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G-000-106.47

# ANNUAL ENVIRONMENTAL MONITORING SUMMARY FOR RMI COMPANY EXTRUSION PLANT ASTABULA, OHIO PERIOD: JANUARY 1, 1987 THROUGH DECEMBER 31, 1987

12/31/87

30
REPORT

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G-000-0077

# ANNUAL ENVIRONMENTAL MONITORING SUMMARY

FOR

RMI COMPANY

EXTRUSION PLANT

ASHTABULA, OHIO

PERIOD: January 1, 1987 through December 31, 1987

PREPARED FOR:

THE U.S. DEPARTMENT OF ENERGY

OAK RIDGE OPERATIONS

And Their Contractor:

WESTINGHOUSE MATERIALS COMPANY OF OHIO

Under Subcontract No. 2-77222

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## 1.0 REPORT SUMMARY

This report summarizes environmental monitoring activities at the RMI Company, Extrusion Plant for calendar year 1987. Section 2.0 is a facility description. Section 3.0 contains the testing results for stack discharges, perimeter air samples, wastewater discharges, offsite soil monitoring and Fields Brook sediment sampling, and ground water monitoring. Section 4.0 contains estimates of radiation dose from air and water releases. Results are compared to applicable standards cited in Section 5.0. These comparisons indicate that all operations are in substantial compliance with these standards.

The format for this report generally follows that as set forth in DOE Order 5481.1 Chapter III 4.c. This report used the 10 CFR 20 definition of a curie of natural uranium (curie = 1475 kilogram).

Airborne emissions from stacks were 0.00016 curie (0.225 kilograms) uranium (averaging 99.23% U238, 0.77% U235) for DOE operations and 0.00023 curie (0.640 kilograms) uranium (99.8% U238, 0.2% U235) for NRC operations. Differences in uranium emissions between DOE and NRC were due to greater production of materials under NRC license during 1987. Radiation dose to the public from stack emissions is calculated using the EPA AIRDOS model and is compared to the EPA NESHAP standards. AIRDOS calculations of RMI data result in a committed dose to a maximally exposed organ (lung) of $1.8 \times 10^{-1}$ millirems, 0.24 percent of the allowable limit of 75 millirems (critical organ) under the current NESHAP regulations.(1) This compares to 9.8 millirems committed dose to a maximally exposed organ (lung) for 1986. The whole body dose is estimated at $2.2 \times 10^{-6}$ millirem/year for 1987 compared to $9.6 \times 10^{-5}$ millirem/year for 1986. Both years were well below the 25 millirem/year limit.(1) The effective 50 year dose equivalent to the population is 0.09 person-rem due (0.9 person-MSV) primarily to inhalation. This compares to 4.2 person-rem in 1986 (42 person-MSV).

In 1986 the Electrostatic Precipitator on Stack #4 was replaced by high efficiency particulate (HEPA) filtration. A decrease in emissions by a factor of approximately 10,000 resulted. In 1987 Stacks #1 and #2 were combined and equipped with HEPA filters. A lathe ventilation system with HEPA filters was also installed (Stack #8). For 1988 HEPA filter upgrades are planned for Stacks #3 and #5.

The average perimeter air concentration was 13 percent of the DOE guide of $1.0 \times 10^{-13}$ microcurie natural uranium per milliliter for concentrations in air in uncontrolled areas.(2) The highest average perimeter air concentration in 1987 was $2.35 \times 10^{-14}$ microcurie natural uranium per milliliter, 24 percent of the DOE guideline for uncontrolled areas.(2) This sampling station was located in a controlled area 275 feet within the east perimeter fence and 75 feet from the nearest source.

Wastewater sampling in 1987 indicated several non-compliances of the NPDES permit for total dissolved solids, total nonfilterable residue, pH, oil and grease, and copper. On October 1, 1987, the Ohio Environmental Protection Agency issued to RMI a new NPDES permit. Upon review of the permit, RMI and Ohio E.P.A. concluded that portions of the permit should be reviewed for possible revision. RMI appealed the permit and a final permit is expected by May 1, 1988.

Wastewater sampling data for the period resulted in an effective dose equivalent of 0.076 millirem from consumption of Fields Brook water at the downstream sample point due to uranium and technetium 99. The calculated effective dose equivalent for Fields Brook upstream was 0.037 millirem. The average downstream concentration of $3.5 \times 10^{-9}$ uCi/ml uranium was 0.70 percent of the DOE guideline of $5 \times 10^{-7}$ uCi/ml for uranium concentrations in water in uncontrolled areas.(2) The average downstream concentration of $1.24 \times 10^{-8}$ uCi/ml technetium 99 was 0.012 percent of the DOE guideline of $1.0 \times 10^{-4}$ uCi/ml

for technetium 99 concentrations in water in uncontrolled areas.[2]

The average offsite soil uranium concentration in samples from 500 feet to 1.5 miles from the plant center was 2.59 picocuries per gram (pCi/g), or 7.4 percent of the applicable NRC guide of 35 pCi/g.[3] Soil uranium concentrations in samples taken 5 to 200 feet north of the north fence line averaged 37 pCi/g, with 3 of the samples taken within 20 feet of the fence exceeding the 35 pCi/g guideline.

The average upstream and downstream Fields Brook sediment uranium concentrations were 1.8 and 2.2 percent respectively, of the applicable NRC guide of 35 pCi/g of uranium.[3]

The hydrogeological studies reported in 1985 and 1986 continued in 1987. Groundwater contamination with trichloroethylene, uranium, and technetium 99 was determined by earlier studies. There are no drinking water wells within a mile of the site. Sixteen additional monitoring wells were installed in 1987. A Hydrogeologic Assessment Report and Risk Assessment Report were prepared. Further site investigation and a remedial action plan are expected to be completed in 1988.

## 2.0 FACILITY DESCRIPTION

RMI Company Extrusion Plant is a subcontractor to Westinghouse Materials Company of Ohio (WMCO) under contract No. 2-77222. The site is also licensed under NRC Source Material License SMB-602.

The site consists of eight buildings on 26 acres. The buildings house a 3850 ton Loewy extrusion press and other processing and machining equipment. The plant employs about 105 people and operates 8 hours per day, 5 days per week.

### 2.1 FACILITY LOCATION AND SETTING

The facility is near the northern edge of Ashtabula County, Ohio, about three miles east of the center of the city of Ashtabula. The plant is located in

a sparsely populated industrial community of chemical production and metal conversion plants. The site is fenced to maintain a restricted area for 100 feet in the prevailing wind direction North northeast. The closest domestic residence is about 1/4 mile from the plant. Figure 1 is a map of the area.

