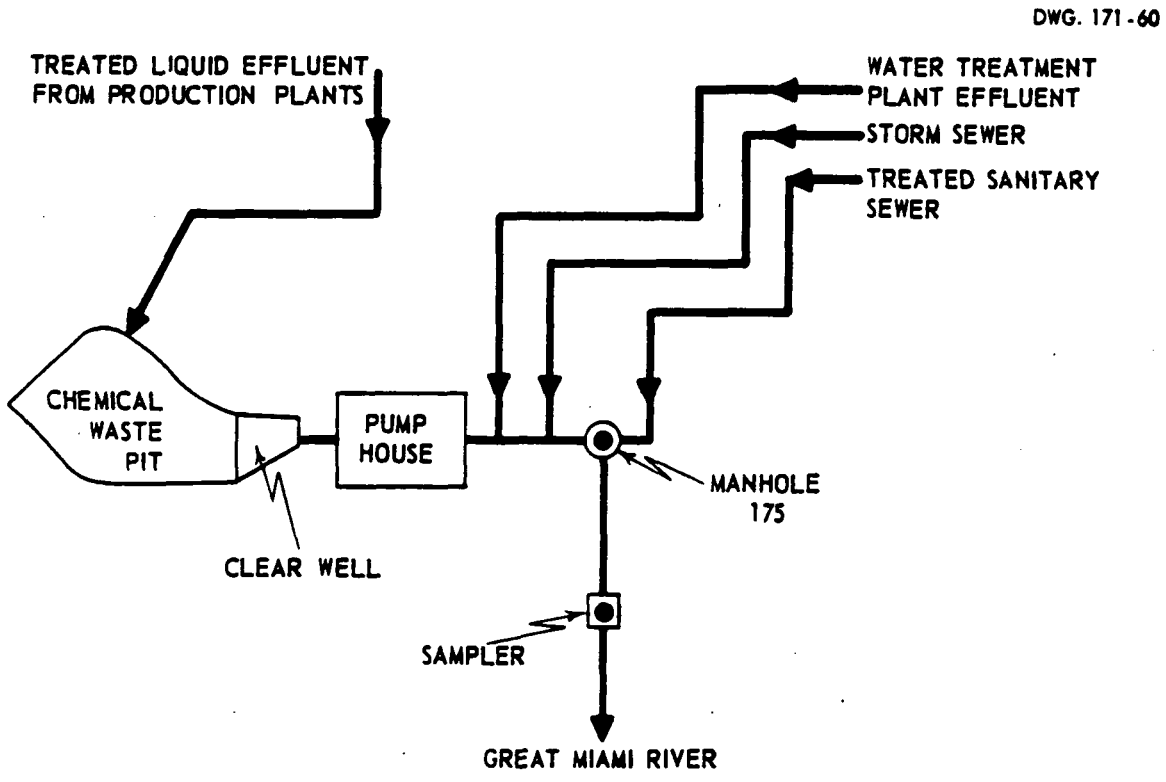

FIGURE 1 Flow Diagram of Chemical Waste and Disposal Process

The locations of all sampling points are shown in Figure 2. A wier-type water sampler collects (at point B) samples of the combined stream (see also Figure 1). The collected sample is removed and analyzed daily. These results when utilized with measurements of river flow are the basis for calculated river concentrations. Since it is difficult to have this type of sampler in an upstream (point A) and downstream (point C) location, weekly spot samples are taken at these points. The collected samples at all points are analyzed for uranium, total activity, chlorides, fluorides, and nitrates.

