AIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910

301/587-8202

Centimeter

Inches

MANUFACTURED TO AIM STANDARDS
BY APPLIED IMAGE, INC.

1 of 1

**SITE ENVIRONMENTAL REPORT
FOR
RMI TITANIUM COMPANY
EXTRUSION PLANT
ASHTABULA, OHIO**

January 1, 1993 through December 31, 1993

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

**PREPARED BY
RMI ENVIRONMENTAL SERVICES
FOR THE
UNITED STATES DEPARTMENT OF ENERGY**

MASTER
DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

875

TABLE OF CONTENTS

	<u>PAGE</u>
List of Figures	iii
List of Tables	iv
List of Acronyms	v
Executive Summary	viii
1.0 Introduction	1-1
1.1 Purpose	1-1
1.2 Background Information	1-1
2.0 Environmental Compliance Summary	2-1
2.1 Comprehensive Environmental Response Compensation and Liability Act (CERCLA)	2-1
2.2 Resource Conservation Recovery Act (RCRA)	2-2
2.3 RCRA Land Disposal Restrictions (LDR)	2-4
2.4 National Environmental Policy Act (NEPA)	2-5
2.5 Clean Air Act (CAA)	2-5
2.6 Clean Water Act (CWA)	2-6
2.7 Safe Drinking Water Act (SDWA)	2-7
2.8 Toxic Substances Control Act (TSCA)	2-8
2.9 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	2-9
2.10 Endangered Species Act (ESA)	2-9
2.11 National Historic Preservation Act (NHPA)	2-10
2.12 Flood Plain Management	2-10
2.13 Protection of Wetlands	2-11
2.14 Other Issues and Actions	2-11
2.15 Summary of Permits	2-12
3.0 Environmental Program Information	3-1
3.1 Monitoring and Surveillance	3-1
3.2 Environmental Restoration	3-1
3.3 Waste Disposal Facility Criteria Approval	3-2
3.4 Ohio Environmental Protection Agency Inspections	3-3
3.5 Pathway Study	3-3
3.6 Waste Management	3-4
3.7 Waste Minimization	3-4
3.8 Environmental Training	3-4

TABLE OF CONTENTS

	<u>PAGE</u>
4.0 Environmental Radiological Program Information	4-1
4.1 Air Sampling for Radiological Parameters	4-1
4.2 Water Sampling for Radiological Parameters	4-2
4.3 Environmental Radiation Monitoring	4-3
4.4 Soil and Sediment Sampling	4-4
4.5 Groundwater Sampling - Radiological	4-6
4.6 Radiation Dose to the Public	4-7
5.0 Environmental Non-Radiological Program Information	5-1
5.1 Wastewater Sampling	5-1
5.2 Air Emissions	5-1
5.3 Groundwater Monitoring - Non-Radiological	5-2
6.0 Groundwater Program Information	6-1
6.1 Historical Information	6-1
6.2 Current Activities	6-3
6.3 Analytical Results	6-3
7.0 Quality Control and Quality Assurance	7-1
7.1 Sample Collection	7-1
7.2 Sample Analysis	7-1
7.3 Data Management	7-2
7.4 Performance Evaluation Studies	7-4
8.0 Spills and Unusual Occurrences	8-1
8.1 Spills	8-1
8.2 Unusual Occurrences	8-1
9.0 References	9-1

LIST OF FIGURES

<u>Figure No.</u>	<u>Title</u>
1	Site Location Map
2	Plant Layout
3	Site Area Map
4	Environmental Radiation Monitor Locations
5	Soil Sample Locations (farther than 0.2 miles)
6	Soil and Sediment Sampling Locations (0.2 miles and closer)
7	Monitoring Well Locations
8	Zinc Control Chart - Zinc Spike
9	Zinc Control Chart - Zinc Duplicate

Figures follow the last page of text.

LIST OF TABLES

<u>Table No.</u>	<u>Title</u>
1	Permits
2	Perimeter Air Sampling Summary
3	Stack Sampling Summary
4	Roof Exhaust Fan Sampling Summary
5	Water Sampling Summary Radiological
6	Environmental Radiation Monitoring Summary Inner Fence and Background Locations
7	Environmental Radiation Monitoring Summary Outer Fence and Background Locations
8	Annual Soil Sampling Analytical Results - Off-Site Soils
9	Annual Soil Sampling Analytical Results - On-Site Soils
10	Annual Fields Brook Sediment Sampling Analytical Results
11	Radiation Dose to the Public
12	NPDES Permit Summary - Internal Outfall 602
13	NPDES Permit Summary - Outfall 001
14	NPDES Noncompliances
15	Trichloroethylene Concentrations in Selected Monitoring Wells During 1993
16	Uranium Concentrations in Selected Monitoring Wells During 1993
17	Technetium-99 Concentrations in Selected Monitoring Wells During 1993
18	Results of the Annual EPA Discharge Monitoring Report - Study Number 013

Tables follow the figures in the last segment of this report.

LIST OF ACRONYMS

ADM	Action Description Memorandum
ANSI	American National Standards Institute
CAA	Clean Air Act
CAMU	Corrective Action Management Unit
CAP	Community Advisory Panel
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
COC	Chain of Custody
CWA	Clean Water Act
DCG	Derived Concentration Guide
DOE	Department of Energy
DOE/CH	Department of Energy Chicago Field Office
DOI	Department of the Interior
DOT	Department of Transportation
EA	Environmental Assessment
EDE	Effective Dose Equivalent
EIS	Environmental Impact Statement
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
FFCA	Federal Facility Compliance Act
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FS	Feasibility Study
FWS	Fish and Wildlife Service
HEA	Health and Environmental Assessment
HEPA	High Efficiency Particulate Air Filter
HRS	Hazardous Ranking System
HSWA	Hazardous and Solid Waste Amendments

LIST OF ACRONYMS

ICRP	International Commission on Radiological Protection
LDR	Land Disposal Restrictions
LEPC	Local Emergency Planning Committee
LLW	Low Level Waste
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDA	Minimum Detectable Activities
MEI	Maximally Exposed Individual
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
OAC	Ohio Administrative Code
OHIO EPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PCB	Polychlorinated biphenyl
PRP	Potentially Responsible Party
PTI	Permit to Install
PTO	Permit to Operate
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RFIES	RCRA Facility Investigation Equivalency Statement
RI	Remedial Investigation

LIST OF ACRONYMS

RI/FS	Remedial Investigation and Feasibility Study
RMI	RMI Titanium Company Extrusion Plant
RMIDP	RMI Decommissioning Project
SARA	Superfund Amendment and Reauthorization Act
SDMP	Site Decommissioning Management Plan
SDWA	Safe Drinking Water Act
SI	Site Investigation
SIP	State Implementation Plan
SPCC	Spill Prevention Control and Countermeasure
STP	Site Treatment Plan
SWMU	Solid Waste Management Unit
TCE	Trichloroethylene
TLD	Thermoluminescent Dosimeter
TSCA	Toxic Substances Control Act
US EPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

The Site Environmental Report for RMI describes the environmental monitoring program in place at RMI and summarizes the 1993 results obtained from implementation of this program. It compares the results of the program to applicable standards and guidelines, and describes the QA and QC standards that are an integral part of the RMI monitoring program.

Historically, the primary mission of RMI from 1961 through 1990 was the extrusion and/or closed-die forging of depleted, normal, and slightly enriched metallic uranium as an intermediate step in the production of nuclear fuel and target elements. These elements were used in DOE production reactors at the Hanford Reservation, near Richland, Washington, and the Savannah River Site, near Aiken, South Carolina. The uranium extruded at RMI ranged from 0.2% depleted to 2.1% enriched uranium-235, which indicates the amount of uranium-235 present in the material. As a comparison, naturally occurring uranium contains approximately 0.711% uranium-235. The uranium isotopes of concern in the extrusions are uranium-234, uranium-235, and uranium-238. On November 1, 1990, RMI ceased extrusion operations and refocused its mission to environmental and facility remediation and restoration.

RMI is committed to protecting human health and the environment and to complying with applicable laws, regulations, DOE orders, and agreements aimed at protecting human health and the environment. To assure that compliance is maintained and to determine the effects of RMI operations on the environment, RMI has established environmental monitoring programs as a part of its remediation effort that include air, water, soil, sediment, vegetation, and groundwater monitoring. These programs and the results obtained in 1993 are presented in this report.

Radiological Environmental Monitoring

Radiological environmental monitoring involves the monitoring of ambient air and surface soils; surface water; groundwater; sediment from the wastewater receiving stream, Fields

Brook; and environmental radiation throughout the site. RMI monitors the ambient air at six facility perimeter locations to determine airborne uranium concentrations at the site boundaries. The overall average of all perimeter ambient air samples was 2.31×10^{-16} $\mu\text{Ci/ml}$, 2% of the DOE guideline for concentrations of total natural uranium in air in uncontrolled areas.⁽⁴⁾

A total of 20 surface soil samples were collected in 1993. Six samples were collected off-site and 14 samples were collected on-site: in high traffic areas, low-lying areas, adjacent to air sampling stations. Of the 14 on-site samples, the total uranium concentrations ranged from 3.51 pCi/g to 1175 pCi/g, with 7 of the 14 samples above the NRC guideline of 30 pCi/g for uncontrolled areas.⁽²⁾ Off-site samples indicated uranium concentrations ranging from 1.88 pCi/g to 21.32 pCi/g, below the 30 pCi/g guideline.⁽²⁾ As a comparison, background uranium-238 concentrations in Ohio soils range from approximately 0.76 pCi/g to 2.2 pCi/g.⁽¹⁷⁾

The Fields Brook upstream and downstream sediment samples showed total uranium concentrations ranging from 1.96 pCi/g to 4.84 pCi/g, well below the applicable NRC guideline of 30 pCi/g.⁽²⁾ These results are consistent with the data obtained in previous years (Table 10).

RMI utilizes environmental TLDs to determine the radiation levels around the facility. Ten TLDs are placed around the perimeter of the facility and two are placed in remote areas to establish background levels of naturally occurring radiation in the Ashtabula area. The average background value for 1993 was 83 mrem/year. The highest environmental radiation level measured for 1993 was 45 mrem/year along the inner east fence, which is in a controlled access area. This value was corrected from background. The highest environmental radiation level measured along the site perimeter fence was 9 mrem/year, corrected for background (Tables 6 and 7).

Radiological Effluent Monitoring

Radiological effluent monitoring involves the monitoring of air and water effluents from the

site. RMI conducts air sampling of the major ventilation stacks when in operation. During 1993, RMI operated 2 ventilation stacks for a total of 535 hours. No radioactive contamination above the minimum detectable activity was detected for any stack samples. The calculated dose to the MEI was 0.0014 mrem/year. RMI also periodically operated four roof exhaust fans. Exhaust air from the fans was sampled to determine the potential amount of uranium emitted. The time weighted average concentration for fan emissions was $5.33 \times 10^{-13} \mu\text{Ci/ml}$.

RMI has one external outfall that discharges into Fields Brook. Flow proportional composite samples are collected weekly and analyzed for uranium and technetium-99. During 1993 the total amount of uranium in waste water discharged from all operations at Outfall 001 was 0.0034 Ci based on total effluent volume and average uranium concentrations in the samples obtained.

Radiation Dose to the Public

In 1993, the MEI living near RMI may have received an estimated committed effective dose of 0.1012 mrem, less than 1% of the 100 mrem/year DOE limit for all pathways. The dose was estimated based on stack emissions and calculated fugitive dust emissions from RMI. In estimating the dose to the MEI, the radionuclides considered to have any effect were uranium-234, uranium-235, and uranium-238 for stack emissions, and uranium, thorium, and technetium-99 for the fugitive dust emissions.

Non-Radiological Environmental Monitoring

RMI conducts routine non-radiological monitoring of waste water effluent under an NPDES Permit issued by the Ohio EPA.⁽³⁾ This permit requires sampling at one internal sampling station and one external sampling station located at the point of discharge into Fields Brook. Samples are collected daily, weekly, and monthly and analyzed for a total of 24 non-radiological parameters. Waste water sampling in 1993 indicated 11 non-compliances of the NPDES permit.

Groundwater Summary

Groundwater monitoring is conducted voluntarily by RMI each year to determine the presence or absence of uranium, technetium-99, and TCE in the site groundwater. Samples were collected from the 35 monitoring wells on site in 1993. Analytical results from these samples showed total uranium concentrations ranging from 0.58 $\mu\text{g/l}$ in well 401 to 436 $\mu\text{g/l}$ in well 104, technetium-99 concentrations ranging from less than 9.05 pCi/l in well 401 to 39,000 pCi/l in well 104, and TCE concentrations ranging from less than 5 $\mu\text{g/l}$ in well 100 to 98,000 $\mu\text{g/l}$ in well 104. The highest concentrations of these constituents in groundwater samples exceed their respective MCLs for drinking water. The MCLs for these constituents are 20 $\mu\text{g/l}$ total uranium, 900 pCi/l technetium-99, and 5 $\mu\text{g/l}$ TCE. It is not anticipated that any constituents found in the monitoring wells are affecting drinking water wells, since there are no drinking water wells within 1.5 miles of the RMI site.

In August 1990, the US EPA approved the RFI with the exception of the proposed clean-up levels. As a result, RMI revised the proposed clean-up levels and in November 1990 submitted the "Summary of Revised Risk Estimates and Proposed Clean-Up Levels for the RMI Extrusion Plant RCRA RFI/CMS CAMU Areas."⁽¹⁸⁾ Based on US EPA comment and review of this document, RMI made appropriate revisions and in October 1991 resubmitted the document. On June 29, 1992, the US EPA gave its conditional approval of the document, dependent upon RMI's compliance with a few minor comments. These comments were incorporated into the document by RMI. Following approval of this document, RMI completed a draft CMS and submitted it to the US EPA in September 1992. RMI is currently waiting for US EPA comment on the CMS.

1.0 INTRODUCTION

1.1 Purpose

This report presents information describing the environmental protection program of the RMIDP, and the data obtained from the implementation of the program in 1993. The program involves ongoing environmental surveillance and monitoring campaigns. The program is conducted based upon guidance from the EPA, NRC, and the DOE. The data obtained from the program are compared with environmental standards and requirements, and highlight significant efforts that have been made to achieve compliance with these standards. This report follows the guidance described in DOE order 5400.1, and presents data on radionuclide and chemical constituents in environmental media at and near the site which include air, surface water, groundwater, soil, and stream sediments. It also describes the potential effects of facility operations on the public. Additionally, this report contains an Environmental Compliance Summary outlining specific environmental compliance activities conducted by RMI.

