LEGIBILITY NOTICE

A major purpose of the Technical Information Center is to provide the broadest dissemination possible of information contained in DOE's Research and Development Reports to business, industry, the academic community, and federal, state and local governments.

Although a small portion of this report is not reproducible, it is being made available to expedite the availability of information on the research discussed herein.

1

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.

ORNL/EIS--154/Vol.4

DE84 001209

Information Division

NUCLEAR FACILITY DECOMMISSIONING AND SITE REMEDIAL ACTIONS:

A SELECTED BIBLIOGRAPHY
Volume 4

P. T. Owen, N. P. Knox, J. M. Fielden, and R. A. Faust
Remedial Action Program Information Center
Information Center Complex

Date of Issue—September 1983

Supported by the
U.S. Department of Energy
Division of Remedial Action Projects

Prepared by the
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37831
operated by
UNION CARBIDE CORPORATION
for the
U.S. DEPARTMENT OF ENERGY
Under Contract No. W-7405-eng-26

NOTICE
PORTIONS OF THIS REPORT ARE ILLEGIBLE.
It has been reproduced from the best available copy to permit the broadest possible availability.

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

CONTENTS

ABSTRACT v
INTRODUCTION vii
Contents of Bibliography viii
Indexes viii
Citation Form ix
Services x
ACKNOWLEDGMENTS xi
SAMPLE REFERENCE xiii
BIBLIOGRAPHIC REFERENCES
Chapter 1. Surplus Facilities Management Program 1
Design, Planning, and Regulations 3
Site Surveys 14
Decontamination Studies 23
Dismantlement and Demolition 29
Land Decontamination and Reclamation 35
Waste Disposal 39
General Studies 49
Chapter 2. Nuclear Facilities Decommissioning 77
Design, Planning, and Regulations 79
Decontamination Studies 91
Dismantlement and Demolition 100
Land Decontamination and Reclamation 114
Waste Disposal 115
General Studies 124
Chapter 3. Formerly Utilized Sites Remedial Action Program 129
Chapter 4. Uranium Mill Tailings Remedial Action Program 143
Chapter 5. Grand Junction Remedial Action Program 171
Chapter 6. Uranium Mill Tailings Management 175
INDEXES
Author 233
Corporate Affiliation 253
Title 265
Publication Description 399
Geographic Location 417
Keywords 423
APPENDICES
Appendix A. Supplemental References 451
Title Index 477
Publication Description Index 553
Appendix B. Acronyms and Abbreviations 563
Appendix C. Distribution List by Affiliation 571

ABSTRACT

This bibliography of 657 references with abstracts on the subject of nuclear facility decommissioning, uranium mill tailings management, and site remedial actions is the fourth in a series of annual reports prepared for the U.S. Department of Energy, Division of Remedial Action Projects. Foreign as well as domestic documents of all types—technical reports, progress reports, journal articles, conference papers, symposium proceedings, theses, books, patents, legislation, and research project descriptions—have been referenced in this publication. The bibliography contains scientific (basic research as well as applied technology), economic, regulatory, and legal literature pertinent to the U.S. Department of Energy's Remedial Action Program. Major chapters are (1) Surplus Facilities Management Program, (2) Nuclear Facilities Decommissioning, (3) Formerly Utilized Sites Remedial Action Program, (4) Uranium Mill Tailings Remedial Action Program, (5) Grand Junction Remedial Action Program, and (6) Uranium Mill Tailings Management. Chapter sections for chapters 1 and 2 include: Design, Planning, and Regulations; Site Surveys; Decontamination Studies; Dismantlement and Demolition; Land Decontamination and Reclamation; Waste Disposal; and General Studies. The references within each chapter or section are arranged alphabetically by leading author. References having no individual author are arranged by corporate author or by title. Indexes are provided for the categories of author, corporate affiliation, title, publication description, geographic location, and keywords.

Appendix A lists 264 bibliographic references to literature identified during this reporting period but not abstracted due to time constraints. Title and publication description indexes are given for this appendix. Appendix B defines frequently used acronyms, and Appendix C lists the recipients of this report according to their corporate affiliation.

This report was generated from a computerized database maintained by the Remedial Action Program Information Center (RAPIC), which exists to provide information support to researchers in the remedial action/radioactive waste management field. Comprehensive literature searches of the database and further information concerning this project may be obtained by contacting RAPIC at (615) 576-0568 or FTS 626-0568.