### 2.2 WORK PERFORMED

The principal activity of the Extrusion Plant under the WMCO subcontract is the conversion of depleted and slightly enriched uranium ingots into rod or tube shapes via extrusion. Extrusion is performed on a 3850 ton Loewy Hydropress. Additional processing includes the cutting, straightening, acid pickling, and machining of the extruded uranium parts.

Non-DOE activities include extrusion operations for clients under NRC license and for clients in the commercial sector.

## 3.0 EFFLUENT MONITORING

Figure 2 is a site map indicating the location of the stacks and the perimeter air monitors. Air monitoring station #6, installed in 1987, is not shown but is located on the perimeter fence at the plant outfall to Fields Brook 525 feet northeast of the main plant.

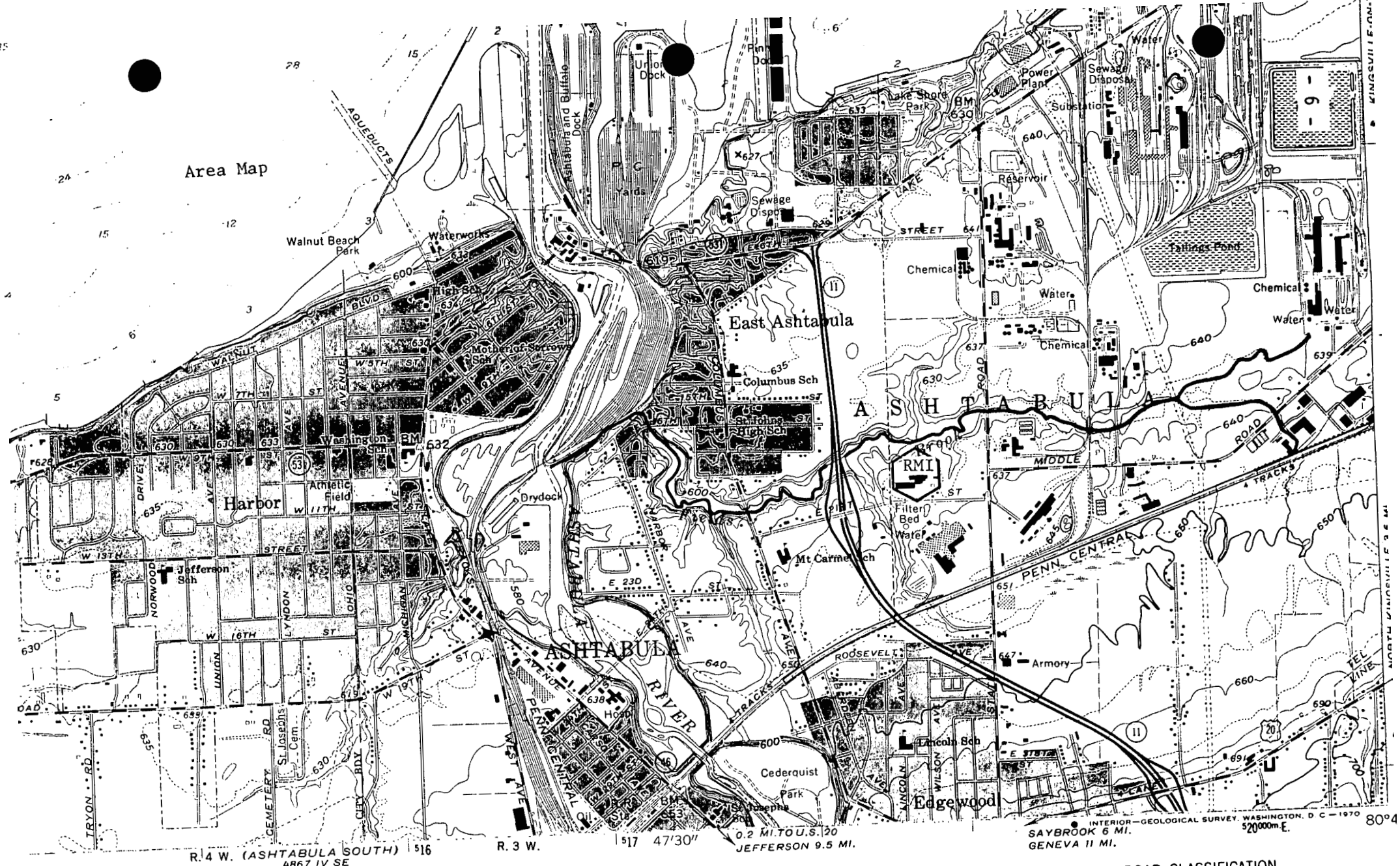
### 3.1 STACK SAMPLING

Uranium processing operations at the Extrusion Plant are ventilated for worker protection. The air effluent from these operations is discharged from seven stacks that extend from 25 to 67 feet above the ground. Stack #8, a lathe ventilation system with High Efficiency Particulate (HEPA) filtration, was installed in 1987. As a minimum, periodic isokinetic grab sampling is performed in each stack in accordance with ANSI N13.1-1969 "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities." Stacks #3, #4, #6, and #8 were equipped with continuous automatic isokinetic samplers in 1987. Sampling results are summarized in Table 1.

Variations in the number of samples from each stack listed in Table 1 exist due to intermittent usage of production areas and the ventilation equipment dedicated to those areas for DOE/NRC operations. As described in section 4.2, the exposure to the local population from airborne releases is calculated annually using the AIRDOS EPA model and meteorological data from the Erie, Pennsylvania Airport.

3.2 PERIMETER AIR SAMPLING

Perimeter air samplers are located on the plant boundary fence line (see Figure 2). The samplers continuously draw air at 35 liters per minute through a 47mm filter. Filters are changed weekly during regular plant operations. Sampling results are summarized in Table 2.