1.2 Background Information

RMI is located in northern Ashtabula County, Ohio, approximately 2 miles northeast of the center of the City of Ashtabula (Figure 1). Geographically, the plant is situated approximately 1 mile south of Lake Erie and approximately 15 miles west of the Ohio/Pennsylvania border.

The RMI site consists of 25 buildings which occupy 7 acres of a 26-acre site (Figure 2). The RMI plant property (Area B) is enclosed by a security fence around its perimeter (Figure 3). Seven acres of undeveloped RMI property joins the eastern boundary of the plant area and is enclosed by a perimeter fence (Area D). Areas E, F, and G are also owned by RMI, but Area E is not enclosed by a fence. Areas A and C are fenced properties owned by other manufacturers. Area C is undeveloped and lies between the northern boundary of the plant and Fields Brook. The site can be reached from State Route 11 at the East 21st Street exit approximately 1-1/2 miles north of its intersection with U.S. Route 20. The facility lies approximately 1/4 mile east of State Route 11 on

East 21st Street. Access to the plant is controlled by a manned guard house at the plant entrance.

The main extrusion plant building was built in 1958 and has been operated by RMI since 1961. RMI is a privately owned facility operating as a Prime Contractor to the DOE. RMI is also licensed by the US NRC under license number SMB-602 for handling radioactive source materials. RMI has conducted extrusion operations for commercial clients and the DOE. The extruded products have been both ferrous and non-ferrous materials, including uranium and small amounts of thorium. Under the DOE contract, the extrusion plant converted uranium and a small amount of thorium ingots into rod or tube shapes. Additional processing included the cutting, straightening, acid pickling, and machining of extruded uranium parts. The finished products were shipped for DOE use to the Feed Materials Production Center (now referred to as the Fernald Environmental Management Project [FEMP]); the Hanford Reservation near Richland, Washington; and the Savannah River Site near Aiken, South Carolina.

Effective November 1, 1990, the DOE directed RMI to change its mission from extrusion operations to decommissioning, decontamination, and environmental restoration of the facility so that it may be released to RMI for unrestricted use.

Decommissioning and environmental restoration of the facility will involve characterization activities to determine the nature and extent of the effect of RMI operations on the surrounding area. Following site characterization, the data collected will be evaluated and the appropriate method of remediation will be identified. The resulting remediation plan will describe the buildings, equipment, soil and groundwater to be remediated, methods to be used for treatment and disposal.

2.0 ENVIRONMENTAL COMPLIANCE SUMMARY

RMI is a privately owned facility operating as a Prime Contractor to the DOE. RMI is also licensed by the NRC for handling radioactive source materials. The major environmental regulations, statutes, and Executive Orders that are applicable to the RMIDP are presented here, along with the compliance status of each during the period of January 1, 1993 to April 1, 1994. These regulations, statutes, and orders are enforced by the Ohio EPA, US EPA, NRC, and DOE in support of RMI's primary mission, which is to conduct decommissioning activities at the project site so that it may be released for unrestricted use. The information presented here summarizes the status of compliance with all applicable guidance, any NOV's issued to the RMIDP, instances of non-compliance and corrective actions, new project initiatives and noteworthy practices, a summary of RMIDP permits, and any other major environmental issues and actions that occurred during the time period identified above.

2.1 Comprehensive Environmental Response Compensation and Liability Act (CERCLA)

CERCLA addresses the clean-up of hazardous waste disposal sites and the response to hazardous substance spills. Under CERCLA, the EPA collects data regarding sites subject to CERCLA action through generation of a PA report, followed by an SI. Based on the data collected, the sites are ranked according to their potential to cause human health impacts or environmental damage. The sites with the highest ranking are placed on the NPL and are subject to mandatory clean-up actions, funded either by PRPs or by the allocation of Superfund money to the project. Federal agencies are responsible for their own clean-up costs.

RMI is not an NPL site, and is not being remediated under the CERCLA regulatory jurisdiction.

2.1.1 Emergency Planning and Community Right to Know Act (EPCRA), SARA Title III

The only part of CERCLA that applies to RMI is the SARA Title III EPCRA. Title III of the 1986 SARA amendments to CERCLA created EPCRA as a freestanding provision for

response to emergency situations involving hazardous materials and for making known to federal, state, and local emergency planning authorities information regarding the presence and storage of hazardous substances and their planned and unplanned environmental releases.

Under EPCRA, RMI is required to complete and file the SARA Section 312 Emergency and Hazardous Chemical Inventory Reporting, and Section 313 Toxic Release Inventory. The information that is reported includes a listing of the inventory of materials at the project site that are subject to the reporting requirements. The 1993 SARA inventory report completed by RMI contained information on quantities of nitric acid, uranium oxide, copper metal, and barium chloride, all of which are materials that were stored at the project site during 1993 in amounts in excess of threshold planning quantities.

RMI also complies with all SARA Subtitle A requirements for emergency planning and notifications, and participates in the LEPC within the county of Ashtabula. The LEPC is capable of assisting with releases from the site. Employees at the facility are trained in the proper implementation of the RMI contingency plan for response to spills or releases from the site.

In addition, RMI is also subject to SARA Subtitle B reporting requirements, which require reporting of significant discharges or releases to the environment. There have been no discharges or releases of oils or hazardous substances from RMI that are reportable under CERCLA.

2.2 Resource Conservation Recovery Act (RCRA)

The RCRA and its implementing regulations are intended to ensure that hazardous wastes are disposed of in an environmentally safe manner and that facilities that treat, store, or dispose of hazardous waste do so in a way that protects human health and the environment. The HSWA of 1984 reauthorized RCRA, altered many of its provisions, and greatly expanded its scope through a set of restrictions on land disposal of hazardous wastes. In addition, the HSWA require that releases of hazardous waste or hazardous

constituents from any solid waste management unit located on the site of a RCRA-permitted facility be identified and remediated as appropriate, regardless of when the waste was placed in the unit or if the unit was originally intended as a waste disposal unit.

RMI is subject to the requirements of RCRA, and is conducting portions of the RMIDP remediation under RCRA requirements. Per these requirements, RMI possesses a RCRA hazardous waste management permit from the US EPA for the storage of hazardous wastes which have been generated at RMI. All hazardous wastes generated at RMI are also radioactive wastes, and are therefore mixed wastes. This permit allows for the storage of up to 6,000 gallons (109 55-gallon drums) of hazardous/mixed wastes within a specifically designated area for longer than 90 days.

On June 1, 1993, the Ohio EPA conducted an inspection of the hazardous waste storage area on site to determine RMI's compliance with the terms of its RCRA hazardous waste management permit. No violations of any state or federal regulations were found.

As a condition of the US EPA RCRA hazardous waste management permit, RMI is required to remediate the area of the former evaporation pond, which was closed in 1984. The SWMUs associated with the former evaporation pond area comprise a CAMU which is being investigated by RMI under the guidance of the US EPA. A RCRA RFIES detailing information on the CAMU was submitted to the US EPA in fulfillment of the conditions of the hazardous waste management permit. The RCRA RFIES was approved by the US EPA on August 6, 1990. RMI then submitted the "Summary of Revised Risk Estimates and Proposed Clean-Up Levels for the RMI Extrusion Plant" which identifies the target clean-up levels for the groundwater and soils within the CAMU.⁽¹⁸⁾ These levels were approved by the US EPA in 1992. In August of 1992, RMI submitted a Draft CMS to the US EPA for review and approval.⁽⁷⁾ Following approval of the CMS, RMI will initiate the implementation of the corrective measures outlined within the study.

In addition, RMI is required to apply for and obtain a state permit for the storage of its hazardous wastes, since the Ohio EPA has primacy from the US EPA to administer the

RCRA program within the state. The application for this permit was originally submitted to the Ohio EPA in 1985, and is currently under review by the Ohio EPA.

2.3 RCRA Land Disposal Restrictions (LDR)

As stated previously, the U.S. Congress amended RCRA through the HSWA in 1984, which placed LDRs on hazardous wastes. To preclude circumvention of the LDRs, the US EPA has placed restrictions on the storage of hazardous wastes that do not meet the LDR standards. RMI currently stores wastes which are subject to the LDRs. Storage of these wastes is consistent with the LDR storage provisions because the treatment capacity for mixed wastes, either at DOE sites or at commercial sites, is not adequate or is simply unavailable at this time.

Through the FFCA of 1992, sites with mixed wastes have a three-year waiver from the mixed waste LDR storage prohibition because the hazardous waste stored is mixed waste (i.e., contains radiological contamination), and the treatment capacity for these wastes is not adequate or is unavailable. Although RMI is not a DOE site, wastes generated at the facility are a result of prior operations for the DOE. Therefore, FFCA is applicable to the RMIDP. The FFCA requires sites to prepare plans for developing the required treatment capacity for mixed waste. Each plan must be project site-specific and must be approved by the appropriate state agency.

To meet the requirements of the FFCA, RMI must complete an STP which will be reviewed and approved by the Ohio EPA. A Conceptual STP was completed by RMI and submitted to the US EPA and the Ohio EPA in October 1993 for review and comment. The Conceptual STP is a starting point for the plan development process, and describes potential waste treatment and disposal options that are or may be available. A Draft STP will be submitted to the agencies in August 1994 for review and comment, and the Final STP is proposed to be submitted in 1995. The Final STP will describe the proposed treatment and disposal facilities that will be used by RMI for the eventual storage and management of the mixed wastes generated by RMI. The Ohio EPA will have the opportunity to approve the plan after consultation with other states that may be affected

by the actions described in the plan, and after consideration of public comments.

2.4 National Environmental Policy Act (NEPA)

The NEPA of 1969 established a national environmental policy that promotes consideration of environmental factors in federal or federally-sponsored projects. It is a statute that compels public officials to comply with numerous other statutes that are enacted to protect the environment. NEPA procedurally requires the review of the environmental impacts of a project. To ensure compliance with this policy, NEPA requires that projects with potentially significant impacts be carefully reviewed through the generation of either an EA or EIS. This review process is designed to ensure that all potential impacts are identified, all available options are considered, and all affected parties are informed and given opportunity to comment on a project.

RMI is required to comply with the implementing procedures of NEPA per the guidance of the DOE in order to evaluate of the impacts that the proposed project site decommissioning activities will have upon human health and the environment. An ADM was completed in 1991 as the first-level decision document in the NEPA process. Following the review of this document, it was determined by the DOE that an EA would be required. The EA presents a detailed description of the proposed remediation action, alternatives to the proposed action, and an evaluation of the relative impacts of each alternative. A draft EA has been prepared, and was submitted to the DOE for review and approval on July 1, 1993. It is anticipated that the final document will be available in 1994.

2.5 Clean Air Act (CAA)

The CAA is a Federal statute that specifies National Ambient Air Quality Standards, sets emission limits for air pollutants and determines emission limits and operating criteria for a number of hazardous air pollutants. The program is implemented by individual states through a SIP, which describes how that state will ensure compliance with the air quality standards for stationary sources. A number of major changes to the CAA were made with the passage of the Clean Air Act Amendments of 1990.

On April 2 and June 8, 1993, the Ohio EPA conducted inspections of the air emission point sources at the RMI site. Only one finding was noted during the inspections, involving the permitting of five new sources at the site. These sources are natural gas heaters. One PTI and six PTO permits for the heaters were filed with the Ohio EPA on June 29, 1993. Dialogue continues between RMI and the Ohio EPA regarding permits for on-site point sources that are currently inactive.

2.5.1 National Emission Standards for Hazardous Air Pollutants (NESHAP)

The NESHAP are a body of federal regulations that set forth emission limits and other requirements, such as monitoring, record keeping, and operational requirements, for activities generating emissions of certain hazardous air pollutants. The standard for radionuclides is the only NESHAP standard affecting RMIDP operations.

The NESHAP standard for radionuclide emissions from DOE facilities (40 CFR 61, Subpart H) establishes the emission limits for release of radionuclides to the air and requirements for monitoring, reporting, and recordkeeping. This regulation was revised in late 1989, resulting in increased monitoring and reporting requirements. RMI operates sources of potential radionuclide emissions to air which are subject to the US EPA NESHAP regulations. Appropriate monitoring and reporting of the stack operations is conducted as required by the NESHAP and OAC regulations. All data collected during 1993 indicate RMI is in compliance with these requirements. These data are presented along with other information in Section 4.0.

2.6 Clean Water Act (CWA) and National Pollutant Discharge Elimination System (NPDES)

The CWA was established in 1977 as a major amendment to the Federal Water Pollution Control Act of 1972 and was substantially modified by the Water Quality Act of 1987. The CWA provides for the restoration and maintenance of water quality in all waters throughout the country, with the ultimate goal of "fishable and swimmable" water quality. The act established the NPDES permitting system, which is the regulatory mechanism designed to achieve this goal. The authority to implement the NPDES program has been delegated to those states, including Ohio, that have developed a program substantially the

same and at least as stringent as the Federal NPDES program.

Wastewater generation activities at RMI are covered by an NPDES permit. This permit requires monitoring of waste water discharged at two point sources at the site. One point source, Outfall 602, contains water from the on-site sanitary waste treatment system. The second point source, Outfall 001, contains treated process water, non-contact cooling water, treated sanitary water, and storm water. Outfall 001 is located at the northern edge of the property, and discharges to Fields Brook. Monitoring of Outfall 001 effluent involves analysis of 19 parameters including flow rate, oil and grease, ammonia, nitrogen, suspended and dissolved solids, metals, bacteria, and acute toxicity bioassay testing. During 1993, there were 11 exceedances of the reporting parameters at Outfall 001, and corrective actions were completed to preclude future exceedances.

On December 3, 1993, the Ohio EPA conducted an inspection of Outfall 001 to determine the status of RMI's compliance with the terms of its NPDES permit. The Ohio EPA determined that RMI was in general compliance with the final effluent limitations of the permit.