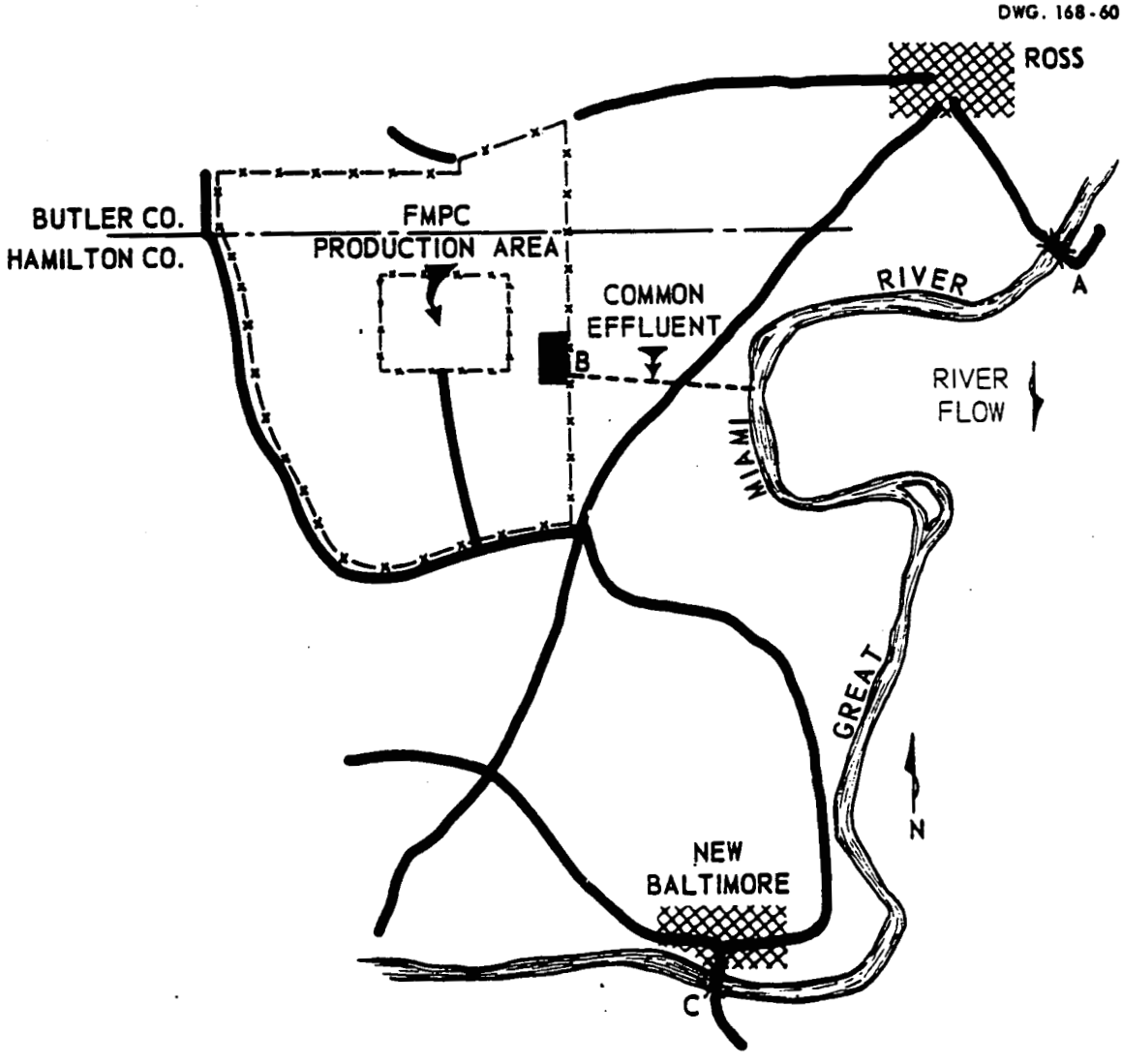

FIGURE 2 Water Sampling Locations (Fernald Area, Feed Materials Production Center and Surrounding Area)

Table I indicates the high, average, and low concentrations of the above contaminants during the third quarter of this year. The applicable MPC's and the percent of each MPC are also indicated for comparison. The results in Table 1 indicate that the liquid wastes discharged by this plant during the third quarter were small in relation to the MPC's. Results C - A (the difference in upstream and downstream concentrations) indicate that the FMPC effluent produced little or no change in the river's quality.