SCALE 1:24 000

1 MILE — 0 — ½

1000 — 0 — 1000 — 2000 — 3000 — 4000 — 5000 — 6000 — 7000 FEET

1 KILOMETER — .5 — 0

CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL
DEPTH CURVES AND SOUNDINGS IN FEET-DATUM IS LOW WATER 586.6 FEET

Figure #1

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Medium-duty — Light-duty

Unimproved dirt

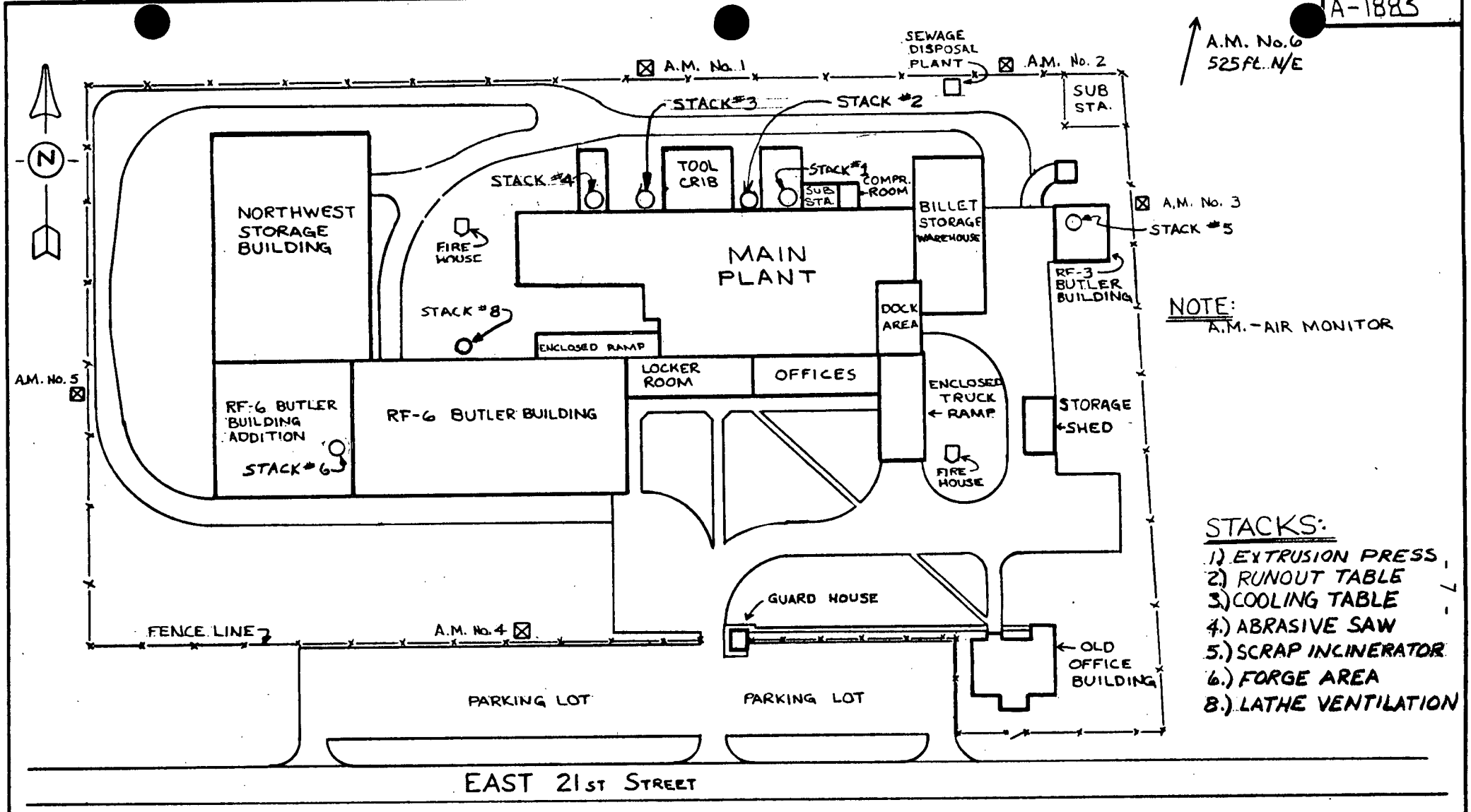
U. S. Route — State Route

Heavy-duty

# ASHTABULA NORTH, OHIO

NE/4 ASHTABULA 15' QUADRANGLE
N4152.5—W8045/7.5

A-1883




NOTE:
A.M. - AIR MONITOR

STACKS:
1.) EXTRUSION PRESS
2.) RUNOUT TABLE
3.) COOLING TABLE
4.) ABRASIVE SAW
5.) SCRAP INCINERATOR
6.) FORGE AREA
8.) LATHE VENTILATION

REVISION

| DATE | NO | DESCRIPTION |
|---|---|---|
| 11-13-86 | 1 | ADDED STACK #4 FILTER BLDG. |
| 3-8-88 | 2 | ADDED STACKS #8 & STACK #1 BLDG. REMOVED STACK #2 |
| | | |
| | | |
| | | |

-DIA'S TO BE CONCENTRIC WITHIN ——— T.I.R.
-FACES TO BE SQUARE WITH ℄ WITHIN ———
● STAMP PART & SERIAL NUMBER.
-DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED
-TOLERANCES UNLESS OTHERWISE SPECIFIED:
WHOLE NUMBERS & FRACTIONS ± 1/64
TWO PLACE DECIMALS ± .010
THREE PLACE DECIMALS ± .005
ANGLES ± 15 MIN.

**R M I COMPANY**
EXTRUSION PLANT
E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004

| MATERIAL | HARDNESS | DATE | SCALE |
|---|---|---|---|
| | | 7-25-84 | 1"=100' |
| | | DWN. JONES | CHK'D. G.V. |
| DESIGNED TO MATE | | CHG. NO. & PROJECT 412 | |
| TITLE RMI Co. EXTRUSION PLANT VENTILATION, STACK LAYOUT | | DWG. NO. A-1883 | |

BRUNING 40-22 58745

TABLE 1

STACK SAMPLING SUMMARY
1987

| Stack # | Identification | # of Samples | Uranium Highest Concen. uCi/ml | Uranium Lowest Concen. uCi/ml | Uranium Average* Concen. uCi/ml |
|---|---|---|---|---|---|
| 1 | Extrusion Press | 21 | $1.59 \times 10^{-11}$ | $2.7 \times 10^{-14}$ | $1.49 \times 10^{-13}$ |
| 2 | Runout Table | 26 | $3.30 \times 10^{-11}$ | $3.87 \times 10^{-13}$ | $5.30 \times 10^{-12}$ |
| 3 | Cooling Table | 7 | $1.17 \times 10^{-11}$ | $1.63 \times 10^{-12}$ | $5.62 \times 10^{-12}$ |
| 4 | Abrasive Saw | 4 | $5.10 \times 10^{-13}$ | $2.00 \times 10^{-15}$ | $1.52 \times 10^{-13}$ |
| 5 | Scrap Incinerator | 120 | $8.24 \times 10^{-10}$ | $5.00 \times 10^{-15}$ | $7.94 \times 10^{-11}$ |
| 6 | Forge Booths | 41 | $1.09 \times 10^{-10}$ | $2.00 \times 10^{-15}$ | $2.08 \times 10^{-11}$ |
| 8 | Lathes | 16 | $1.97 \times 10^{-11}$ | $8.1 \times 10^{-14}$ | $2.46 \times 10^{-12}$ |