The discharge of storm water through Outfall 001 as described above is permitted by the Ohio EPA as part of the CWA. Storm water discharges in Ohio can be permitted through the General, Individual, or Group Storm Water permit processes. In February 1993, RMI received General Storm Water Permit No.OHR000156 for the discharge of storm water from the Ohio EPA. A general permit is written to cover a category of facilities conducting similar activities within the entire state of Ohio. The permit describes parameters and timing requirements for sampling of the storm water discharge point source. A Storm Water Pollution Prevention Plan was finalized on April 1, 1993, and facility operations have been conducted in compliance with conditions of the permit and this plan.

2.7 Safe Drinking Water Act (SDWA)

The SDWA of 1974 established a program to ensure that public drinking water supplies are free of potentially harmful materials. This mandate is carried out through the

institution of national drinking water quality standards, such as MCLs and MCLGs, as well as through imposition of well head protection requirements, monitoring requirements, treatment standards, and regulation of underground injection activities. The SDWA established Primary and Secondary National Drinking Water Regulations, which set forth requirements to protect human health (primary standards) and provide aesthetically acceptable water (secondary standards).

Drinking water is provided to RMI by the City of Ashtabula. Therefore, the requirements of the SDWA are not applicable to the RMIDP.

2.8 Toxic Substances Control Act (TSCA)

TSCA was enacted in 1976 in response to the acknowledgement by Congress that human populations were incurring unacceptable and unnecessary levels of exposure to chemical substances and mixtures. Although regulations already existed to control these substances, the regulations were oriented toward a specific medium (i.e., air, water, or solid waste) and were not sufficient to reduce, to below a reasonable level, the overall risk of injury to human health as a results of chemical manufacture, processing, distribution in commerce, use, or disposal. TSCA is a gap-filling statute that gives the US EPA the authority to control substances to the extent they are not covered by other laws. It gives the US EPA the authority to prohibit or limit the manufacture, importation, processing, distribution, use, or disposal of chemicals which pose an unreasonable risk (e.g. PCBs and asbestos). Typically TSCA applies to the manufacture, processing, or distribution of chemicals or substances or mixtures in commerce. TSCA also mandated the development of data on the health effects of such chemicals and mixtures, and specifies that TSCA regulations must be designed in a manner that does not unduly impede technological innovation or commerce.

The only TSCA-regulated compounds of potential concern at RMI are PCBs and asbestos. Per the requirements of TSCA, RMI has verified the absence of PCBs in wastes generated on site. The US EPA and the Ohio EPA conducted an inspection of the project site in January 1993, during which time this absence was confirmed. All identified friable

asbestos materials at the site were removed in 1988. The wetted waste material is contaminated with uranium, and is being stored on site in steel 55-gallon drums with plastic liners.

2.9 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

FIFRA, as amended, provides for the Federal control of pesticide distribution, sale, and use. It requires the registration (with minor exceptions) of all new pesticides. It also provides for the suspension or cancellation of pesticide products which present an "imminent hazard" to human health or the environment.

FIFRA provides for the inspection of establishments which produce, distribute, or sell pesticides. It does not provide for the inspection of pesticide users by regulatory authorities.

All applications of pesticides or herbicides at the project site are extremely limited, entailing mainly the spraying of weeds along plant boundary fencelines, and the minimal use of rodenticides within the plant buildings. RMI ensures that all pesticides and herbicides are US EPA-approved and used properly.

2.10 Endangered Species Act (ESA)

The ESA of 1973 is designed to protect plant and animal resources from the adverse effects of development. Under the Act, the Secretary of the Interior (through the FWS) and the Secretary of Commerce are directed to establish programs to ensure the conservation of endangered or threatened species or critical habitat of such species.

To comply with the ESA, Federal agencies are required to make an assessment of the proposed project area to determine if any threatened or endangered species or critical habitat of these species exist. If no such species or habitat are present this fact is to be documented in a letter to the FWS. If such species or habitat are found to exist, the FWS is to be notified and a series of consultations and studies are then carried out to determine the extent of impact and any special actions which must be taken to minimize this impact.

In August of 1993, RMI contacted the DOI to request information on endangered species at the site. This request was delegated to the FWS, which responded with the information that Ashtabula County was within the range of the Indiana Bat (*Myotis solalis*). The FWS indicated that if there were areas with favorable habitat for the bat, and there was to be a disturbance of the potential roosting trees in these areas during what is considered to be the nesting period of the bat, a population survey should be completed to determine if the bats are present in the area. A habitat survey of the RMIDP site was completed in September of 1993, and it was determined that areas located north of the plant may be considered suitable habitat for this bat. If it is determined that the potential areas of habitat will be disturbed during the nesting season, a population survey will be conducted.

2.11 National Historic Preservation Act (NHPA)

The NHPA requires Federal agencies to assess the impact of proposed projects on historic or culturally important sites, structures or objects within the site of the proposed projects. It further requires Federal agencies to assess all sites, buildings, and objects on the site to determine if any qualify for inclusion in the National Registry of Historic Places. The Act also establishes a procedure for archaeological investigation activities and a system of civil and criminal penalties for unlawfully damaging or removing such artifacts.

The Ohio Historical Society was contacted by RMI in 1992 for the purpose of completing a data search to determine if the RMIDP site was associated with any areas of historical importance. Based upon the documentation supplied by RMI and the surveys of the Historical Society, the decommissioning project will not have any affect upon any properties eligible to be listed or currently listed on the National Register of Historic Places.

2.12 Flood Plain Management

Federal policy on managing flood plains is contained in Executive Order 11988 (May 24, 1977). This executive Order requires Federal facilities to avoid to the extent possible adverse impacts associated with the occupancy and modifications of floodplains. A project proposed for construction in a floodplain must demonstrate that there is no reasonable alternative to the floodplain location.

The definition of "floodplain" as given in 10 CFR 1022.4 (which contains this executive Order) states that the base floodplain covered by this Order is the 100-year floodplain. RMI does not have a 100-year floodplain, in whole or in part, at the project site or associated with the project site. Therefore, the requirements of this Order are not applicable to the RMIDP.

2.13 Protection of Wetlands

Federal policy on wetland protection is contained in Executive Order 11990. In addition, 10 CFR Part 1022 describes DOE's implementation of this Executive Order. This Order requires Federal agencies to identify potential impacts to wetlands resulting from proposed activities, and to minimize these impacts. Where impacts cannot be avoided, action must be taken to mitigate the damage by repairing the damage or replacing the wetlands with an equal or greater amount of a man-made wetland as much like the original wetland as possible. The current DOE policy is for no net decrease in the amount of wetland as a result of DOE activities.

Three jurisdictional wetland areas were delineated at the RMIDP site in May 1993. Two of these areas are located on the Fields Brook flood plain. Remediation activities are proposed for those portions of the three wetlands areas that are determined to be impacted by facility operations through on-going soil and groundwater characterization activities. The portions of the wetlands to be remediated have not yet been determined. If any of the jurisdictional wetland areas are determined to be within the areas to be remediated, appropriate permits will be obtained from the U.S. Army Corps of Engineers.

2.14 Other Issues and Actions

The purpose of this section is to summarize the most important issues related to environmental protection encountered during 1993. Since preceding sections of this chapter contain detailed discussions of most of the current issues and actions related to each major environmental regulation, discussions of these issues will not be repeated in this section. However, RMI has initiated a public relations effort to improve communication between and understanding of the RMI organization and the community.

A summary of this effort is provided below.

2.14.1 Public Relations Information

RMI is participating in the formation of a CAP. The panel will consist of up to 20 members and represent a cross section of the local community and may include vocations such as clergy, educators, homemakers, workers, retired persons, environmentalists and others.

The objectives of the panel include, but are not limited to: 1) provide feedback from the communities about project operations and concerns and identify ways to improve communications with the community, 2) provide input to the community from the project about facility operations and concerns, 3) provide a mechanism for the project to discuss community response to project ideas and plans, 4) address community/industry issues that are important to the community, 5) provide a means to educate project and corporate management about the community, and 6) provide a means to educate community leadership about the project.

RMI anticipates that questions and concerns from the CAP will be representative of questions and concerns from the community and as such, can be used to develop information pamphlets concerning the RMI Project targeted to answer the questions of the general public. The CAP program is just getting under way and is expected to evolve into a meaningful mechanism to develop credibility and knowledge between RMI and the community.

2.15 Summary of Permits

With the change in mission at RMI from producing uranium extrusions to decommissioning of the site, it was necessary to modify the environmental permits to identify this change in activity. All known activities that require permits have been addressed through the appropriate agency. All air and water permits held by RMI and their current status are summarized on Table 1. A brief summary of each type of permit is given below.

2.15.1 Air Permits

RMI currently maintains PTOs for six air sources. Three of the sources are associated with extrusion activities, and three of the sources will be used during decommissioning operations. In addition, RMI maintains two air sources that have been determined by the Ohio EPA as not requiring permits, and are currently on registration status. RMI is in compliance with the air permit conditions for uranium emissions as specified by the Ohio EPA and NESHAP requirements for radionuclides as administered by the US EPA.⁽⁸⁾

2.15.2 Waste Water Permit

RMI maintains an NPDES permit which regulates the discharge of water from the project site through a point source to Fields Brook. Monitoring of the waste water is conducted at the discharge of the sanitary sewage treatment system and at the point where the combined water discharges enter Fields Brook. These activities are described in Section 5.1 of this report.

2.15.3 Storm Water Permit

RMI maintains an Ohio EPA General Storm Water Permit. This permit was issued following RMI's filing of a Notice of Intent (NOI) for coverage under the Storm Water General Permit for Industrial Activity to discharge to Fields Brook. This permit is required by the recent amendments to the CWA. The permit requires the completion of a Storm Water Pollution Prevention Plan and performance of storm water monitoring. The parameters and timing requirements for sampling of storm water are described in the permit. These activities are described in Section 5.1 of this report.

2.15.4 Hazardous Waste Storage Permit

RMI possesses a hazardous waste storage permit issued by the US EPA for the storage of hazardous/mixed wastes which have been generated at the RMI site. This permit allows for the storage of up to 6,000 gallons (109 55-gallon drums) of hazardous/mixed wastes within a specifically designated and maintained area for longer than 90 days.

On March 5, 1994, RMI submitted an application for a Class 1 Modification to the

hazardous/mixed waste storage permit. This modification contained alterations to the sections on general permit provisions, containers, general facility standards, and closure of the storage facility. Many of the changes involved the alteration in RMI's contract status with the DOE.

While RMI is conducting the decommissioning of the site, it may be necessary to generate and store additional hazardous/mixed waste. To ensure that adequate storage space will be available, RMI requested temporary authorization for additional storage space. This Temporary Authorization Determination was approved on June 15, 1993. The Temporary Authorization required that RMI complete and submit a Class 3 Modification to the permit which describes this additional storage space. This modification was submitted to the agency on December 9, 1993.

The Ohio EPA has primacy over the US EPA to administer the RCRA program within the state. Therefore, RMI has submitted an application to the Ohio EPA for the storage of hazardous/mixed waste with provisions that are identical to the US EPA permit. The two permits, when both are approved, will apply equally to the RMIDP. The Ohio application has received a favorable preliminary review by the Ohio EPA, and is being reviewed for approval by the Hazardous Waste Facility Board of the State of Ohio.

3.0 ENVIRONMENTAL PROGRAM INFORMATION

3.1 Monitoring and Surveillance

RMI conducts monitoring and surveillance of environmental media and personnel. The programs are designed to ensure compliance with EPA, NRC regulations and DOE orders. Data from radiological monitoring programs are presented in Section 4 of this report, and Section 5 presents non-radiological data.

3.2 Environmental Restoration

As described in Section 1 of this report, RMI is undertaking decommissioning and environmental restoration of the site. Decommissioning and environmental restoration of the facility will involve characterization activities to determine the nature and extent of the effect of RMI operations on the surrounding area. Following site characterization, the data collected will be evaluated and the appropriate method of remediation will be identified. The resulting remediation plan will describe the buildings, equipment, soil and groundwater to be remediated, methods to be used for treatment and disposal.

3.2.1 Draft Decommissioning Plan

RMI has been included in the SDMP of the NRC. The SDMP describes sites that have been targeted by the NRC for non-routine decommissioning. Per NRC request, RMI submitted a draft decommissioning plan to the NRC in December 1991. This plan outlined the scope of work that is proposed for the decommissioning activities at RMI. The NRC completed their review of the document and requested that RMI develop a Site Characterization Plan. As data are generated during the characterization of the site, a detailed report will be forwarded to the NRC.

3.2.2 NRC License Amendment

RMI holds a license with the Nuclear Regulatory Commission to possess source materials. The NRC has requested that RMI amend its license to indicate the proposed decommissioning activities and milestones for the project. On May 14, 1993, the license amendment was approved by the NRC, which included the submittal of a project site

characterization plan by RMI. RMI submitted the plan to the NRC in October 1993. In November 1993, a second amendment was approved by the NRC that allows for the completion of pre-decommissioning activities such as survey, clean-up and removal of equipment and wastes. An EA and FONSI were prepared and issued by the NRC for these pre-decommissioning activities. It is proposed that the NRC license will be terminated following the successful completion of the decommissioning of the site.

3.2.3 Site Characterization

RMI is in the process of conducting site characterization work. Per the requirements of the NRC, a Draft Site Characterization Plan was completed in October and forwarded to the NRC for review and approval. The plan describes a multimedia characterization approach that will include soil (both surface and subsurface), groundwater, buildings, and equipment characterization. Site characterization will be conducted in a phased approach that will encompass three phases: Phase I - Preliminary Investigation, Phase II - Detailed Investigation, and Phase III - Supplemental Investigations. The results from the characterization will be used to identify the nature and delineate the extent of contamination in the vicinity of the plant, and will be used in the design of the remediation activities. Phase I work is currently being conducted in several areas of the plant, including a Phase I surface soil characterization conducted during April through June 1993 in Areas A and C (see Figure 3).

3.3 Waste Disposal Facility Criteria Approval

It is proposed that the LLW generated during decommissioning will be sent to the NTS for disposal. In November 1993, RMI submitted an Application to Ship Waste to the Nevada Test Site (Rev.1). In October 1993, the NTS audit team conducted an audit of RMI's waste characterization, packaging, and shipping procedures and activities. Six findings and seven observations were noted during the audit. Three weeks following this, the team was invited back to RMI to conduct a follow-up surveillance on these issues. The surveillance determined that RMI had successfully passed the audit. Shipment of waste to NTS will be conducted by RMI in 1994.