TABLE I Water Sampling Results for Third Quarter of 1960

Location†	No. of Samples	Uranium ($\times 10^{-8}$ $\mu c/cc$)				Total Activity ($\times 10^{-8}$ $\mu c/cc$)			
		High	Low	Average	% MPC	High	Low	Average	% MPC
B (FMPC Outfall - Calculated River Concentration)	92	.040	.001	.010	.05	.050	.000	.011	.36
A (Upstream)	18	.030	.001	.012	.06	.110	.009	.036	1.20
C (Downstream)	18	.030	.010	.015	.08	.140	.014	.041	1.36
C - A	NA	NA	NA	.003	.02	NA	NA	.004	.13
	(1) MPC	20 $\times 10^{-8}$ $\mu c/cc$*				3 $\times 10^{-8}$ $\mu c/cc$**			
		Nitrate (ppm)				**Chloride (ppm)**			
B	92	13.8	0.0	6.7	15.0	10.5	0.1	5.4	2.1
A	18	6.0	ND	1.5	3.4	49.0	21.0	37.5	15.0
C	18	9.0	2.2	5.1	11.5	58.0	24.0	41.8	17.0
C - A	NA	NA	NA	3.6	8.1	NA	NA	4.3	2.0
	(2) MPC	44 ppm				250 ppm			
		Fluoride (ppm)							
B	92	.47	.00	.10	8.0				
A	18	.95	ND	.46	38.0				
C	18	1.20	ND	.46	38.0				
C - A	NA	NA	NA	ND	NA				
	(2) MPC	1.2 ppm							

NA - Not Applicable
ND - Non-Detectable
$\mu c/cc$ - Microcuries per cubic centimeter
ppm - parts per million
(1) U.S. Department of Commerce, National Bureau of Standards Handbook 69, Pages 86*, 93**.
(2) NLO - State
† See Figure 2

Part II – Monitoring of Air

Air samples, rainwater, and gumpapers from fallout stations are collected around the 1000-acre plant site 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. The amount of particulates in the air is calculated by drawing a known quantity of air through a filter medium and analyzing the medium for material indicative of the operation.

During the many involved processes various airborne dusts are generated. Appropriate type dust collectors, such as bag collectors, electrostatic precipitators, and scrubbing towers are specially designed for each operation and are attached to stacks that would have emissions of significant quantities of material.

The determination of the actual amount of material which is in the air surrounding the project is accomplished by the use of air sampling equipment. The samples are analyzed for uranium and total activity. The air sampling stations are shown in Figure 3.