* Average Concentration per Sample

TABLE 2

PERIMETER AIR SAMPLING SUMMARY
1987

| Station # | Location | # of Samples | Uranium Highest Concen. uCi/ml | Uranium Lowest Concen. uCi/ml | Uranium Average Concen. uCi/ml | Uranium DOE Guideline(2) uCi/ml |
|---|---|---|---|---|---|---|
| 1 | North Fence-West | 46 | $4.42 \times 10^{-14}$ | $1.04 \times 10^{-15}$ | $1.03 \times 10^{-14}$ | $1.00 \times 10^{-13}$ |
| 2 | North Fence-East | 45 | $6.75 \times 10^{-14}$ | $4.47 \times 10^{-15}$ | $2.25 \times 10^{-14}$ | $1.00 \times 10^{-13}$ |
| 3 | East Fence | 46 | $1.43 \times 10^{-13}$ | $1.78 \times 10^{-15}$ | $2.35 \times 10^{-14}$ | $1.00 \times 10^{-13}$ |
| 4 | South Fence | 46 | $4.42 \times 10^{-14}$ | $1.04 \times 10^{-15}$ | $7.92 \times 10^{-15}$ | $1.00 \times 10^{-13}$ |
| 5 | West Fence | 46 | $2.40 \times 10^{-14}$ | $1.00 \times 10^{-17}$ | $3.68 \times 10^{-15}$ | $1.00 \times 10^{-13}$ |
| 6 | North Fence-Outfall | 5 | $6.11 \times 10^{-15}$ | $9.00 \times 10^{-17}$ | $4.06 \times 10^{-15}$ | $1.00 \times 10^{-13}$ |
| | Average | | | | $1.33 \times 10^{-14}$* | $1.00 \times 10^{-13}$ |

* Overall average of perimeter samples.

### 3.3 WASTEWATER SAMPLING

Before release, all process water from plant operations passes through a Sparkler Co. Model RJ-1-108, 3 micron diatomaceous earth filter. Sanitary waste is treated in a Fluidyne Co. Model SBR-5V sequencing batch reactor treatment plant. Process water, sanitary sewage, storm sewers and salt bath non-contact cooling water all combine to form the final effluent. Construction has started on a new waste water treatment facility which will utilize lime, settling, and filtration technology. The new facility will go into operation in mid 1988.

Each week, hourly water samples are taken and composited for a 24 hour period at the release point to Fields Brook, at a point 700 feet upstream in Fields Brook, and at a point 2,000 feet downstream in Fields Brook. These samples are analyzed for uranium, and starting late in 1987, for technetium 99. The release point samples are also analyzed for the NPDES permit[4] parameters twice each month or more often as specified by the permit. Tables 3 and 4 summarize the sampling. NPDES samples are analyzed in duplicate by the RMI laboratory. Uranium in wastewater discharge from all operations was 0.0262 curie (38.62 kg) based on total effluent volume and average uranium concentration at the monitoring point.

During calendar year 1987 there were ten instances of noncompliance with the NPDES permit for the Extrusion Plant. The following is a listing by parameter and suspected cause for these noncompliances. Table 4 compares high, low and average values to the permit limit for each parameter.

| Parameter | Number of Exceedances | Cause |
|---|---|---|
| Oil and Grease (O&G) | 2 | (1) Use of concentrated detergent which removed excess O&G from equipment and waste water trenches overloading the waste water treatment system.<br>(1) Leak of water soluble oil from the Extrusion Press. |
| Total Dissolved Solids (TDS) | 2 | (2) Use of salt for de-icing entering storm water drains. |
| pH | 2 | (2) Dilute nitric acid inadvertently entering waste water treatment system. |
| Copper (Cu) | 1 | (1) Overflow of copper pickling acid rinse water. |
| Total Nonfilterable Residue (T-NFR) | 3 | (1) Discharge pipe replacement<br>(2) Sanitary treatment malfunction |

The total nonfilterable residue exceedances have been alleviated through daily observations of operation of a sanitary sewer sequencing batch reactor. The wastewater treatment facility planned for August 1988 start-up is designed for continuous pH monitoring, and more efficient removal of oil & grease, total dissolved solids, and metals than the current diatomaceous earth filter.

TABLE 3

WASTEWATER MONITORING SUMMARY
1987

| Sample Location | Uranium # of Samples | Uranium Highest Concen. uCi/ml | Uranium Lowest Concen. uCi/ml | Uranium Average Concen. uCi/ml | Technetium 99 # of Samples | Technetium 99 Average Concen. uCi/ml |
|---|---|---|---|---|---|---|
| Plant Outfall | 53 | $1.62 \times 10^{-6}$ | $8.38 \times 10^{-8}$ | $4.53 \times 10^{-7}$ | 4 | $3.86 \times 10^{-7}$ |
| Fields Brook Upstream | 53 | $1.38 \times 10^{-8}$ | $3.09 \times 10^{-10}$ | $1.19 \times 10^{-9}$ | 4 | $1.65 \times 10^{-8}$ |
| Fields Brook Downstream | 53 | $9.60 \times 10^{-9}$ | $8.04 \times 10^{-10}$ | $3.50 \times 10^{-9}$ | 6 | $1.24 \times 10^{-8}$ |