3.4 Ohio Environmental Protection Agency Inspections

On January 5, 1993, the Ohio EPA conducted an inspection of RMI's SPCC Plan. There were no findings issued; however, two additional items of information were requested. The items were submitted on January 11, 1993.

Also on January 5, 1993, the US EPA and the Ohio EPA conducted an inspection of RMI's PCB materials handling and record keeping per the TSCA regulations. RMI has not operated equipment containing PCBs or used PCB-containing materials at the site. This was verified via document review and an inspection of the plant, to the satisfaction of the agency inspector. A report to this effect was filed with both agencies.

In July of 1993, the Ohio EPA conducted a RCRA inspection at the RMI site. The site was found to be in satisfactory condition, and no notices of violation were issued by the agency.

3.5 Pathway Study

As a portion of the decommissioning process, a pathway analysis was completed in 1993. The pathway study identified and examined significant pathways of potential exposure for contaminants that currently exist at the site. The exposures were evaluated through the use of GENII-S and RESRAD transport models. These computer models were developed to determine the annual effective dose equivalent that receptors may receive for each of the credible pathways that are determined to exist. From this information, a fatal cancer risk was estimated based upon the dose equivalent.

The data used to complete this evaluation included the soil, groundwater, surface water, stream sediment, vegetation, and air data obtained from the RMI site and surrounding areas during 1992. The overall dose from the reasonable maximum exposure was estimated to be $9.0\text{E-}9$ rem/yr, which is considered low. For two of the receptor groups, which are the MEI and the population, the inhalation pathway was determined to be the most significant pathway. The mean dose to the MEI was estimated to be $3.0\text{E-}6$ rem/yr, which is also considered low.

3.6 Waste Management

RMI currently generates the following classes of waste: 1) non-radioactive, non-hazardous waste (solid waste); 2) low level radioactive waste; 3) hazardous waste; and 4) radioactive hazardous (mixed) waste. The non-radioactive/non-hazardous waste is disposed of at a solid waste landfill. LLW is being shipped to NTS for disposal. Hazardous wastes are collected and stored in compliance with the RCRA regulations, sampled, and lab-packed for treatment and disposal at a hazardous waste treatment facility. The mixed waste is stored in compliance with the RCRA regulations and with the RMI hazardous waste management permit. All waste shipments are made in compliance with the RCRA regulations and the appropriate DOT regulations.

RMI maintains a comprehensive Waste Management Plan, which is written in accordance with DOE Order 5820.2A, Radioactive Waste Management.⁽¹⁵⁾ The Waste Management Plan is modified or updated as needed.

3.7 Waste Minimization

The RMI Titanium Company Extrusion Plant Waste Minimization and Pollution Prevention Awareness Plan was finalized in March of 1993. The plan describes waste minimization techniques and efforts that will be used during decommissioning of the facility. The plan also provides the requirements and policy for waste volume and toxicity reduction, and is designed to meet regulatory requirements and governmental policy directives such as RCRA, CERCLA, and DOE Orders 5400.1, 5400.3, and 5820.2A.^(9,14,15) The Pollution Prevention Program is consolidated with the waste minimization plan in accordance with DOE Order 5400.1.

3.8 Environmental Training

The RMI Training Program Plan is a comprehensive plan designed to address many training areas to assure that site workers receive the training necessary to complete their work safely and efficiently. The general areas of training that were covered in 1993 were health and safety rules, radiological hazards, procedure and plan implementation, and environmental training. The specific areas of environmental training covered in 1993 are

described in the following paragraphs.

In accordance with OSHA regulations found in 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response," each site worker who is directly involved in hazardous waste operations receives either the required 24-hour or 40-hour training. Each site worker who has had this training completes a required eight-hour refresher ⁽¹⁶⁾ class once yearly. New site workers do not engage in any hazardous waste operations duties until the required training under 29 CFR 1910.120 is completed.

Each site worker who has unrestricted access to all areas of the RMIDP receives training in hazardous waste handling and emergency measures as required by RCRA and the RMI Hazardous Waste Storage Permit. This training includes the following: an overview of the applicable regulations, a review of the specific RMI procedures to be followed in handling hazardous waste, and a review of the RMI Contingency Plan which is part of the RCRA permit.

Site workers also receive training in the RMI SPCC Plan as required by the US EPA in 40 CFR Part 112. The training is conducted on an annual basis as required by the RMI Training Program Plan.

4.0 ENVIRONMENTAL RADIOLOGICAL PROGRAM INFORMATION

4.1 Air Sampling For Radiological Parameters

4.1.1 Perimeter Air Sampling

Six continuous air monitoring stations are located around the perimeter of the facility. Weekly composite samples are collected from each station and analyzed for uranium using gross alpha counting. When samples are counted for radioactivity, a value for background radiation (due to natural sources) must be determined. Samples with counts below the count due to background radiation are said to be below the minimum detectable activity, MDA. Many of the samples collected were below the MDA. During 1993, the maximum detected concentration of uranium was $1.33 \times 10^{-14} \mu\text{Ci/ml}$, which is below the DCG of $1.00 \times 10^{-13} \mu\text{Ci/ml}$ uranium established by DOE Order 5400.5. The DCG for a radionuclide is defined as the air or water concentration of that radionuclide that, under conditions of continuous exposure for one year by one exposure mode, would result in an effective dose equivalent of 100 mrem.⁽¹⁾ The overall average uranium concentration in perimeter air samples with activities above the MDA was $2.31 \times 10^{-15} \mu\text{Ci/ml}$. Perimeter ambient air results are summarized in Table 2.

4.1.2 Air Effluent Sampling

RMI conducts volumetric air sampling of the major discharge stacks when they are in operation. These samples are collected in a sampling system designed in accordance with ANSI N13.1-1969, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities," and are analyzed by gross alpha counting for total uranium. Summary air data from 1993 are contained in Table 3. All uranium concentrations detected in the stack samples were below the MDA. The MDA varies because of the sensitivity of the counting instrument and the volume of the samples collected. The volume of the samples is dependent upon the stack velocity and the hours of operation.

The stack data are reported annually to the DOE in the Radioactive Effluent Discharge Report, and to the US EPA in the NESHAP annual report. The data are also used in the CAP-88 PC computer model, which calculates an estimated dose to an MEI and is used

to demonstrate compliance with the NESHAP limit of 10 mrem/year dose to public.

RMI also operates four roof exhaust fans when it is necessary to ventilate ambient air in the plant. When operating, the air flow from the fans is sampled to determine the amount of uranium particulates emitted from these sources. During 1993, the exhaust fans were operated 2372.8 hours. Analytical data from the exhaust fan air samples are contained in Table 4.

4.2 Water Sampling For Radiological Parameters

4.2.1 Sampling of Fields Brook

RMI has one external outfall (Outfall 001) that discharges into Fields Brook, which is a stream located north of the site. Flow proportional composite samples are collected weekly from the outfall and analyzed for uranium and technetium-99.⁽⁹⁾ RMI also monitors the quality of the water in Fields Brook for uranium and technetium-99. Two sample locations have been established, one upstream of the outfall, and one downstream of the outfall. Upstream data are used to establish background levels while downstream data are used to evaluate if the RMI operations have significant impact on Fields Brook radiological conditions.

The weekly analytical results from the sampling of Outfall 001 and Fields Brook are compared to the DCG values for uranium and technetium-99,⁽¹¹⁾ and are summarized in Table 5. The maximum uranium concentration detected in samples from Outfall 001 was $3.04 \times 10^{-7} \mu\text{Ci/ml}$, which is below the DOE guideline of $5 \times 10^{-7} \mu\text{Ci/ml}$. The guideline lists different values for the different uranium isotopes and solubility doses; this value is the lowest of the values listed. The average uranium concentration was $8.22 \times 10^{-8} \mu\text{Ci/ml}$, which is well below the DOE guideline. Technetium-99 concentrations ranged from $1.6 \times 10^{-8} \mu\text{Ci/ml}$ to $2.5 \times 10^{-7} \mu\text{Ci/ml}$, well below the guideline. During 1993, the total amount of uranium in wastewater discharged from all operations at Outfall 001 was 0.0034 Ci based on total effluent volume and average uranium concentrations at Outfall 001.

The upstream and downstream samples obtained from Fields Brook were collected simultaneously via 24 hour, time-based, weekly composite samples. The median uranium values for the upstream and downstream sampling sites were $8.0 \times 10^{-10} \mu\text{Ci/ml}$ and $8.1 \times 10^{-10} \mu\text{Ci/ml}$, respectively. To compare these values to the water standard of 4 mrem/year, 4% of the DCG is used, which is $2.4 \times 10^{-08} \mu\text{Ci/ml}$.⁽¹⁾ The upstream and downstream values were 3.3 % and 3.4 %, respectively, of the 4 mrem/ year equivalent of the DCG.

Similar comparisons can be performed for technetium-99. The median upstream and downstream technetium-99 values were 4×10^{-8} and $4 \times 10^{-8} \mu\text{Ci/ml}$, respectively. The DCG value for technetium-99 in drinking water is $4 \times 10^{-06} \mu\text{Ci/ml}$. The average upstream and downstream values were 1 % of the 4 mrem/year equivalent of the DCG.⁽¹⁾

4.3 Environmental Radiation Monitoring

Environmental radiation levels around RMI are determined using TLDs designed for environmental monitoring.

4.3.1 Radiation Monitoring in Controlled Access Area

Radiation levels are measured at the perimeter of the site and the perimeter of the controlled access area (Figure 4). To determine background radiation levels for this area, two TLDs are located off site in two separate areas. For 1993, the average background value was 83 mrem/year (Table 6).

4.3.2 Radiation Monitoring in Non-Controlled Access Areas

The highest environmental radiation level recorded at a site to which the public has access for 1993 was 5 mrem/year (Table 7). This value, obtained at the perimeter west fence - south, has been corrected to eliminate effects of the average value for background radiation. The average background radiation value was calculated by averaging the two background values obtained 3.5 miles south and 1.8 miles westsouthwest of the site. It should be noted that the value obtained at the perimeter west fence - south is equal to the background level obtained 3.5 miles south of the site.

4.4 Soil and Sediment Sampling

4.4.1 Soil Sampling

Surface soil samples are collected annually from locations both on-site and off-site and analyzed for uranium and technetium-99. The analytical data are used to evaluate the impact of RMI operations on the surrounding environment. Concentrations of uranium detected in soil samples are compared to the NRC free-release guideline of 30 pCi/g⁽²⁾ and also to past data to determine long term trends.

Soil samples were collected both on and off-site from nine sites that were also sampled in previous years and from 11 new sites. A total of six soil samples were collected off-site. Four of these locations were determined by using 0.5-mile concentric rings originating from the center of the plant and extending outward to 1.5 miles (Figure 5). These locations are patterned after the 1985 baseline soil sampling program, and are the same off-site locations that were sampled during 1992. Samples are generally taken on the four compass points and on a north-northeast line (the prevailing wind direction) along the concentric ring boundaries. The prevailing wind direction is to the north as determined by meteorological data from the Erie International Airport located in Erie, Pennsylvania. Two of the off-site samples were collected at new locations 17.5 feet (sample X-16) and 67 feet (sample X-15) from the site (see Figure 6).

Analytical Results: Off-Site Soils

All off-site soil samples were collected by hand,^(24,25) and were analyzed for isotopic uranium and technetium-99. Analytical results for these samples are summarized in Table 8.

Total uranium concentrations were calculated by summing the results of uranium-234, uranium-235, and uranium-238 for each off-site soil sample. The total uranium concentrations for the samples ranged from 1.88 pCi/g in sample S-0.5 to 21.32 pCi/g in sample X-15. All total uranium concentrations from off-site soils are below the NRC limit of 30 pCi/g, and are comparable to the results of off-site samples obtained in previous years.

The total technetium-99 concentration in off-site soils ranged from less than 0.321 pCi/g in sample X-16 to 0.904 pCi/g in sample X-15. There is currently no guidance for acceptable limits for technetium-99 in soils.

Analytical Results: On-Site Soils

On-site soil samples were collected from 14 locations within Areas B, C, and D (Figure 6). Five of these locations are identical to those sampled during 1992, and the remaining locations are new. Sample numbers OAS-1 through OAS-6 which coincide with the perimeter air samplers (Figure 6), were collected in accordance with Section 5.9.1 of the DOE Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance, which states that soil sampling locations should be selected to coincide with air sampling stations.⁽²⁷⁾ All other on-site samples were collected in high-traffic areas within the plant boundaries or in low-lying areas where stormwater runoff is considered likely to collect. A summary of the analytical results for these samples is presented in Table 9.

Samples OAS-1 through OAS-6 were collected at locations directly below the perimeter air samplers with these identifications. Total uranium concentrations were calculated by summing the laboratory results of uranium-234, uranium-235, and uranium-238 concentrations for each sample. Concentrations of total uranium in each sample ranged from 9.07 pCi/g in sample OAS-6 to 390.5 pCi/g in sample OAS-3. Three of these six samples exhibited total uranium concentrations above the NRC limit for uncontrolled areas of 30 pCi/g: OAS-5 (159.8 pCi/g - Area D), OAS-4 (110.8 pCi/g - Area C), and OAS-3 (390.5 pCi/g - Area C). All three of these sample locations are in a controlled area, along the fenceline separating Area B from Areas C and D.

Four soil samples were collected from Area B, and total uranium concentrations for these samples were calculated from the isotopic uranium values as discussed earlier. Concentrations of total uranium in the samples ranged from 25.86 pCi/g in sample X-2 to 112.11 pCi/g in sample X-5A. Of these four samples, two exhibited total uranium concentrations above the NRC limit for uncontrolled areas of 30 pCi/g: sample X-5A

(112.11 pCi/g) and sample X-4 (52.55 pCi/g).

Four soil samples were collected from Area D, and total uranium concentrations for these samples were calculated from the isotopic uranium values as discussed earlier. Concentrations of total uranium in these samples ranged from 3.51 pCi/g in sample X-14 to 1175 pCi/g in sample X-6. Of these four samples, two exhibited total uranium concentrations above the NRC limit for uncontrolled areas of 30 pCi/g: sample X-6 (1175 pCi/g) and sample X-7A (64.74 pCi/g). Both of these sample locations are in a controlled area east (less than 20 feet) of the Area B eastern perimeter fence.