INTRODUCTION

The staff of the Remedial Action Program Information Center (RAPIC) provides technical information support to the U.S. Department of Energy's (DOE's) Remedial Action Program under the cosponsorship of the program's four major constituents:

- Surplus Facilities Management Program
  Lead Field Office—DOE Richland Operations Office
  Lead Technical Contractor—UNC Nuclear Industries, Inc., Office of Surplus Facilities Management (OSFM)
- Formerly Utilized Sites Remedial Action Program
  Lead Field Office—DOE Oak Ridge Operations Office
  Lead Technical Contractor—Bechtel National, Inc.
- Uranium Mill Tailings Remedial Action Program
  Lead Field Office—DOE Albuquerque Operations Office
  Lead Technical Contractor—Jacobs Engineering Group, Inc.
- Grand Junction Remedial Action Program
  Lead Field Office—DOE Grand Junction Area Field Office
  Lead Technical Contractor—Bendix Field Engineering Corporation

The Nuclear Facility Decommissioning and Site Remedial Actions database was developed and is maintained by RAPIC, which is part of the Information Center Complex (ICC), Information Division, located at Oak Ridge National Laboratory. RAPIC's communications with the U.S. DOE's Remedial Action Program are administratively coordinated through the Office of Surplus Facilities Management, UNC Nuclear Industries, Richland, Washington.

RAPIC serves as a central clearinghouse for information (derived from both foreign and domestic publications) concerning scientific, regulatory, and socioeconomic aspects of radioactively contaminated facility/site remedial actions. For both government and industry, these remedial actions encompass such activities as:

- Performing characterization surveys of radioactively contaminated facilities/sites.
- Conducting ongoing security and surveillance programs.
- Performing preventive maintenance actions to ensure containment of radioactivity while awaiting permanent facility disposition.
- Assessing environmental and engineering aspects of proposed remedial action alternatives.
- Drafting detailed remedial action project plans and procedures.
- Performing remedial actions to make facilities/sites available for restricted or unrestricted use.

This bibliography of 657 references is the fourth in a series to be prepared by RAPIC. Volumes 1, 2, and 3, which were published in 1980, 1981, and 1982, respectively, had the same title and same subject coverage. Subsequent volumes, incorporating newly identified items of relevance, will be issued on an annual basis. The contents of this publication are stored in a computer-retrievable data file which undergoes periodic updating. It is preferred that researchers use these published bibliographies as their "first line" reference tool; however, the data base can be accessed through RAPIC for more current literature listings or for a comprehensive subject search of the entire data base.

CONTENTS OF THE BIBLIOGRAPHY

The subject matter of this bibliography is presented in six chapters: Surplus Facilities Management Program, Nuclear Facilities Decommissioning, Formerly Utilized Sites Remedial Action Program, Uranium Mill Tailings Remedial Action Program, Grand Junction Remedial Action Program, and Uranium Mill Tailings Management.

The Surplus Facilities Management Program (SFMP) chapter contains references pertaining to the SFMP or to sites included in the program, as well as other U.S. sites for which decommissioning is either planned or underway. The Nuclear Facilities Decommissioning chapter contains foreign site-specific information as well as any decommissioning technology information that is not domestic site-specific. Because of the size and diversity of the first two chapters, it has been necessary to subdivide each of these chapters into the following sections: Design, Planning, and Regulations; Site Surveys; Decontamination Studies; Dismantlement and Demolition; Land Decontamination and Reclamation; Waste Disposal; and General Studies. A number of references, not specifically D&D related, pertaining to low-level radioactive waste disposal have been added to the Waste Disposal sections of chapters 1 and 2. We have not attempted to provide a comprehensive listing but rather have included a few generic references that we think will be of interest to the readership.

The Formerly Utilized Sites Remedial Action Program (FUSRAP) chapter contains references pertinent to FUSRAP management or to FUSRAP sites. These sites were used by the Manhattan Engineer District or by the Atomic Energy Commission from the 1940s through the 1960s for the processing, handling, storage, or shipment of radioactive materials.

The Uranium Mill Tailings Remedial Action Program (UMTRAP) chapter contains information pertinent to UMTRAP management or to approximately 25 program sites, located primarily in the western United States. These sites are inactive uranium milling sites that were operated under government contract.

The Grand Junction Remedial Action Program chapter contains information pertinent to the remedial actions that are underway in Grand Junction, Colorado. This program is concerned with local structures that have in, under, or adjacent to their walls or foundations uranium mill tailings that originated from the Grand Junction uranium tailings pile.