TABLE 4

NPDES PERMIT SUMMARY
1987

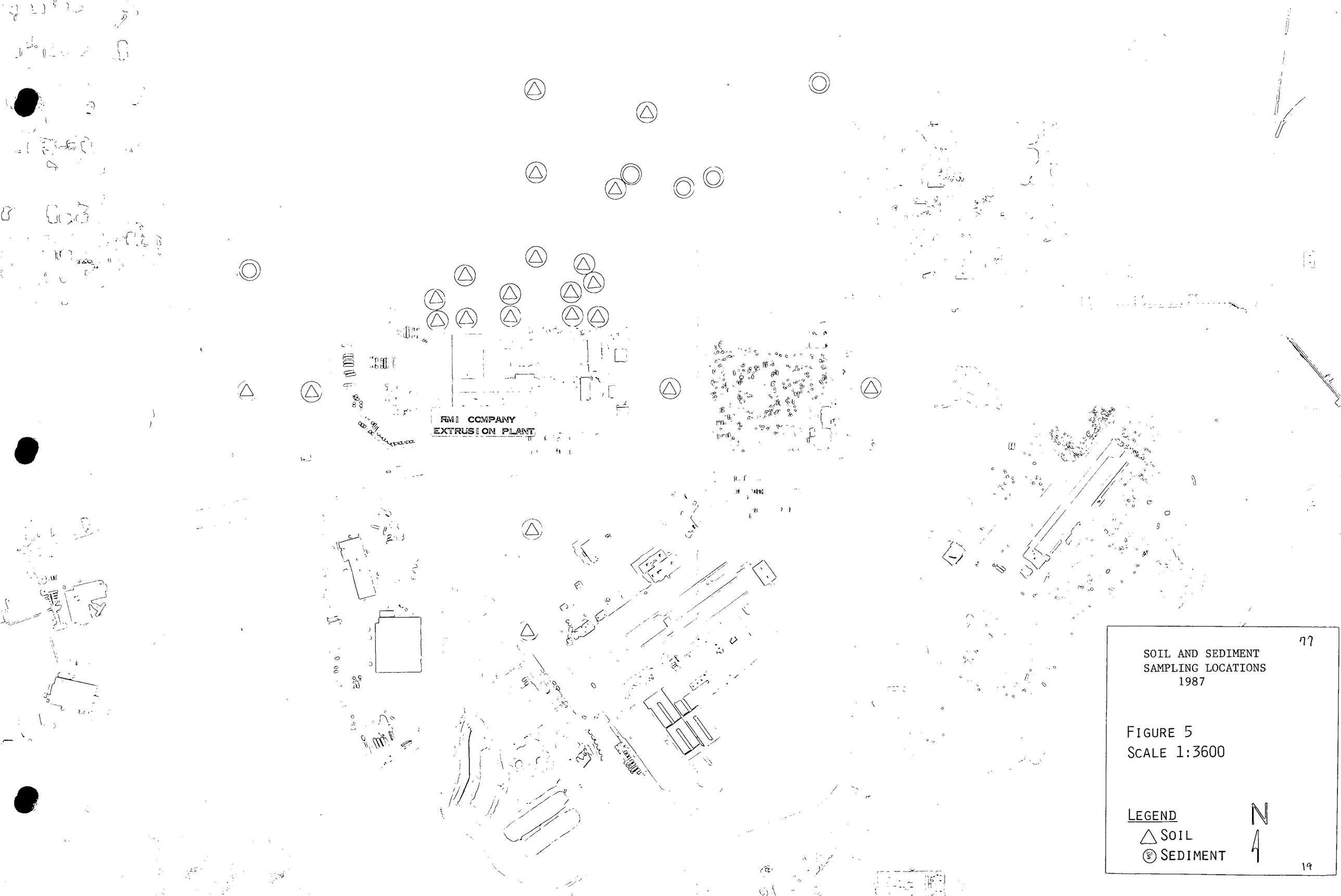
| Parameter | # of Samples | Highest Concen. | Lowest Concen. | Average Concen. | Permit Limit | Compliance With Permit Limits % |
|---|---|---|---|---|---|---|
| pH (S.U.) | 53 | 8.2 | 5.5 | 7.7 | 6-9 | 96 |
| Total Dissolved Solids (mg/l) | 32 | 452.0 | 237.0 | 300.2 | 400 avg. | 94 |
| Total Nonfilterable Residue (mg/l) | 34 | 32.0 | 1.0 | 6.4 | 10 avg. | 91 |
| Oil & Grease (mg/l) | 31 | 14.5 | 4.0 | 4.3 | 10 | 94 |
| Copper (ug/l) | 31 | 800.0 | <50.0 | <137.8 | 500 | 97 |

3.4 SOIL SAMPLING

Annually soil samples in the area of the site are analyzed for uranium and compared to levels detected the previous year. Offsite soil sample locations are determined using 1/2 mile concentric rings originating from the center of the plant and extending outward to one and one-half miles. Samples are taken on the four compass point directions and on a North Northeast line along the ring boundaries (see Figure 4). The prevailing wind direction is to the North Northeast. Additional samples are taken from 502 to 1181 feet from the plant (see Figure 5). The number of samples and their locations is based on the extensive 1985 baseline soil sampling program. Near offsite soil samples are taken from 5 feet to 200 feet north of the north fence line. Background soil samples are taken 3.25 and 3.50 miles from the plant at upwind locations. Sampling locations are indicated on figures 4 and 5. All samples are 3/4 inch diameter by 6 inch deep core borings. Sampling protocol is according to established U.S. EPA procedures[5,6]. Blind duplicates are analyzed by the vendor laboratory to assure reproducibility of results. Table 5 is a summary of this sampling.

The average of offsite soil uranium concentration in samples from 0.1 miles to 1.5 miles from the center of the RMI Plant was 2.59 pCi/g. This is 7.4 percent of the applicable NRC guide of 35 pCi/g used for comparison purposes[3]. The measured soil concentration at 3 to 3.5 miles was 0.32 pCi/g. Naturally occurring uranium concentrations in Ohio range from about 1.2 pCi/g to 4.4 pCi/g.[14] Part of the CY 1987 soil sampling program included ten (10) near offsite (5 to 200 feet) samples from locations north of the plant. All 1987 samples were collected via EPA sampling procedures[5,6]. As a quality control measure at least one in ten samples was analyzed in duplicate, and was also sent to another lab to cross check. Three of the samples collected within 20 feet of

RMI Company
Extrusion Plant
3.5 MILES
SOUTH
SOIL SAMPLE LOCATIONS 77
1987
Figure 4
Scale 1:22,800
Legend
Soil
N


RMI COMPANY
EXTRUSION PLANT
SOIL AND SEDIMENT
SAMPLING LOCATIONS
1987
FIGURE 5
SCALE 1:3600
LEGEND
SOIL
SEDIMENT
N

the north fence had uranium concentrations above the NRC guide of 35 pCi/g at 150, 126, and 42 pCi/g. Sources of removable uranium contamination next to the north fence have been identified and are now controlled through covering, decontaminating or removing of contaminated material. In addition a fence is being constructed to prevent access to the area. All samples taken from distances greater than 20 feet from the fence were below the NRC guide. Soil concentrations from all locations were similar to those found in past years indicating no increase in 1987.

TABLE 5

SOIL MONITORING SUMMARY
1987

| Distance from Plant Center | Uranium (pCi/g) No. of Samples | Highest Concen. | Lowest Concen. | Average Concen. | NRC[3] Guideline pCi/g |
|---|---|---|---|---|---|
| 5 to 200 ft. from North Fence | 10 | 150.07 | 1.77 | 37.16 | 35 |
| 0.10 mile | 4 | 19.27 | 0.88 | 10.21 | 35 |
| 0.15 mile | 4 | 6.33 | 0.26 | 2.08 | 35 |
| 0.20 mile | 4 | 2.42 | 0.69 | 1.23 | 35 |
| 0.5 mile | 4 | 0.43 | 0.28 | 0.36 | 35 |
| 1.0 mile | 4 | 0.45 | 0.40 | 0.42 | 35 |
| 1.25 to 1.5 mile | 5 | 0.80 | 0.22 | 0.47 | 35 |
| 3.25 and 3.5 mile | 2 | 0.33 | 0.30 | 0.32 | 35 |

Naturally occurring uranium concentrations in Ohio soils range from about 1.2 pCi/g to 4.4 pCi/g.[14]

### 3.5 SEDIMENT SAMPLING

Annually, 6 inch deep composite sediment samples are taken from the Fields Brook creekbed at the point of plant wastewater discharge. Sediment samples are also taken upstream and downstream of the outfall (see Figure 5). Sampling results are summarized in Table 6.