4.4.2 Sediment Sampling

Sediment samples are collected on an annual basis from the creekbed of Fields Brook. During 1993, samples were collected at five locations and analyzed for isotopic uranium and technetium-99 (Figure 6). Analytical results for these samples are summarized on Table 10.

Total uranium concentrations were calculated for these samples by summing the isotopic uranium values obtained through laboratory analysis. Total uranium concentrations ranged from 1.96 pCi/g in sample SD-012 (Outfall) to 4.84 pCi/g in sample SD-018 (375 feet downstream). All of the samples exhibited total uranium values below the NRC limit of 30 pCi/g, and are comparable to the results of sediment samples obtained in previous years.

4.5 Groundwater Sampling - Radiological

RMI sampled groundwater monitoring wells for isotopic uranium and technetium-99 following US EPA established methods⁽¹²⁾ in 1993. Radiological analyses were conducted according to industry accepted methods. The data collected in 1993 and in previous years have been used to determine the nature and extent of contamination associated with the former evaporation pond and to determine the appropriate clean-up actions. These data are also used to evaluate groundwater quality in areas not associated with the former evaporation pond. See Section 6 for a complete groundwater discussion.

4.6 Radiation Dose to the Public

A Pathways Analysis was completed in 1993 for 1992 conditions at the RMIDP. The Pathways Analysis included both air and water pathways, and provided a calculated dose assessment for releases of fugitive dust and surface water run-off. Technetium-99 and the thorium-230, -232, and -228 isotopes were included in these pathway dose assessments.

The DOE has established a 100 mrem/year all pathways effective dose equivalent limit to the public. This limit is based on an all-pathways approach, which is the summation of exposures to radiation sources external to the body plus the committed effective dose equivalent from radionuclides taken into the body during the year.⁽¹⁾

4.6.1 Air Pathway

As a part of the pathways analysis, RMI utilized the CAP-88 PC computer code for calculation of an EDE to the MEI for point source emissions to air. This code is used to demonstrate compliance with the NESHAP standard of 10 mrem/year. The code takes into account the amount and type of radionuclides emitted, wind speed and direction, rainfall, mixing height, and air temperature. The CAP-88 PC code includes the dose due to airborne radionuclide deposition by estimating dose from ingestion of local produce, meat, and milk that can be affected by radionuclide emissions. The conservative assumption was made that 100% of the foodstuffs are raised locally.

As a part of the air pathway analysis, the potential EDE to the MEI was calculated using stack emission data. The effective dose equivalent to the MEI due to stack emissions was estimated to be 0.0014 mrem/year. This is below the NESHAP limit of 10 mrem/year set by the US EPA. The radionuclides used in the dose assessment for stack emissions were uranium-234, uranium-235, and uranium-238. The pathway effective dose equivalent was also calculated for stack emissions at 0.0006 person-rem/year.

4.6.2 Water Pathway

In addition to the air pathway, the pathways analysis conducted for the RMIDP also

included an analysis of the water pathway. This analysis showed that there are no known sources of drinking water within the RMI site or within 1000 feet of the site. Fields Brook, located directly north of the site, is not a known source of drinking water, nor is it an area of significant recreational activity. For these reasons, a surface water pathway independent of fugitive emission (run-off) was determined to be unrealistic, and not included.

Groundwater consumption is not included in the pathways calculation since there is insufficient groundwater to supply drinking water wells, and there are no drinking water wells within 1.5 miles of the RMI site. Also, the contaminated groundwater plume identified at the site is within an area that is fenced, secured, and maintained by RMI. Since the groundwater pathway has no receptor, it is not a realistic pathway and therefore has not been included in the all pathways calculation.

4.6.3 Total Dose to Maximally Exposed Individual

The Pathways Analysis for the RMIDP provided a calculated dose assessment for releases of fugitive dust, and for surface water run-off. Because the stacks were not in operation when the Pathways study was conducted, those emissions were not included in the dose assessment. To determine the total dose to the MEI and to the surrounding population, these two pathways were summed. Since the doses from both pathways were summed, the resulting total dose represents potential or estimated, rather than actual, doses.

The use of conservative estimates used throughout the calculation gives added assurance that the total dose, which is estimated to be less than 1 mrem, is the maximum dose that could be received by a theoretical member of the public. The total dose is well below the 100 mrem all pathways limit established by DOE Order 5400.5.⁽¹⁾ Table 11 summarizes the pathway dose determination.

5.0 ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

5.1 Wastewater Sampling

Wastewater produced at the RMI site is composed of process water, treated sanitary sewage, storm sewer effluent, and non-contact cooling water. Process water and some storm water is treated in the on-site wastewater treatment system, which is designed to remove heavy metals and particulates using a lime, settle, and filter process. The sanitary waste is treated in a Fluidyne Co. Model SBR-5V sequencing batch reactor that utilizes a combination of aeration, microbial action, and settling treatment technology. Once treated, the final wastewater effluent is discharged from the site through two outfalls under NPDES Permit 3IC0003*DD (effective November 1, 1992), administered by the Ohio EPA.

The internal outfall (Outfall 602) is located at the discharge of the sanitary batch reactor. Monthly grab samples and daily observations for color, odor, and turbidity for this outfall are required by the NPDES permit. A summary of Outfall 602 analytical results is presented in Table 12. Outfall 001, the external outfall, discharges into Fields Brook, which is located north of the plant. Weekly composite sampling, weekly grab sampling, monthly grab sampling and continuous flow monitoring are conducted at this outfall per the NPDES permit. A summary of Outfall 001 analytical results is presented in Table 13. Analytical methods used are those identified by the NPDES permit methodologies as specified by US EPA.⁽²⁰⁾

During 1993, there were 11 instances of non-compliance with the NPDES permit for the site. Table 14 summarizes these non-compliances by parameter and suspected cause.

5.2 Air Emissions

During 1993, four non-radiological chemical substances within the SARA Title III reporting threshold were on site: copper, barium chloride, uranium oxide, and nitric acid. The largest release pathway for the copper, barium chloride, and uranium oxide is water discharges, followed by emissions to air. Nitric acid was not released through stack

emissions during 1993. Pursuant to the SARA Title III reporting requirements, RMI has compiled this information into a Toxic Chemical Release Inventory that is reported to the US EPA. SARA requires that information on the use, storage, production, and release of hazardous chemicals such as these be available to the public and to emergency responders.

5.3 Groundwater Monitoring - Non-Radiological

RMI collected and analyzed samples from groundwater monitoring wells in 1993 for pH, specific conductance, total organic carbon, total organic halogens, and volatile organics following US EPA established methods.⁽¹²⁾ The data collected in 1993 and in previous years have been used by RMI and the US EPA to determine the nature and extent of contamination associated with the former evaporation pond and to determine the appropriate clean-up actions. RMI also uses this data to evaluate groundwater quality in areas not associated with the former evaporation pond. Section 6 contains a complete groundwater discussion.

6.0 GROUNDWATER PROGRAM INFORMATION

6.1 Historical Information

The RMI Titanium Company Extrusion Plant operates under regulation of the US EPA and the authority of the Resource Conservation and Recovery Act (RCRA). Effective July 29, 1989, RMI received a final permit for the on-site storage of hazardous waste. Under this permit, a maximum of 6,000 gallons of hazardous wastes is allowed to be stored in 55-gallon drums. The permit also provides the authority and framework for corrective action to be performed on groundwater contamination at the RMI facility.

RMI once operated a small wastewater evaporation pond on the north side of the plant (Figure 7). The pond was used for disposal of sodium nitrate solution containing small quantities of uranium. TCE was used at the plant from 1962 to 1966 for degreasing extrusions. The TCE tank was retained from 1966 to approximately 1972 for degreasing extrusion tooling. It is believed that a single unauthorized disposal of TCE into the evaporation pond occurred during or before 1972. The evaporation pond was closed in 1984.

In 1985, a hydrogeological investigation was performed to determine if past plant operations had affected groundwater.⁽¹¹⁾ Uranium, technetium-99 (a fission product from the uranium fuel cycle), and TCE were discovered downgradient from the evaporation pond. Additional hydrogeological investigations have identified the former evaporation pond as the source of groundwater contamination.

In May 1989, RMI completed a Supplemental Hydrogeological Assessment that defined the extent of the TCE, uranium, and technetium-99 groundwater contamination plumes that extend from the former evaporation pond.⁽¹⁷⁾ A total of 38 monitoring wells were originally installed at various depths to identify the plumes. However, three of the wells were abandoned to prevent them from serving as potential pathways of contaminant migration after an evaluation of existing hydrogeologic data indicated the existence of a vertical gradient from the surface to deeper portions of the unconsolidated sediment. The

35 wells currently at the site are shown in Figure 7.

The Supplemental Hydrogeological Assessment showed that the contamination plume extends approximately 100 feet north of the former evaporation pond and to varying depths ranging up to 30 feet. The RMI site is built on an area of unconsolidated clay till through which the groundwater flows slowly to the north-northwest. Due to the low groundwater yield characteristic of clay till, there is insufficient water to supply drinking water wells, and there are currently no drinking water wells within 1.5 miles of the RMI site.

A low-lying seepage pond is located on the Fields Brook flood plain approximately two hundred feet north of the former evaporation pond (Figure 7). Uranium and technetium-99 are present in low concentrations in the seepage pond water and sediments. It appears that episodic overland surface flow from the former evaporation pond to the seepage pond has occurred in the past.

In August 1989, RMI completed an HEA of the groundwater contamination.⁽⁴⁾ This document, along with the Supplemental Hydrogeological Assessment serve as the RFI Equivalency Statement.^(17,8) The RFI fulfilled requirements specified by the Hazardous Waste Storage permit. In August 1990, the US EPA approved the RFI with the exception of the proposed clean-up levels. As a result, RMI revised the proposed clean-up levels and in November 1990 submitted the "Summary of Revised Risk Estimates and Proposed Clean-Up Levels For The RMI Extrusion Plant RCRA RFI/CMS CAMU Areas."⁽¹⁸⁾ Based on US EPA comment and review of this document, RMI made appropriate revisions and in October 1991 resubmitted the document. On June 29, 1992, the US EPA gave its conditional approval of the document, dependent upon RMI's complying with a few minor comments. These comments were incorporated into the document by RMI.

Following approval of the clean-up levels RMI completed a draft CMS and submitted it to the US EPA in September 1992. RMI is currently waiting for US EPA comment on the document, and anticipates receipt of these comments in mid to late 1994. In general, the

draft CMS included the identification and development of corrective action alternatives, evaluation of the corrective action alternatives, and justification and recommendation of the corrective action alternative(s).

Three SWMUs have been identified at RMI and will be considered for corrective action. Together they comprise a CAMU:

- the former evaporation pond area
- the groundwater plume associated with the former evaporation pond
- the seepage pond at the base of the escarpment (300 feet north of the RMI production building)

It is anticipated that these areas will require corrective actions to meet the clean-up level criteria consistent with US EPA guidelines and defined in the Summary of Revised Risk Estimates and Proposed Clean-up Levels document.⁽¹⁸⁾

6.2 Current Activities

In an effort to monitor the groundwater quality in the CAMU and determine which clean-up level criteria have been exceeded, RMI has conducted voluntary sampling of the 35 active monitoring wells on-site since 1985. Selected monitoring wells were sampled and analyzed in 1993 for pH, specific conductance, total organic carbon, and total organic halogens. Other routine parameters were uranium, technetium-99, gross alpha and beta radiation, and volatile organics (TCE). Concentrations of TCE, isotopic and total uranium, and technetium-99 for selected wells are summarized in Tables 15, 16, and 17, respectively. Selected wells include the background (upgradient) wells, the well at the center of the main plume (MW 104), the well at the center of the secondary plume, which is the well adjacent to the low-lying pond area (MW 206), and all wells that exceed the applicable regulatory limit for the analyte presented.

6.3 Analytical Results

Analytical results of the volatile organics analysis performed on groundwater samples showed that the concentration of TCE in the wells ranged from less than 5 $\mu\text{g/l}$ in well 100 to 98,000 $\mu\text{g/l}$ in well 104 (Table 15). All upgradient wells exhibited less than 5 $\mu\text{g/l}$ TCE,

which is below the US EPA MCL of 5 $\mu\text{g/l}$ for TCE in drinking water. Wells located in the area of the main TCE plume (near the former evaporation pond) showed concentrations of TCE at 98,000 $\mu\text{g/l}$ (well 104, center of plume), 2,300 $\mu\text{g/l}$ (well 200), and 9 $\mu\text{g/l}$ (well 300). Wells located in the area of the secondary TCE plume (near the seepage pond) showed concentrations of TCE at less than 5 $\mu\text{g/l}$ (well 206, center of plume) and 15 $\mu\text{g/l}$ (well 201, downgradient edge of plume). It is important to note that the highest concentration of TCE was found in a well screened in the till layer of the water-bearing zone, and that TCE concentrations appear to decrease with depth in the wells screened in the till/bedrock interface layer.

Concentrations of total uranium in groundwater samples were calculated from isotopic uranium values obtained through laboratory analysis. Total uranium concentrations in the samples ranged from 0.58 $\mu\text{g/l}$ in well 401 to 436 $\mu\text{g/l}$ in well 104 (Table 16). Two of the upgradient wells (well 100 and 401) exhibited concentrations of total uranium below the US EPA MCL of 20 $\mu\text{g/l}$ for total uranium in drinking water. Well 101, an upgradient well screened in the till layer and located beneath the modular office building, showed a total uranium concentration of 28 $\mu\text{g/l}$. Well 104, at the center of the main TCE plume, showed the highest total uranium concentration at 436 $\mu\text{g/l}$. Well 307, which is downgradient of the main TCE plume, showed total uranium at 22.4 $\mu\text{g/l}$. Well 206, at the center of the secondary TCE plume, showed a total uranium concentration below the US EPA MCL of 20 $\mu\text{g/l}$. Total uranium in well 206 was 3.76 $\mu\text{g/l}$. These data indicate that total uranium concentrations are highest near the former evaporation pond, and decrease in a downgradient direction. These data also indicate that uranium is not present above the US EPA MCL of 20 $\mu\text{g/l}$ in groundwater from the till/bedrock interface layer.

Concentrations of technetium-99 in groundwater samples ranged from less than 9.05 pCi/l in well 401 to 39,000 pCi/l in well 104 (Table 17). Both upgradient wells and well 206 (center of the secondary TCE plume) showed concentrations of technetium-99 below the US EPA National Interim Primary Drinking Water Standard of 900 pCi/l. Well 104, at the center of the main TCE plume, was the only well sampled that showed a technetium-99 concentration above the US EPA limit.