The Uranium Mill Tailings Management chapter contains foreign site-specific information, as well as any basic or applied research, not domestic site-specific, that is pertinent to the management of uranium mill tailings.

INDEXES

It is suggested that readers familiarize themselves with the color-coded indexes, which are essential to finding needed references in this bibliography. The citations in this bibliography are grouped by broad subject categories; locating references on specific topics requires the use of these indexes. The numbers appearing after each listing in the indexes are citation numbers which are in ascending order. The author index (pink pages) is organized alphabetically by the last name of each author listed in this bibliography. All authors for a citation are indexed. The corporate affiliation index (blue pages) is an alphabetical listing of the corporate affiliation of all authors. The title index (yellow pages) is a permuted index of individual title words. A number of title words have been suppressed from this index (e.g., conjunctions, prepositions, articles, and auxiliary verbs, as well as a number of words that frequently appear in document titles on this subject coverage, such as *decommissioning, decontamination, mill, and tailings*). There is a separate listing for each

word in the title with the indexed title word appearing at the left margin of the page. The publication description index (green pages) lists alphabetically all report numbers, journal citations, conference descriptions, or other descriptions that would identify the publication. The geographic location index (gold pages) is an alphabetical index of the geographic descriptions of sites referenced in the bibliography. The index is divided into two sections, domestic sites and foreign sites. The keyword index (orange pages) is an alphabetical index of specific terms selected from a controlled thesaurus.

CITATION FORM

The references within each chapter are arranged alphabetically by first author, corporate affiliation, or title of the document. When the author is not given, the corporate affiliation will appear first. If these two levels of authorship are not given, the title of the document is used as the identifying level.

As a result of computer limitations in indicating superscripts and subscripts in the standard manner, certain conventions have been established for this bibliography:

1. X sub t (X being a variable) means X_t or X subscript t.
2. For chemical compounds and elements, NaIO3 (for example) means $NaIO_3$.
3. 10(E+3) or X(E-3) (E denoting exponent) means 10^3 or X^{-3}.
4. Cubic or square dimensions of measurements will be shown as, for example, 6 cu cm for 6 cubic centimeters or 3 sq km for 3 square kilometers.
5. Nuclide mass numbers will be shown as Ra-226, U-238, etc.
6. Abbreviations have been used in this publication for certain unit measurements and are listed as follows:

A	ampere	l	liter
a	acre	lb	pound
Bq	becquerel	m	meter
C	Celsius	MeV	mega electron volt
c.d.	current density	min	minute
Ci	curie	oz	ounce
cpm	counts per minute	ppm	parts per million
cps	counts per second	R	roentgen
deg	degree	rad	radiation absorbed dose
dpm	disintegrations per minute	rem	roentgen-equivalent-man
dps	disintegrations per second	s	second
F	Fahrenheit	Sv	sievert (dose equivalent)
ft	feet	V	volt
g	gram	W	watt
gal	gallon	W(t)	watts (thermal)
hr	hour	WL	working level
in.	inch	yd	yard
keV	kilo electron volt	yr	year

7. The following prefixes have been used to indicate multiples or subdivisions of units of measurement.

a	atto	(10^{-18})	da	deca	(10^{1})
f	femto	(10^{-15})	h	hecto	(10^{2})
p	pico	(10^{-12})	k	kilo	(10^{3})
n	nano	(10^{-9})	M	mega	(10^{6})
u	micro	(10^{-6})	G	giga	(10^{9})
m	milli	(10^{-3})	T	tera	(10^{12})
c	centi	(10^{-2})	P	peta	(10^{15})
d	deci	(10^{-1})	E	exa	(10^{18})

SERVICES

RAPIC provides information support to a large number of researchers who are involved in the remedial action/radioactive waste management field. Such services as performing topical searches of RAPIC databases, performing computerized literature searches of the commercially available databases, and providing assistance in locating hardcopies of documents referenced in the bibliography are provided free of charge to the U.S. DOE's Remedial Action Program personnel or their subcontractors. Copies of most documents referenced in this bibliography can be obtained through either the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161, or the Technical Information Center, U.S. Department of Energy, P.O. Box 62, Oak Ridge, Tennessee 37831.

All inquiries for information services should be addressed to:

Remedial Action Program Information Center
Oak Ridge National Laboratory
P.O. Box X, Building 2001
Oak Ridge, Tennessee 37831

Telephone: *FTS 626-0568 [(615)576-0568]*
or
FTS 624-7764 [(615)574-7764]

ACKNOWLEDGMENTS

Staff of the Office of Surplus Facilities Management (OSFM), UNC Nuclear Industries, closely guided this project and contributed many of the publications referenced in this bibliography.