The average upstream and downstream sediment uranium concentrations were 0.92 and 1.2 percent respectively, of the NRC guide for soils of 35 pCi/g.[3] These levels are similar to levels detected in past years indicating no increase during 1987.

TABLE 6

SEDIMENT MONITORING SUMMARY
1987

| Location | Distance From Outfall | Uranium Concen. (pCi/g) | NRC[3] Guideline (pCi/g) |
|---|---|---|---|
| Outfall | - | 3.09 | 35 |
| Upstream | 800' | 0.34 | 35 |
| Upstream | 100' | 0.31 | 35 |
| Downstream | 300' | 0.44 | 35 |
| Downstream | 1800' | 0.39 | 35 |

Naturally occurring uranium concentrations in Ohio soils range from about 1.2 pCi/g to 4.4 pCi/g.[14]

3.6 GROUNDWATER

As described in the 1985 Environmental Monitoring Summary a hydrogeological study was completed at the RMI site during CY 1985. Groundwater flow at the site was determined to be generally north-northwest. Groundwater contamination by the degreasing solvent trichloroethylene (200 parts per million) and uranium (150 pCi/liter) was detected in one of the original six monitoring wells installed (100 series). The contaminated well (MW 104) is located inside the northern plant fence. Figure 6 shows monitoring well locations.

The most probable route of entry into the groundwater was through a small (30 x 10 x 3 foot) clay lined solar evaporation pond located upgradient from MW 104. The sodium nitrate solution placed in the pond for evaporation contained small amounts of uranium. The trichloroethylene is suspected to have resulted from a single unauthorized disposal into the pond prior to 1972. The pond was closed in 1984.

The 1986 Environmental Monitoring Summary describes additional hydrogeologic studies completed during 1986. During 1986 it was determined that in addition to trichloroethylene and uranium contamination detected in 1985, monitoring well 104 also contained Technetium 99 (0.050 parts per million or 900,000 picocuries/liter). Downgradient well MW 206 contains traces of trichloroethylene (0.005 ppm) and Technetium 99 (0.0015 ppm or 26,000 pCi/liter) as well. These Technetium 99 levels can be compared to the US EPA National Interim Primary Drinking Water Regulations Maximum Permissible Concentration of 900 picocuries/liter[10] and the DOE derived concentration guideline for drinking water contaminated with radionuclides by members of the public of 100,000 pCi/l.[2]

In 1987 based on the previous studies sixteen (16) additional monitoring wells (300 series) were constructed. Three of the previous wells

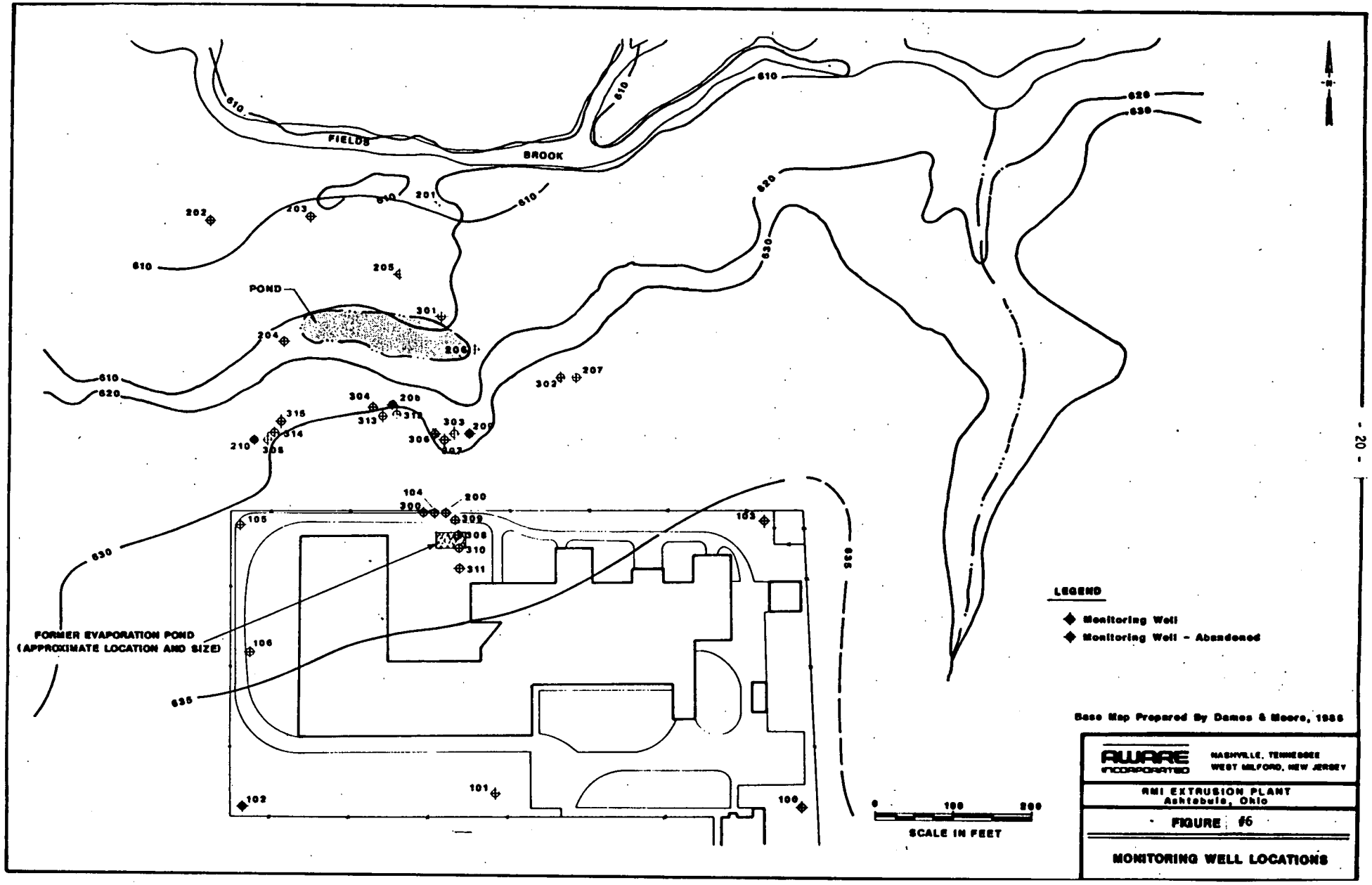
(MW 208, MW 209, MW 210) were closed by pressure grouting to prevent these wells serving as pathways of contaminant migration.