7.0 QUALITY CONTROL AND QUALITY ASSURANCE

RMI sampling procedures require that samples be collected so that they are representative of the media being sampled. The procedures also require the generation of accurate analytical data through QC and QA measures. Collection, handling, storage, shipment and analysis of samples is accomplished per US EPA accepted methods and guidelines which provide the basis for written procedures established by RMI.⁽¹⁹⁾ The QC and QA measures employed during sample collection, in-house analysis, contract laboratory analysis, data management, and laboratory performance evaluation are described in this section.

7.1 Sample Collection

RMI conducts various sampling campaigns based on documented procedures for media including soil, groundwater, hazardous waste, solid waste and wastewater effluent. These campaigns are conducted in accordance with the Field Manual of US EPA SW-846 Test Methods for Evaluating Solid Waste, and other applicable DOE guidelines.⁽¹³⁾ Wastewater effluent is collected and analyzed in accordance with NPDES permit requirements, US EPA 600 Methods for Chemical Analysis of Water and Wastes, and applicable DOE orders and guides.⁽²⁰⁾

7.2 Sample Analysis

7.2.1 The RMI Laboratory

RMI Laboratory analyses are conducted in accordance with RMI-L-105, RMI Extrusion Plant Laboratory Quality Assurance Plan.⁽²¹⁾ RMI has developed, approved and documented analytical procedures based on US EPA procedures as applicable for all in-house analyses. Personnel are trained to these procedures to assure that only qualified individuals conduct the analyses. These procedures require sample blanks, duplicates, controls, and spikes to be run with every analysis for control, except for pH, specific conductance, total suspended solids and total dissolved solids. Determinations of pH are made using two calibration buffers, normally a pH 4 buffer and pH 7 buffer, or a pH 7 buffer and a pH 10 buffer. The two buffers used depend on the expected pH of the sample, since the sample pH must fall within the range of the two buffers used. Specific

conductance determinations are made using a standard solution and a blank, and are run in duplicate to verify reproducibility of results. Total suspended solids are run in duplicate utilizing a laboratory blank, and total solids are run in duplicate utilizing a spike sample. The solution used to spike the sample is a sodium chloride solution. The RMI laboratory performs calibration checks on each instrument used before analyses to verify that the instrument is in proper working order.

7.2.2 Contract Laboratory

Samples to be analyzed for some of the radiological or hazardous parameters are sent to vendor laboratories. RMI requires the use of approved methods such as those described in SW-846 and industry accepted methods for analytical operations. Specific QC and QA is dependent on such things as sample matrix, type of analysis, and types of instruments involved. RMI requires that laboratories performing hazardous waste and/or radiological determinations have a documented QA plan that incorporates the criteria of NQA-1, Quality Assurance Program Requirements for Nuclear Facilities, that they satisfactorily complete the RMI pre-award sample analysis, and that they be audited by RMI to verify compliance with the specified requirements.⁽²⁶⁾ Typically, these audits consist of reviews of the laboratories organization, chain of custody procedures, calibration procedures and frequency, analytical procedures and standard operating procedures, data reduction, data validation, data reporting, internal QC checks, internal audits, preventive maintenance, corrective action, QA reports to management, training, instrumentation, laboratory approvals, certifications, and performance evaluation studies.

To verify reproducibility and reliability of data, RMI routinely submits duplicates and blanks as blind samples to the laboratories. The data generated from blank samples are used to indicate cross contamination or laboratory contamination. The data generated from duplicates are used to verify reproducibility.

7.3 Data Management

7.3.1 The RMI Laboratory

RMI maintains control charts to track recoveries and precision of analyses. Figures 8 and

9 are examples of zinc control charts for spikes and duplicates, respectively. These charts depict the data obtained for recovery and precision for a one year time period. The warning limits for recovery are 95.9% to 104.7% (Figure 8) and the control limits are 93.7% to 106.9% (Figure 8). The warning limit for precision is 0.02 mg/l and the control limit is 0.03 mg/l (Figure 9). These data are used to determine accuracy and instrument performance, to verify the analysis is in control, and is compared to previous data to determine any long term trends. The recovery determinations are made using matrix spikes that also enable RMI to identify matrix interferences.

Once the data have been determined to be acceptable, they are compared to the appropriate regulatory guidelines. For example, zinc results would be compared to the RMI NPDES permit limits to verify compliance. The data would then be reported to the Ohio EPA in the monthly report submitted by RMI.

The data generated from the analyses are kept on file at RMI for easy accessibility as specified in the RMI NPDES permit.

7.3.2 Vendor Laboratory

For samples sent to vendor laboratories, the analytical reports are sent to RMI so the data may be reviewed for precision, accuracy, reproducibility, completeness and comparability. Data obtained for the RMI blank samples are evaluated to verify that no cross contamination occurred, and precision among the duplicate samples is evaluated. The analytical QC data are also reviewed for precision and cross contamination. Once the data are found to be acceptable, they are compared to the appropriate regulatory thresholds and standards for appropriate disposition. The data are then kept on file at RMI for future use during site decommissioning.

For example, soil samples collected during the annual soil sampling campaign are sent out to a vendor laboratory for radiological analysis. After the samples are analyzed, the analytical reports are sent to RMI. RMI reviews the data, and verifies whether the QC data are acceptable. Once the data have been determined to be acceptable, they are compared

to the NRC free release guideline of 30 pCi/g for soils, and compared to past data to detect any trends which may be developing. The data are then kept on file at the RMI site for future use during site decommissioning.

7.4 Performance Evaluation Studies

RMI participates in the annual EPA Discharge Monitoring Report Quality Assurance Program. The purpose of this program is to evaluate the analytical and reporting abilities of the RMI and commercial laboratories currently performing NPDES-related analyses. Results for the 1993 study are shown in Table 18. All results for 1993 were acceptable.

8.0 SPILLS AND UNUSUAL OCCURRENCES

This section of the report details the EPA and/or DOE requirements for the prevention and/or reporting of spills or unusual occurrences that are applicable to the RMIDP. A spill is defined as an intentional or unintentional, uncontrolled discharge to the environment. An occurrence is defined as a non-routine event, activity, procedural deficiency, or material defect categorized as reportable to the DOE.

8.1 Spills

An approved SPCC Plan is in place at RMI that meets the requirements of 40 CFR 112 "Oil Pollution Prevention." The plan has been prepared to ensure that oil and chemicals existing on site are not discharged into or upon navigable waters of the United States because of equipment or human failure. The plan outlines sources and locations of oils and chemicals, and emergency operations procedures. This plan is amended as necessary, and is reviewed at least every three years. During 1993, RMI had no oil or reportable quantity chemical releases to the environment.

8.2 Unusual Occurrences

RMI has in place a procedure for documenting and ranking Unusual Occurrences. An occurrence, as defined in DOE Order 5484.1 is "any deviation from the planned or expected behavior or course of events in connection with any Department of Energy or Department of Energy-controlled operation if the deviation has environmental protection, safety, or health protection significance." Significant Unusual Occurrences are reported to the Department of Energy-Ashtabula Office located at the RMI facility as specified in DOE Order 5484.1.⁽²²⁾ During 1993, RMI had no significant Unusual Occurrences having adverse environmental impact.

9.0 REFERENCES

1. U.S. Department of Energy, Radiation Protection of the Public and the Environment, DOE Order 5400.5, February 8, 1990.
2. 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. 30 pCi/g limit for unrestricted disposal of enriched uranium.
3. Ohio EPA - NPDES Permit No. 3IC00023*DD.
4. Risk Assessment for the RMI Extrusion Plant, Ashtabula, Ohio. AWARE Inc., February 1988.
5. Ralph M. Parsons Company, 1991. Decommissioning Plan for RMI Titanium Company Extrusion Plant, December 1991.
6. Eckenfelder 1989. RFI Equivalency Document For The RMI Extrusion Plant Volume I, August 1989.
7. Eckenfelder, 1990. Corrective Measures Study For Former Evaporation Pond, RMI Extrusion Plant, Ashtabula, Ohio, September, 1990.
8. Code of Federal Regulation, Title 40-Part 61, Subpart H, 61.93. National Emission Standards for Hazardous Air Pollutants.
9. U.S. Department of Energy, General Environmental Program Requirements, DOE Order 5400.1, January 9, 1989.
10. Code of Federal Regulations, Title 40 Part 141.16. Environmental Protection Agency National Primary Drinking Water Regulations.
11. Groundwater Quality Assessment, RMI Company, Extrusion Plant, Ashtabula, Ohio. Dames & Moore Job No. 10805-213, July 1986.
12. U.S. EPA RCRA Groundwater Monitoring Technical Enforcement Guidance Document, OSWER-9950.1, September, 1986.
13. U.S. Environmental Protection Agency. Test Methods For Evaluating Solid Waste SW-846, 3rd edition, 1986.
14. U.S. Department of Energy, Hazardous and Radioactive Mixed Waste Program, DOE Order 5400.3, February 22, 1989.

15. U.S. Department of Energy, Radioactive Waste Management, DOE Order 5820.2A, September 26, 1988.
16. Code of Federal Regulation, Title 29 Part 1910.120. Hazardous Waste Operations and Emergency Response.
17. Eckenfelder 1989a. Supplemental Hydrogeologic Assessment, RMI Extrusion Plant, Ashtabula, Ohio. May 1989.
18. Eckenfelder, 1991. Summary of Revised Risk Estimates and Proposed Clean-Up Levels for the RMI Extrusion Plant RCRA RFI/CMS CAMU Areas. October 1991.
19. RMI Extrusion Plant Laboratory Procedures Manual RMI-L-138.
20. Methods for Chemical Analysis of Water and Wastes, U.S. EPA 600/4-79-020. March 1983.
21. RMI Extrusion Plant Laboratory Quality Assurance Plan, RMI-L-105.
22. U.S. Department of Energy, Environmental Protection, Safety, and Health Protection Information Reporting Requirements, DOE Order 5484.1 Chapter III 4c., June 29, 1990.
23. 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.
24. U.S. EPA Preparation of Soil Sampling Protocol; Techniques and Strategies; U.S. EPA, EPA-600/4-83-020, May, 1983.
25. U.S. EPA, Soil Sampling Quality Assurance User's Guide; U.S. EPA, EPA-600/4-84-043, May, 1984.
26. American Society of Mechanical Engineers, Quality Assurance Program Requirements for Nuclear Facilities, ASME NQA-1-1989 ed.
27. U.S. Department of Energy, Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance, January 1991.

DATE	NO	DESCRIPTION	DATE	NO	DESCRIPTION
11/13/86	1	ADDED STACK #4 FILTER BLDG.	6/29/90	5	REDRAWN ON AUTOCAD
2/11/86	2	ADDED STACK #8	4/25/91	6	GENERAL REVISIONS
2/23/86	3	GENERAL REVISIONS	6/19/92	7	REMOVED ON SITE SOIL
4/3/89	4	CHGD. HAZ. WASTE STG. BLDG.			SAMPLE LOCATIONS
		TO R.C.R.A. STG. BLDG.	6/24/92	8	ADDED ROOF EXHAUST VENTILATORS

RMI COMPANY EXTRUSION PLANT		E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004 CHG. No. & PROJECT 403	
DATE	SCALE	CHK'D BY	OWN. BY
6/29/90	1" = 90'		JONES
TITLE		CHG. No.	
RMI Co. EXTRUSION PLANT		A-1883R1	
VENTILATION, STACK LAYOUT			

DATE	NO	DESCRIPTION	DATE	NO	DESCRIPTION
11/13/86	1	ADDED STACK #4 FILTER BLDG.	6/29/90	5	REDRAWN ON AUTOCAD
2/11/86	2	ADDED STACK #8	4/25/91	6	GENERAL REVISIONS
2/23/86	3	GENERAL REVISIONS	6/19/92	7	REMOVED ON SITE SOIL
4/3/89	4	CHGD. HAZ. WASTE STG. BLDG.			SAMPLE LOCATIONS
		TO R.C.R.A. STG. BLDG.	6/24/92	8	ADDED ROOF EXHAUST VENTILATORS

RMI COMPANY EXTRUSION PLANT		E. 21st STREET P.O. BOX 579 ASHTABULA, OHIO 44004 CHG. No. & PROJECT 403	
DATE	SCALE	CHK'D BY	OWN. BY
6/29/90	1" = 90'		JONES
TITLE		CHG. No.	
RMI Co. EXTRUSION PLANT		A-1883R1	
VENTILATION, STACK LAYOUT

FIGURE 3
SITE AREA MAP

REVISIONS		DATE	BY	APP'D
1	INITIALS			
2	INITIALS			
3	INITIALS			
4	INITIALS			
5	INITIALS			
6	INITIALS			
7	INITIALS			
8	INITIALS			
9	INITIALS			
10	INITIALS			
11	INITIALS			
12	INITIALS			
13	INITIALS			
14	INITIALS			
15	INITIALS			
16	INITIALS			
17	INITIALS			
18	INITIALS			
19	INITIALS			
20	INITIALS			

LEGEND

- 8' SECURITY FENCE
- EM # - ENVIRONMENTAL THERMOLUMINESCENT DOSIMETER
- RMI PROPERTY LINE

FIGURE 4
ENVIRONMENTAL RADIATION
MONITOR LOCATION

RMI COMPANY
EXTRUSION PLANT
ASHTABULA, OHIO

SCALE - 1" = 200'-0"

FIGURE 5

REVISION			THIS DRAWING IS PROPERTY OF THE		RMI COMPANY			
REV. No.	DATE	DESCRIPTION	A DIVISION OF RMI TITANIUM Co.		EXTRUSION PLANT E. 21st. STREET P.O. BOX 579 ASHTABULA, OHIO 44004			
1	4/27/94	GENERAL REVISIONS	AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO OTHERS, OR FOR ANY OTHER PURPOSE DETRIMENTAL TO THE INTEREST OF THE RMI TITANIUM COMPANY AND WILL BE RETURNED UPON REQUEST.		DATE 3/28/94	SCALE 1"=2400'	CHG. No. 1000-078	DWN BY JONES
					TITLE SOIL SAMPLE LOCATIONS FARTHER THAN 0.2 MILES			
					REQUESTOR SIGNATURE
					ENGINEER SIGNATURE
					DWG. No. A-2116			
					REV. No. 1

FIGURE 6

RMI COMPANY

EXTRUSION PLANT

E. 21st. STREET P.O. BOX 579 ASHTABULA, OHIO 44004

DATE 3/29/94	SCALE 1"=200'	CHG. No. 1000-078	DRAWN BY JONES
-----------------	------------------	----------------------	-------------------

REQUESTOR SIGNATURE

115-11, Vols. 1
ENGINEER SIGNATURE

DWG. No. A-2117 REV. 1

THIS DRAWING IS PROPERTY OF THE

Services

A DIVISION OF RMI TITANIUM CO.