Special thanks are extended to Sherry Daniels of ICC Information Sciences and Operations and Rob Scogin of the UCCND Computer Sciences Division for the computer production of this document and to Sherry Hawthorne and Judy Crutcher of the ICC Publications Office and Ellie Trotter of the Hazardous Materials Information Center for assistance in final publication preparations.

We appreciate the time that Tim Myrick, Operations Division, and Woody Cottrell, Health and Safety Research Division, contributed in reviewing this report.

SAMPLE REFERENCE

This is an example of the format for the descriptive fields used in this bibliography:

1—*Chapter Heading*
2—*Section Heading*
3—*Record Number*
(Sequential Number of Reference)
4—*Author(s)*
5—*Corporate Affiliation*
6—*Document Title*
7—*Publication Description*
8—*Publication Date*
9—*Abstract*
10—*Abstract Credit*

CHAPTER 2. [1]NUCLEAR FACILITIES DECOMMISSIONING [2]DESIGN, PLANNING, AND REGULATIONS

[3]191
[4]Anderson, R. C., and D. T. Dexheimer
[5]Bechtel Power Corporation, San Francisco, CA

[6]INCORPORATING DECOMMISSIONING REQUIREMENTS INTO THE DESIGN PROCESS FOR NUCLEAR POWER PLANTS

[7]CONF-800359; Decommissioning Requirements in the Design of Nuclear Facilities, Proceedings of a Nuclear Energy Agency Specialist Meeting, Paris, France, March 17-19, 1980, (pp. 123-134), 285 pp. [8](1980)

[9]As a first step in incorporating decommissioning requirements into the design process, greater effort should be made to optimize designs and select alternatives to facilitate decommissioning without adding to the initial cost of the plant. In this regard, the concept of designing to minimize the plant's bulk quantities of concrete, piping and electrical cables offers a significant opportunity to make the ultimate decommissioning easier. A major design objective should be to build "smaller and lighter" to facilitate decommissioning through the simple reduction of the amount of equipment and structures requiring decontamination, dismantlement, demolition, and disposal. (Auth)[10] (JMF)

1/2

Chapter 1

SURPLUS FACILITIES MANAGEMENT PROGRAM

- Design, Planning, and Regulations
- Site Surveys
- Decontamination Studies
- Dismantlement and Demolition
- Land Decontamination and Reclamation
- Waste Disposal
- General Studies

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DESIGN, PLANNING, AND REGULATIONS

1

Adams, G.A., W.C. Bowen, P.M. Cromer, J.C. Cwynar, W.R. Jacoby, and H.G. Woodsum, Westinghouse Electric Corporation, Madison, PA

Decontamination and Decommissioning

DOE/ET/37247-1; 142 pp. (1982, February)

The project scope included the complete decontamination and decommissioning (D&D) of the Westinghouse ARD Fuel Laboratories at the Cheswick Site in the shortest possible time. This was accomplished in the following four phases: (1) preparation of documents and necessary paperwork; packaging and shipping of all special nuclear materials in an acceptable form to a reprocessing agency; loading of generated waste into bins, barrels and strong wooden boxes; (3) shipping of all bins, barrels and boxes containing waste to the designated burial site; removal of all utility services from the laboratories; and (4) final survey of remaining facilities and certification for nonrestricted use; preparation of final report These four phases of work were conducted in accordance with applicable regulations for D&D of research facilities and applicable regulations for packaging, transportation, and burial and storage of radioactive materials. The Advanced Fuel Laboratories now meet requirements of ANSI 13.12 and can be released for unrestricted use. The four principal documents used in the D&D of the Cheswick Site were: (1) Plan for Fully Decontaminating and Decommissioning, Revision 3; (2) Environmental Assessment for Decontaminating and Decommissioning the Westinghouse Advanced Reactors Division Plutonium Fuel Laboratories, Cheswick, PA; (3) WARD-386, Quality Assurance Program Description for Decontaminating and Decommissioning Activities; and (4) Health Physics, Fire Control, and Site Emergency Manual. These documents are provided as Attachments 1, 2, 3 and 4. (Auth)(JMF)(RAF)

2

Aguilar, M.A., D.F. Hauman, C.E. Wickland, and D.M. Wilkins, Rockwell International, Energy Systems Group, Rocky Flats Plant, Golden, CO