Approximately 200 feet north of the north plant fence there is a steep downhill slope (approximately 20 feet elevation decrease). At the foot of the slope there is a ponded area of standing water about 20 x 35 feet and up to one foot deep during wet weather. The water in the ponded area is the result of direct groundwater discharge, precipitation, and intersection with the shallow ground water table. Trace contamination with trichloroethylene (0.003 parts per million), uranium (0.355 ppm or 240 pCi/l) and technetium 99 (0.0001 ppm or 2000 pCi/l) has been detected in the ponded water.

A Hydrogeologic Assessment Report[11] prepared by AWARE Inc., environmental consultants, summarized all hydrogeologic data available through September, 1987. A subsequent Risk Assessment Report[12] prepared by AWARE, Inc., evaluated the potential risk to public health posed by existing conditions at the RMI site based on the current information. The hydrogeologic evaluation showed the movement of groundwater to be very slow. Due to the low groundwater flow characteristic of the area, there are no domestic water wells at or near the RMI site. The Risk Assessment Report indicated no public health risks.

All monitoring wells are sampled and analyzed quarterly for the four RCRA indicator parameters. These include four replicate analyses for each of pH, specific conductance, total organic carbon and total organic halogens. Other routine analyses are uranium, gross alpha and gross beta radiation, sodium, chloride and trichloroethylene.

Additional site assessment is planned for 1988. A remedial feasibility study and site remedial action plan are anticipated for completion in 1988.


FIELDS BROOK
POND
610
620
630
635
FORMER EVAPORATION POND
(APPROXIMATE LOCATION AND SIZE)
LEGEND
Monitoring Well
Monitoring Well - Abandoned
Base Map Prepared By Dames & Moore, 1986
AWARE INCORPORATED
NASHVILLE, TENNESSEE
WEST MILFORD, NEW JERSEY
RMI EXTRUSION PLANT
Ashtabula, Ohio
FIGURE #6
MONITORING WELL LOCATIONS
0 100 200
SCALE IN FEET



24

74

TABLE 7

Average 1987 Monitoring Well Concentrations

| PARAMETER | Units | Upgradient Wells (#100, 101, 103, 105, 106, 311) | Wells in Pond Area (#104, 200, 300, 308, 309, 310) Mean | Low | High | Downgradient Wells (#204, 205, 207, 301, 302, 303, 304, 305) | Wells at top of Escarpment (#306, 307, 312, 313, 314, 315) | Well #206 | Wells Influenced by Fields Brook (#201, 202, 203) |
|---|---|---|---|---|---|---|---|---|---|
| pH(1)(2) | S.U. | 7.3 | 8.1 | 7.5 | 9.8 | 7.8 | 8.0 | 6.9 | 7.4 |
| Specific Conductance(1) | umho | 1,590 | 10,300 | 1,600 | 31,300 | 2,280 | 1,450 | 1,440 | 4,250 |
| Total Organic Carbon(1) | mg/l | 4.4 | 18.3 | 7.2 | 55.7 | 7.5 | 42.6 | 6.4 | 5.7 |
| Total Organic Halogen(1) | ug/l | <17 | 16,500 | 270 | 41,100 | <32 | <48 | 21.3 | <721 |
| Trichloroethylene(3) | mg/l | <0.003 | 96 | 0.081 | 425 | <0.002 | <0.035 | <0.002 | 0.662 |
| Uranium(4) | mg/l | 0.0213 | 1.68 | 0.01 | 9.54 | 0.00456 | 0.037 | 0.00129 | 0.00601 |
| Gross Alpha | pCi/l | 23.1 | 656 | 12.6 | 3,720 | 4.6 | 43.7 | 1.99 | 7.81 |
| Gross Beta | pCi/l | 16.6 | 38,900 | 31.4 | 136,000 | 45.3 | 64.3 | 4,400 | 29.90 |
| Technetium 99(4) | pCi/l | 30.8 | 150,000 | 37.3 | 608,000 | 77.3 | 86.3 | 23,400 | 166 |
| Sodium(7)(5) | mg/l | 105 | 2,560 | 370 | 9,120 | 259 | 158 | 223 | 622 |
| Chloride(2) | mg/l | <79.2 | 565 | 131 | 1,810 | 258 | 59.9 | 27.7 | 977 |

(1) RCRA indicator parameter - Look for statistically significant increase in downgradient well compared to upgradient well using student's t- test, 40 CFR 265.93.

The following drinking water citations are included for reference only. These wells are not used for drinking water. There are no drinking water wells in the area.

(2) National Secondary Drinking Water Regulations 40 CFR 143.3, Recommended levels for public water systems:
chloride - 250 mg/l pH - 6.5 to 8.5

(3) National Primary Drinking Water Regulations. Proposed maximum contaminant level for trichloroethylene - 0.005 mg/l. 50 FR 46902, 11/13/85.

(4) DOE Draft Derived Concentration Guides - Concentration's of Radionuclides in Water that Could be Continuously Consumed and Not Exceed an Effective Dose Equivalent of 100 mrem/year, 600 pCi/l for U238, U235 (0.81 mg/l for natural U), 500 pCi/l for U234, 100,000 pCi/l for Tc 99.

(5) USEPA recommended drinking water maximum contaminant level for sodium of 20 mg/l for persons on sodium restricted diets, 49 FR 6/18/84.