AND IS LOANED UPON CONDITION THAT IT IS NOT TO BE REPRODUCED OR COPIED IN WHOLE OR IN PART, OR USED FOR FURNISHING INFORMATION TO OTHERS, OR FOR ANY OTHER PURPOSE DETRIMENTAL TO THE INTEREST OF THE TITANIUM COMPANY AND WILL BE RETURNED UPON REQUEST.

REVISION

REV. No.	DATE	DESCRIPTION
1	4/27/94	GENERAL REVISIONS

FIGURE 7

REVISED 9/83

Source: ECKENFELDER INC., (1983a)
 Base Map Prepared By: Dames & Moore, 1980

RMI EXTRUSION PLANT
 Ashland, Ohio

MONITORING WELL LOCATIONS	
4227	9/83
ECKENFELDER INC.	
Nashville, Tennessee Mahwah, New Jersey Rockaway, New York

PE : ZINC - SPIKE

FB-01 FB-23 MR-16 MR-31 AP-22 MY-11 JN-11 JL-01 JL-26 AG-11 AG-31 SP-22 OC-13 NV-03 NV-23 DC-15 JA-2

MONTH & DATE, 1993

FIGURE 8

PE : ZINC - DUPLICATE

FIGURE 9

TABLE 1

PERMITS 1993

Source	Application Number	Stack No.	Permit Issued	Expires	Issuing Agency
Air Permits					
Cooling Table PTO	0204010171P007	3	02/25/87	Renewal Application 01/26/93	OEPA
Abrasive Saw PTO	0204010171P004	4	02/17/87	Renewal Application 01/26/93	OEPA
Acid Pickling PTO	0204010171P002	6,7	02/17/87	Renewal Application 01/26/93	OEPA
Decontamination Facility (Stack 1A)	0204010171P013	1	08/27/93	08/27/96	OEPA
Decontamination Facility (Stack 5A)	0204010171P014	5	08/27/93	08/27/96	OEPA
Sandblast Facility	0204010171P015	11	08/27/93	08/27/96	OEPA
WATER PERMITS					
National Pollutant Discharge Elimination Permit No. 3IC00023*DD			11/01/92	10/28/97	OEPA
Stormwater No. OHR000156			10/26/92	04/26/94	OEPA
SOLID WASTE PERMIT					
Hazardous Waste Storage Facility EPA I.D. No. OHD980683544			07/29/89	07/29/99	U.S.EPA

PTO = Permit to Operate
PTI = Permit to Install
RS = Registration Status

TABLE 2
PERIMETER AIR SAMPLING SUMMARY^(a)
1993

Station # ^(b)	# of Samples	# of Samples Below MDA ^(c)	Maximum Concentration ($\mu\text{Ci/ml}$)	Minimum Concentration ($\mu\text{Ci/ml}$)	Central Tendency ^(d) ($\mu\text{Ci/ml}$)	DOE DCG ^(e) Guideline ($\mu\text{Ci/ml}$)	NRC ^(e) Value ($\mu\text{Ci/ml}$)
1	54	25	1.04×10^{-14}	$< 2.9 \times 10^{-16}$	2.33×10^{-15}	1.00×10^{-13}	4.00×10^{-12}
2	54	23	1.12×10^{-14}	0.00	2.26×10^{-15}	1.00×10^{-13}	4.00×10^{-12}
3	54	16	1.14×10^{-14}	0.00	2.25×10^{-15}	1.00×10^{-13}	4.00×10^{-12}
4	54	23	1.18×10^{-14}	$< 1.64 \times 10^{-15}$	2.41×10^{-15}	1.00×10^{-13}	4.00×10^{-12}
5	54	23	1.12×10^{-14}	0.00	2.37×10^{-15}	1.00×10^{-13}	4.00×10^{-12}
6	54	24	1.33×10^{-14}	1.52×10^{-15}	2.21×10^{-15}	1.00×10^{-13}	4.00×10^{-12}
Average					2.31×10^{-15}	1.00×10^{-13}	4.00×10^{-12}

(a) Samples collected are composite samples

(b) See Figure 2 for perimeter air station locations

(c) MDA is minimum detectable activity

(d) Median of values above the MDA used to calculate central tendency

(e) Value is for U-234 and U-235. DOE DCG guideline value for U-238 and U-natural are $5 \times 10^{-12} \mu\text{Ci/ml}$.

TABLE 3
STACK SAMPLING SUMMARY^a
1993

Stack #	Identification	# of Samples	Total Hours Operated	Total Cubic Meters Discharged	Maximum Concentration ($\mu\text{Ci/ml}$)	Minimum Concentration ($\mu\text{Ci/ml}$)	Measure of Central Tendency ($\mu\text{Ci/ml}$)
1A	Decontamination Room 1	27	145.4	6.861×10^5	$<2.53 \times 10^{-10}$	$<5.25 \times 10^{-13}$	$<1.16 \times 10^{-11b}$
11	Sandblast Facility	62	389.3	4.567×10^6	$<2.36 \times 10^{-11}$	$<4.19 \times 10^{-13}$	$<5.66 \times 10^{-12b}$
				<u>5.040×10^6</u>			$<2.03 \times 10^{-12c}$

a Samples collected are composite samples.

b Median used to determine central tendency.

c Flow weighted arithmetic mean (for total stack emissions) used to determine central tendency.

TABLE 4
ROOF EXHAUST FAN SAMPLING SUMMARY^a
1993

Fan Number	# of Samples	Total Hours Operated	Maximum Concentration ($\mu\text{Ci/ml}$)	Minimum Concentration ($\mu\text{Ci/ml}$)	Measure of Central Tendency ($\mu\text{Ci/ml}$)
1	7	54.2	1.76×10^{-12}	5.31×10^{-13}	1.06×10^{-12b}
2	19	2107.3	3.27×10^{-12}	$<4.80 \times 10^{-13}$	8.49×10^{-13b}
3	2	6.5	5.22×10^{-12}	$<5.12 \times 10^{-13}$	2.87×10^{-12b}
4	23	204.8	2.07×10^{-12}	$<5.71 \times 10^{-14}$	6.11×10^{-13c}
Average					5.33×10^{-13d}

- a Samples collected are composite samples.
- b Arithmetic mean used to determine central tendency.
- c Median used to determine central tendency.
- d Time weighted arithmetic mean used to determine central tendency.

TABLE 5
WATER SAMPLING SUMMARY
RADIOLOGICAL 1993

Total Uranium:

Sample Location	# of Samples	# of Samples Below MDA	Maximum Concentration ($\mu\text{Ci/ml}$)	Minimum Concentration ($\mu\text{Ci/ml}$)	Central Tendency ($\mu\text{Ci/ml}$)	Standard Deviation	DOE Guideline ^(c) ($\mu\text{Ci/ml}$)	NRC ^(d) ($\mu\text{Ci/ml}$)
Outfall 001	50	0	3.04×10^{-07}	2.46×10^{-08}	$8.22 \times 10^{-08(a)}$	5.86×10^{-08}	5×10^{-07}	3×10^{-06}
Fields Brook-800' upstream	50	25	3.1×10^{-09}	3.8×10^{-10}	$8 \times 10^{-10(b)}$	(e)	5×10^{-07}	3×10^{-06}
Fields Brook-925' downstream	50	23	2.5×10^{-09}	3.7×10^{-10}	$8.1 \times 10^{-10(b)}$	(e)	5×10^{-07}	3×10^{-06}

Technetium 99:

Sample Location	# of Samples	# of Samples Below MDA	Maximum Concentration ($\mu\text{Ci/ml}$)	Minimum Concentration ($\mu\text{Ci/ml}$)	Central Tendency ($\mu\text{Ci/ml}$)	Standard Deviation	DOE Guideline ^(c) ($\mu\text{Ci/ml}$)	NRC ($\mu\text{Ci/ml}$)
Outfall 001	50	0	2.5×10^{-07}	1.6×10^{-08}	$7.72 \times 10^{-08(a)}$	4.64×10^{-08}	1×10^{-04}	2×10^{-04}
Fields Brook-800' upstream	50	45	$< 1.5 \times 10^{-09}$	1.5×10^{-09}	$4 \times 10^{-09(b)}$	(e)	1×10^{-04}	2×10^{-04}
Fields Brook-925' downstream	50	48	1.3×10^{-09}	1.8×10^{-09}	$4 \times 10^{-09(b)}$	(e)	1×10^{-04}	2×10^{-04}

- (a) Arithmetic mean used to determine Central Tendency
- (b) Median used to determine Central Tendency
- (c) Most conservative value listed for various uranium isotopes and solubility classes
- (d) Value is for U natural and all isotopes except U-238
- (e) Standard deviation not applicable because of large number of non-detects

TABLE 6

**ENVIRONMENTAL RADIATION MONITORING SUMMARY
INNER FENCE AND BACKGROUND LOCATIONS
1993**

Station #	Location	1992 Annual Reading (mrem/year) Not Corrected for Background	1992 Annual Reading (mrem/year) Background Corrected	1993 Annual Reading (mrem/year) Not Corrected for Background	1993 Annual Reading (mrem/year) Background Corrected
EM-1 ^(a)	Inner North Fence-West	128	22	122	39
EM-2 ^(a)	Inner North Fence-East	111	5	94	11
EM-3 ^(a)	Inner East Fence	150	44	128	45
	Average Inner Fence	389	71	115	32
EM-7	Background-3.5 Miles South	113	Not Applicable	88	Not Applicable
EM-8	Background-1.8 Miles WSW	99	Not Applicable	78	Not Applicable
	Average Background	106	Not Applicable	83	Not Applicable

(a) Station is on inner fence, inaccessible to the public.

TABLE 7
ENVIRONMENTAL RADIATION MONITORING SUMMARY
OUTER FENCE AND BACKGROUND LOCATIONS
1993

Station #	Location	1992 Annual Reading (mrem/year) Not Corrected for Background	1992 Annual Reading (mrem/year) Background Corrected	1993 Annual Reading (mrem/year) Not Corrected for Background	1993 Annual Reading (mrem/year) Background Corrected
EM-4	Perimeter South Fence	100	(a)	86	3
EM-5	Perimeter West Fence-South	111	5	88	5
EM-6 ^(b)	Perimeter South Fence-Gate	106	(a)	92	9
EM-9	Perimeter West Fence-North	106	(a)	80	(a)
EM-10 ^(b)	Perimeter North Fence	115	9	87	4
EM-11	Perimeter North Fence-Outfall	114	8	84	1
EM-12 ^(b)	Perimeter East Fence	106	(a)	84	1
	Average Perimeter Fence	108	2	86	3
EM-7	3.5 Miles South	113	Not Applicable	88	Not Applicable
EM-8	1.8 Miles WSW	99	Not Applicable	78	Not Applicable
	Average Background	106	Not Applicable	83	Not Applicable

(a) Value is less than or equal to background.

(b) Station inaccessible to the public.

TABLE 8
ANNUAL SOIL SAMPLING ANALYTICAL RESULTS
OFF-SITE SOILS
1993

Sample Identification	Distance From Plant Center	Results (pCi/g)					Total Uranium Reference Value (pCi/g) ^(b)
		U-234	U-235	U-238	Tc-99	Total-U ^(a)	
NNE-0.5	0.5 miles	1.01	0.0986	1.17	0.404	2.2786	30
ENE-0.5	0.5 miles	0.876	0.128	0.983	<0.450	1.987	30
S-0.5	0.5 miles	0.938	0.0503	0.897	<0.402	1.8853	30
WSW-0.5	0.5 miles	1.01	<0.0426	1.12	<0.396	2.13	30
X-15*	67 feet	9.43	0.791	11.1	0.904	21.321	30
X-16*	17.5 feet	1.35	0.101	1.38	<0.321	2.831	30

* New sampling location for 1993.

(a) Total uranium values were calculated from isotopic uranium values obtained through laboratory analysis.

(b) Current U.S. NRC guidance for acceptable limit of total uranium in soils. There is currently no guidance for acceptable limits of technetium 99 in soils.

(1) Soil samples are collected from 0 - 6 inches below grade.

(2) Soil samples are dried at 110°C prior to analysis.

TABLE 9
ANNUAL SOIL SAMPLING ANALYTICAL RESULTS
ON-SITE SOILS
1993

Sample Identification	Site Location (Area)	Distance From Area B or C Fence (feet)	Results (pCi/g)					Total Uranium Reference Value (pCi/g) ^(b)
			U-234	U-235	U-238	Tc-99	Total-U ^(a)	
X-17*	Area B	On-Site	11.1	0.890	14.7	1.48	26.69	30
X-2	Area B	On-Site	10.3	0.756	14.8	1.26	25.856	30
X-4	Area B	On-Site	20.3	1.35	30.9	3.48	52.55	30
X-5A	Area B	On-Site	46.2	2.61	63.3	4.67	112.11	30
X-5B (dup)	Area B	On-Site	40.6	2.27	55.5	4.01	98.37	30
OAS-1*	Area B	On-Site	4.52	0.366	4.38	0.484	9.266	30
OAS-2*	Area B	On-Site	6.56	0.855	8.34	1.01	15.755	30
OAS-3*	Area C	5	115	10.5	265	88.9	390.5	30
OAS-4*	Area C	5	49.2	5.30	56.3	7.37	110.8	30
OAS-5*	Area D	5	60.4	3.40	96.0	27.2	159.8	30
OAS-6*	Area D	10	4.40	0.359	4.31	0.382	9.069	30
X-13*	Area D	250	5.57	0.286	6.98	1.51	12.836	30
X-14*	Area D	75	1.53	0.154	1.83	0.533	3.514	30
X-6	Area D	10	327	157	691	89.0	1175	30
X-7A	Area D	10	23.4 ^(B)	1.24 ^(B)	37.9 ^(B)	6.52	—	30
			23.9	1.54	39.3	NA	64.74	30
X-7B (dup)	Area D	10	15.2	0.806	24.4	4.09	40.406	30

* New sampling location for 1993.