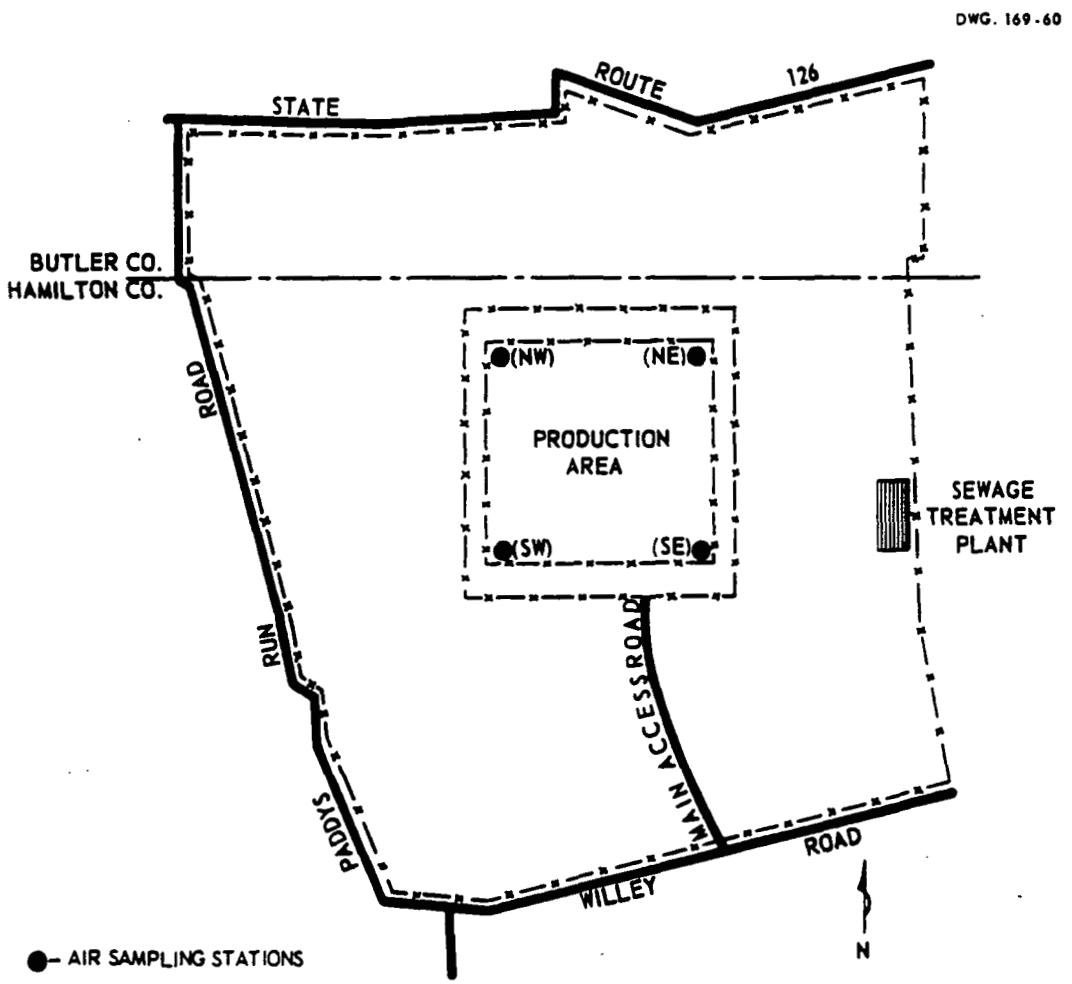

FIGURE 3 Air Sampling Locations (Fernald Area, Feed Materials Production Center and Surrounding Area)

Table II indicates the high, average, and low concentrations for air sampling during the third quarter. The MPC's and the percent of the MPC are listed for comparison. The results of sampling indicate that even well within the project area (from 1200 to 3400 feet) owned and controlled by the AEC, the concentrations averaged only 8.7% of the MPC for uranium and 0.17% of the MPC for total radioactivity.

TABLE II Air Sampling Results for Third Quarter of 1960

Location †	No. of Samples	Uranium ($\times 10^{-12}$ $\mu c/cc$)				Total Activity ($\times 10^{-12}$ $\mu c/cc$)			
		High	Low	Average	% MPC	High	Low	Average	% MPC
SW	10	.64	.11	.30	15.0	.58	.13	.31	.31
NW	12	.26	.03	.16	8.0	.27	.04	.15	.15
NE	11	.21	.03	.12	6.0	.22	.03	.12	.12
SE	10	.25	.03	.13	6.5	.25	.03	.12	.12
Average Concentration		NA	NA	.17	8.7	NA	NA	.17	.17
(1) MPC		2×10^{-12} $\mu c/cc$*				100×10^{-12} $\mu c/cc$**			

NA - Not Applicable
$\mu c/cc$ - Microcuries per cubic centimeter
(1) U.S. Department of Commerce, National Bureau of Standards Handbook 69, Pages 86*, 94**.
† See Figure 3.

CONCLUSIONS

During the third quarter, the amount of airborne and water activity remained at the low level that it had during the first half of the year. The results submitted so far this year are of the same magnitude as they have been in past years. These concentrations of materials present in the air and water environ surrounding the FMPC project are well below their respective MPC's. It therefore may be concluded from this report that the Fernald Area operations added insignificant amounts of materials to the surrounding community environment.