## 4.0 ESTIMATION OF RADIATION DOSE

### 4.1 DOSE FROM DRINKING WATER

Water is sampled downstream of the RMI Company Extrusion Plant effluent discharge point to determine potential radiation doses from consuming Fields Brook water. This is a worst case assumption since Fields Brook is not a known drinking water source. Sampling data for 1987 resulted in an effective dose equivalent of 0.076 millirem per year from consumption of Fields Brook water at the downstream sample point. This is based on an average adult liquid intake of 730 Liters per year and the average uranium concentration of $3.50 \times 10^{-9}$ uCi/ml and technetium 99 concentration of $1.24 \times 10^{-8}$ uCi/ml at the sample point (see Table 3). The calculated effective dose equivalent for the upstream sampling data is 0.037 mrem per year based on the average uranium concentration of $1.19 \times 10^{-9}$ uCi/ml and Technetium 99 concentration of $1.65 \times 10^{-8}$ uCi/ml at the sample point (see Table 3). Estimated lower large intestine and stomach doses from consumption of Fields Brook water were 0.512 and 0.118 mrem/yr downstream respectively and 0.174 and 0.156 mrem/yr upstream respectively. These doses are very low when compared to the DOE accepted standard of 100 mrem whole body dose, 5,000 mrem to any organ[8] (see Table 8), and when compared to the average annual effective dose equivalent for the U.S. population of 360 mrem per person from all sources (excluding tobacco products).[13] All assumptions for the above calculations are based on recommendations of the International Commission on Radiological Protection (ICRP)[8] and U.S. DOE Dose Equivalent Tables.[9]

### 4.2 DOSE FROM AIRBORNE RELEASES

ORNL performed AIRDOS modeling of 1987 RMI stack emission, meteorological and population data in compliance with The National Emissions Standards for Hazardous Air Pollutants (NESHAP). For DOE operations, the model predicted a whole body dose equivalent of $1.5 \times 10^{-6}$ millirem/year, a total effective dose

commitment of $1.0 \times 10^{-2}$ millirem/year and a maximum organ (lung) dose commitment of $8.3 \times 10^{-2}$ millirem/year (Table 9). The whole body dose equivalent is from external exposure only, i.e., ground deposition and air immersion. The total effective dose equivalent includes both external and internal exposures. For NRC operations, the model predicted $6.8 \times 10^{-7}$ millirem/year whole body dose equivalent, $1.1 \times 10^{-2}$ millirem/year total effective dose commitment and $9.4 \times 10^{-2}$ millirem/year organ (lung) dose commitment. Other predicted organ doses are presented in Table 9; however, the pulmonary region of the lung is considered the organ receiving the highest dose commitment. The dose limits established by EPA[1] are 25 millirem/year whole body and 75 millirem/year to any organ. Total population committed effective dose equivalent attributable to RMI operations was 0.09 person-rem for the 50 mile population of 1,645,430 people for DOE and NRC work combined. This dose is very low when compared to an average natural background radiation from the sun, rocks, food, air, and water of nearly 500,000 person-rem for the same population size.[13]

Meteorological data were obtained from the Erie, Pennsylvania airport located approximately 30 miles east of the plant site, in nearly the same geographical setting relative to Lake Erie.

TABLE 8

Dose Summary From Ingestion of Water From Fields Brook[a]

| Location | Organ | Dose-50 yr. Commitment (mrem) | ICRP Standard[b] (mrem) | % of Standard |
|---|---|---|---|---|
| Fields Brook at Rt. 11 Bridge (downstream) | Effective Dose Equivalent[c] | 0.076 | 100 | 0.076 |
| | Lower Large Intestine Wall (Uranium only)[d] | 0.512 | 5,000 | 0.010 |
| | Stomach Wall (Tc 99 only)[e] | 0.118 | 5,000 | 0.002 |
| Fields Brook at State Rd. Bridge (upstream) | Effective Dose Equivalent[c] | 0.037 | 100 | 0.037 |
| | Lower Large Intestine Wall (Uranium only)[d] | 0.174 | 5,000 | 0.003 |
| | Stomach Wall (Tc 99 only)[e] | 0.156 | 5,000 | 0.003 |

a) Assumes average intake of 730 l/yr. from Fields Brook.
b) DOE accepted standards based on ICRP 26 for prolonged exposures from all pathways (100 mrem effective dose, 100 mrem whole body dose, 5 REM to any organ)[8]
c) Weighted sum dose based on average concentration of uranium and technetium 99 from Table 3.
d) Lower large intestine wall is the most affected organ.
e) Stomach wall is the most affected organ.

TABLE 9

Airborne Dose to the Nearest Resident[a]

| Operations | Whole-body dose[c] | Dose[b] (millirem/yr) Effective[d] | Bone[e] | Kidney | Lung[f] | Stomach Wall |
|---|---|---|---|---|---|---|
| DOE | 1.5E-6 | 1.0E-2 | 1.1E-3 | 4.6E-4 | 8.3E-2 | 4.7E-6 |
| NRC | 6.8E-7 | 1.1E-2 | 3.5E-4 | 1.5E-4 | 9.4E-2 | 2.4E-6 |
| TOTAL | 2.2E-6 | 2.1E-2 | 1.4E-3 | 6.1E-4 | 1.8E-1 | 7.1E-6 |

[a] Nearest resident is 305 m northeast.

[b] Fifty-year dose commitment.

[c] Whole-body dose for uranium is from external doses only since they are not deposited throughout the body.

[d] Weighted sum dose.

[e] Endosteal cells of the bone.

[f] Pulmonary region of lung.

## 5.0 REFERENCES

1. Code of Federal Regulation, Title 40- Part 61, Subpart H, 61.93. National Emission Standards for Hazardous Air Pollutants.

2. DOE memorandum, R. J. Stern to Heads of Field Organizations, February 28, 1986, Preparation of Site Environmental Reports for Calendar Year 1985.

3. NRC, Federal Register Vol. 46, No. 205, October 23, 1981, pp 52061. Disposal or On-site Storage of Thorium or Uranium Wastes from Past Operations. 35 pCi/g limit for unrestricted disposal of depleted uranium.

4. Ohio EPA - NPDES Permit No. OH0000442.

5. Preparation of Soil Sampling Protocol; Techniques and Strategies; U.S. EPA, EPA-600/4-83-020, May, 1983.

6. Soil Sampling Quality Assurance User's Guide; U.S. EPA, EPA-600/4-84-043, May, 1984.

7. Groundwater Quality Assessment, RMI Company, Extrusion Plant, Ashtabula, Ohio. Dames & Moore Job No. 10805-213, July, 1986.

8. International Commission on Radiological Protection Publication No. 26, 1977 and No. 30, 1979.

9. Committed Dose Equivalent Tables for U.S. Department of Energy Population Dose Calculations. Prepared for U.S. DOE under Contract No. DE-AC06-76RL01830.

10. USEPA National Interim Primary Drinking Water Regulations, EPA Publication EPA-570/9-76-003 Appendix B, Radionuclides.

11. Hydrogeologic Assessment, RMI Extrusion Plant, Ashtabula, Ohio. AWARE Inc., January 1988.

12. Risk Assessment for the RMI Extrusion Plant, Ashtabula, Ohio. AWARE Inc., February 1988.

13. National Council on Radiation Protection and Measurements Report No.93, Issued September 1, 1987.

14. Myrich T.E., B. A. Berven, and F. F. Haywood, Determination of Concentrations of Selected Radionuclides in Surface Soil in the U.S., Health Physics, 45(3), 1983, pp. 631-642.