(a) Total uranium values were calculated from isotopic uranium values obtained through laboratory analysis.

(b) Current U.S. NRC guidance for acceptable limit of total uranium in soils. There is currently no guidance for acceptable limits of technetium 99 in soils.

(B) Analyte is present in the laboratory blank in small quantities.

(1) Soil samples are collected from 0 - 6 inches below grade.

(2) Soil samples are dried at 110°C prior to analysis.

TABLE 10
ANNUAL FIELDS BROOK SEDIMENTS SAMPLING
ANALYTICAL RESULTS
1993

Sample Identification	Distance From NPDES Outfall (feet)	Results (pCi/g)					Total Uranium Reference Value (pCi/g) ^(b)
		U-234	U-235	U-238	Tc-99	Total-U ^(a)	
SD-010	950-Downstream	1.94	0.0946	2.38	0.645	4.4146	30
SD-018	375-Downstream	2.13	0.112	2.60	0.519	4.842	30
SD-017	300-Downstream	0.980	0.0335	1.09	<0.360	2.1035	30
SD-012	Outfall	0.965	<0.0259	0.997	<0.362	1.962	30
SD-022A	100-Upstream	1.57	0.110	1.55	<0.428	3.23	30
SD-022B (dup)		1.53	<0.0258	1.52	<0.417	3.05	30

- (a) Total uranium values were calculated from isotopic uranium values obtained through laboratory analysis.
(b) Current U.S. NRC guidance for acceptable limit of total uranium in soils and sediment. There is currently no guidance for acceptable limits of technetium 99 in soils and sediments.

- (1) Sediment samples are collected from 0 - 6 inches below grade.
(2) Sediment samples are dried at 110°C prior to analysis.

TABLE 11
RADIATION DOSE TO THE PUBLIC
1993

	Dose to MEI (mrem/yr)	Applicable Guideline	Population Dose person-rem/year
Stack Emissions	0.0014 ^d	10 mrem/year ^a	0.00061
Pathways Analysis (Fugitive Dust)	0.1 ^a	10 mrem/year ^a 100 mrem/year ^b	0.00068
Total	0.1012	100 mrem/year ^b	N/A ^c

a US EPA NESHAP standard

b All pathways guideline set by DOE

c Population files used to determine population files were similar, but contained different values

d 1993 data

e 1992 data

TABLE 12

**NPDES PERMIT SUMMARY
INTERNAL OUTFALL 602^(a)
1993**

Parameter	Units	Sampling Frequency	Maximum	Minimum	Central Tendency	OEPA Permit Limits		Compliance With Permit Limits (%)
						Daily Maximum	Monthly Average Maximum	
Flow	GPD	Continuous	7,000	0	1800 ^(b)	(d)	(d)	(d)
pH	s.u.	Monthly	7.3	6.7	Not Applicable	Range 6.5 - 9.0		100
Color	Severity units ^(e)	Daily	4	0	Not Applicable	(d)	(d)	(d)
Odor	Severity units ^(e)	Daily	3	0	Not Applicable	(d)	(d)	(d)
Turbidity	Severity units ^(e)	Daily	4	0	Not Applicable	(d)	(d)	(d)
BOD	mg/l	Monthly	81	<1	20 ^(c)	40	25	Daily - 100
Suspended Solids	mg/l	Monthly	15	4	8 ^(c)	45	30	Daily - 100 Monthly - 100

(a) Water discharged from sanitary sewer system

(b) Arithmetic mean used to determine Central Tendency

(c) Median used to determine Central Tendency

(d) No permit limit, for monitoring requirements only

(e) Table of Severity Units:

<u>Reported Value</u>	<u>Severity Description</u>	<u>Turbidity</u>	<u>Odor</u>	<u>Color</u>
0	None	Clear	None	Colorless
1	Mild			
2	Moderate	Light Solids	Musty	Grey
3	Serious			
4	Extreme	Heavy Solids	Septic	Black

TABLE 13
NPDES PERMIT SUMMARY
OUTFALL 001
1993

Parameter	Units	Sampling Frequency	Maximum	Minimum	Central Tendency	OEPA Permit Limits		Compliance With Permit Limits (%)
						Daily Maximum	Monthly Average Maximum	
Flow	MGD	Continuous	0.467	0.001	0.077 ^b	d	d	d
pH	s.u.	Weekly	6.8	8.8	Not Applicable	Range 6.5 - 9.0		100
Dissolved Solids	mg/l	Weekly	545	181	315 ^b	475	d	94
Dissolved Solids	kg/day	Weekly	130.3	9.8	28.4 ^c	56	d	98
Residue Total	mg/l	Weekly	182	<1	18 ^b	d	d	d
Non-filterable								
Oil and Grease	mg/l	Weekly	34	1.0	1.4 ^b	10	10	100
Ammonia	mg/l	Weekly	1.03	<0.05	0.20 ^b	d	d	d
Phosphorus	mg/l	Weekly	1.20	0.10	0.38 ^b	d	d	d
Cyanide	mg/l	Weekly	0.01	<0.005	<0.005 ^b	0.092	d	100
Cyanide	kg/day	Weekly	<0.004	<0.0002	<0.0005 ^c	0.011	d	100
Fluoride	mg/l	Weekly	1.04	0.24	0.74 ^b	d	d	d
Barium	ug/l	Weekly	180	20	74 ^b	d	d	d
Molybdenum	ug/l	Weekly	2.0	22.0	8.0 ^b	d	d	d
Silver	ug/l	Weekly	<1.0	<0.2	<0.2 ^c	d	d	d
Zinc	ug/l	Weekly	960	40	182 ^b	450	410	94
Zinc	kg/day	Weekly	0.288	0.002	0.009 ^c	0.053	0.048	95
Cadmium	ug/l	Weekly	2.5	<0.1	0.5 ^b	d	d	d
Copper	ug/l	Weekly	240	<50	<50 ^c	180	d	98
Copper	kg/day	Weekly	<0.036	<0.002	<0.005 ^c	0.021	d	100 ^a
Hexavalent Chromium	ug/l	Weekly	<10	<10	<10 ^b	31	d	100
Hexavalent Chromium	kg/day	Weekly	<0.007	<0.0003	<0.001 ^c	0.0036	d	100 ^a
Mercury	ug/l	Weekly	<0.2	<0.1	<0.2 ^b	d	d	d
Acute Toxicity	Tua	Weekly	3.13	<0.1	f	d	d	d
Fecal Coliform ^a	#/100ml	Weekly	<100	1	5.5 ^c	2000	1000	100
E. Coli ^a	#/100ml	Weekly	30	<10	16 ^b	d	d	d

a) Summer only; May 1 through October 31

b) Mean used to determine Central Tendency

c) Median used to determine Central Tendency

d) No permit limit, for monitoring requirement only

e) Max. loading not an exceedance because concentration was below detection limit

f) Measurement of Central Tendency not appropriate due to data distribution

TABLE 14
NPDES NONCOMPLIANCES^a
1993

Sample Date	Outfall	Parameter	Type of Exceedance	Sample Value	NPDES Permit Limit	Cause
01-04-93	001	TDS	Daily loading ^b	130 kg/day	56 kg/day	*A
01-04-93	001	Zinc	Daily loading ^b	0.288 kg/day	0.053 kg/day	*A
January	001	Zinc	Monthly loading ^{bc}	0.084 kg/day	0.048 kg/day	*A
02-23-93	001	TDS	Daily concentration	494 mg/L	475 mg/L	*B
03-16-93	001	Zinc	Daily concentration	820 ug/l	450 ug/l	*C
03-23-93	001	Zinc	Daily concentration	480 ug/l	450 ug/l	*C
03-30-93	001	TDS	Daily concentration	545 mg/l	475 mg/l	*B
March	001	Zinc	Monthly concentration	412 ug/l	410 mg/l	*C
04-13-93	001	Copper	Daily concentration	240 ug/L	180 ug/L	*C
04-13-93	001	Zinc	Daily concentration	960 ug/L	450 ug/L	*C
04-22-93	001	TDS	Daily concentration	484 mg/L	475 mg/L	*D

- a) Exceedances were reported to the Ohio EPA as required by RMI's NPDES permit. Corrective actions have been instituted to identify and preclude future exceedances.
- b) Loading values are calculated from flow rates and concentration values.
- c) Mean of monthly values.

- *A Unusually large flow due to stormwater; concentrations were below discharge limits.
- *B Stormwater run-off containing deicing material.
- *C Stormwater run-off containing rain gutter solids that were high in metals.
- *D Stormwater; steady rain.

TABLE 15

**TRICHLOROETHYLENE CONCENTRATIONS
IN SELECTED MONITORING WELLS
DURING 1993**

Identification ^(a)	Location	Number of Samples	Trichloroethylene ($\mu\text{g/l}$)	Reference Value ($\mu\text{g/l}$)
100 (T)	Upgradient	1	<5	5 ^(b)
401 (T/B)	Upgradient	1	<5	5 ^(b)
402 (B)	Upgradient	1	<5	5 ^(b)
104 (T)	Center of Main Plume	1	98,000	5 ^(b)
213 (T)	Duplicate of 104	1	94,000	5 ^(b)
200 (T/B)	Main Plume	1	2,300	5 ^(b)
300 (T/B)	Main Plume	1	9	5 ^(b)
206 (T/B)	Center of Secondary Plume	1	<5	5 ^(b)
201 (T/B)	Downgradient Edge of Secondary Plume	1	15	5 ^(b)

(a) These wells are not drinking water wells and there are no known drinking water wells within 1.5 miles.

(b) National Revised Primary Drinking Water Regulations: Maximum Contamination Levels for Organic Contaminants is 5 $\mu\text{g/l}$ for Trichloroethylene Title 40 Part 141.61.

(T) Till Monitoring Well

(T/B) Till/Bedrock Monitoring Well

(B) Bedrock Monitoring Well

TABLE 16

**URANIUM CONCENTRATIONS
IN SELECTED MONITORING WELLS
DURING 1993**

Identification ^(a)	Location	Number of Samples	Uranium (μg/l)				Reference Value (μg/l) ^(c)
			U-234	U-235	U-238	Total-U ^(b)	
100 (T)	Upgradient	1	2.74E-04	<7.06E-02	4.12E+00	4.12E+00	20 ^(d)
401 (T/B)	Upgradient	1	3.86E-05	<1.07E-01	5.79E-01	5.79E-01	20 ^(d)
101 (T)	Upgradient	1	1.80E-03	5.00E-01	2.75E+01	2.80E+01	20 ^(d)
104 (T)	Center of Main Plume	1	1.48E-02	2.43E+00	4.33E+02	4.36E+02	20 ^(d)
213 (T)	Duplicate of 104	1	1.53E-02	3.29E+00	4.58E+02	4.61E+02	20 ^(d)
307 (T)	Downgradient of Main Plume	1	9.09E-04	1.68E-01	2.22E+01	2.24E+01	20 ^(d)
206 (T/B)	Center of Secondary Plume	1	3.59E-04	<7.66E-02	3.76E+00	3.76E+00	20 ^(d)

(a) These wells are not drinking water wells and there are no known drinking water wells within 1.5 miles.

(b) Total uranium values were calculated from the isotopic uranium values obtained through laboratory analysis.

(c) DOE Order 5400.5 Derived Concentrations Guides for U-234, U-235, and U-238 are 5.0×10^{-6} μCi/ml, 5.0×10^{-6} μCi/ml, and 6.0×10^{-6} μCi/ml respectively.

(d) The U.S. EPA Proposed Maximum Contaminant Level for total uranium in drinking water is expected to be 20 μg/l.

(T) Till Monitoring Well

(T/B) Till/Bedrock Monitoring Well

TABLE 17

**TECHNETIUM-99 CONCENTRATIONS
IN SELECTED MONITORING WELLS
DURING 1993**

Identification ^(a)	Location	Number of Samples	Technetium 99 (pCi/l)	Reference Value (pCi/l) ^(b)
100 (T)	Upgradient	1	<11.6	900 ^(c)
401 (T/B)	Upgradient	1	<9.05	900 ^(c)
104 (T)	Center of Plume	1	39,000	900 ^(c)
213 (T)	Duplicate of 104	1	22,200	900 ^(c)
206 (T/B)	Center of Secondary Plume	1	327	900 ^(c)

(a) These wells are not drinking water wells and there are no known drinking water wells within 1.5 miles.

(b) DOE Order 5400.5 Derived Concentration Guide for technetium 99 is 1.0×10^{-4} $\mu\text{Ci/ml}$.

(c) National Interim Primary Drinking Water Standard is 4 mrem/yr (900 pCi/l or 9.0×10^{-7} $\mu\text{Ci/ml}$) for beta emitting man-made radionuclides.

(T) Till Monitoring Well

(T/B) Till/Bedrock Monitoring Well

TABLE 18

**RESULTS OF THE ANNUAL EPA
DISCHARGE MONITORING REPORT
STUDY NUMBER 013
1993**

Analyte	RMI Reported Value	True Value	Acceptance Limits
Cadmium ¹ (ug/l)	95.0	93.9	78.3 - 110
Copper ² (ug/l)	420	410	365 - 462
Mercury ¹ (ug/l)	2.10	2.10	1.57 - 2.75
Zinc ² (ug/l)	250	240	209 - 271
pH ²	6.06	6.10	5.96 - 6.22
TSS ² (mg/l)	30.4	33.0	24.0 - 34.6
Oil & Grease ² (mg/l)	22.3	23.0	14.1 - 28.1
Ammonia - Nitrogen ¹ (mg/l)	8.83	9.80	7.80 - 11.6
Total Phosphorus ² (mg/l)	1.61	1.60	1.25 - 1.94
Carbonaceous BOD ¹ (mg/l)	26	19.5	6.28 - 32.4
Total Cyanide ¹ (mg/l)	0.110	0.130	0.0821 - 0.169
Ceriodaphnia acute data as % of sample:			
LC50 - DWM, 20 Deg. ¹	10.0	28.9	D. L. - 58.6

¹ Analysis performed by contracted commercial laboratory.

² Analysis performed by RMI in-house laboratory.

**DATE
FILMED**

7/12/94

END