Criteria and Cost Estimates for Decommissioning and Decontamination of Major Plutonium Buildings at Rocky Flats Plant

RFP-3258; 77 pp. (1982, June)

This report is part of the evaluation of two out of three major alternatives considered in the Long-Range Rocky Flats Utilization Study: (1) modify the older plutonium buildings to meet all safety requirements identified by the risk assessment program; (2) relocate the plant elsewhere; and (3) transfer the major plant mission to other existing Department of Energy (DOE) facilities. The latter two alternatives would require decommissioning and decontamination of seven major buildings: Building 559, 771, 774, 707, 776/777 and 371/374. Thirteen categories of decommissioning and decontamination activities and the cost estimates required to bring the buildings to the standby condition and either the restricted-use or the unrestricted-use condition were determined. A total expenditure of about $215 million (1981 dollars) would allow two of the buildings to be prepared for restricted use and five of the buildings to be prepared for unrestricted use. (EDB)

3

Argonne National Laboratory, Argonne, IL

Environmental Assessment Decontamination and Decommissioning of Plutonium Fabrication Facility, Building 350 ANL-Illinois

DOE/EA-0082; 60 pp. (1979, September 27)

Building 350 was constructed specifically to house the Plutonium Fabrication Facility (PFF), which became operational in 1959, and was used extensively during its fifteen-year life span for developing methods of alloying, casting, machining, cladding, and assembling fuel elements containing plutonium. However, in 1973, when Argonne National Laboratory (ANL) began consolidating and upgrading its various plutonium operations to meet both programmatic needs and the security, safety, and safeguard aspects of handling fissile materials, it was decided to transfer this work to the Fuels Technology Center (FTC) in Building 212 along with the necessary gloveboxes and equipment, and the remainder of the facility was declared surplus. The goal or objective of the proposed action is to decontaminate and decommission the surplus Plutonium Fabrication Facility including the glovebox room, fan loft and service floor, to allow usage of the building space by the New Brunswick Laboratory and to remove the potential hazard for dispersal of residual plutonium from contaminated unused equipment in the event it were subjected to a tornado or other destruc-

tive occurrence. The gloveboxes are contaminated with various levels of alpha contamination, some of which exceed 10(E+9) dpm/100 sq cm, and a total of up to 200 grams of plutonium may be distributed throughout the glovebox system. The work consists generally of dismantling and interior equipment removal followed by *decontamination*, painting and size reduction of all gloveboxes including the seven in controlled storage. In addition, ventilation ductwork, filter banks, utility systems and associated equipment components must also be removed. (Auth)(JMF)

4

Argonne National Laboratory, Division of Environmental Impact Studies, Argonne, IL

Environmental Assessment Related to the Decontamination and Decommissioning of the Argonne National Laboratory CP-5 Research Reactor

DOE/EA-0173; ANL/EIS-15; 86 pp. (1982, June)

The proposed action is the decontamination and decommissioning of the Argonne National Laboratory CP-5 research reactor. This will consist of the dismantling, removal, and transport of all radioactive materials, including the biological shield, to the low-level waste burial site at Richland, Washington. The facility, located at Argonne National Laboratory (ANL) in Du Page County, Illinois, about 35 km (22 mi) southwest of downtown Chicago, has been in safe-layup status (fuel and heavy-water moderator removed) since September 28, 1979. The enriched-uranium fuel and heavy-water moderator have been removed from the reactor and shipped to the Savannah River Plant at Aiken, SC. Decommissioning activities will be carried out by contractors under the direction of Argonne National Laboratory staff personnel. The cost will be about $12.1 million, if the activities begin in the first quarter of FY 1983 and are completed within 36 months. There will be no adverse impact on land use, and no adverse water-quality or water-use impacts will occur. Air quality in the vicinity of the facility will occasionally be degraded by dust raised during the demolition of small, reactor-related structures. Some of the biotic habitat, vegetation, and animal life of the 1.2-ha (3-acre) waste-storage yard will be disturbed or destroyed during decontamination of the yard, the impact being negligible in terms of the local ecosystem. There will be minimal socioeconomic impact on the ANL area because, at most, only 50 additional workers will be on-site at any time during the decommissioning. A cumulative occupational dose of about 21 person-rem will be received by the work force of up to about 50 persons participating in the dismantling activities. Population doses during the transportation of reactor scrap and wastes from dismantlement will be about 50% of the cumulative population dose within 80 km of the site. A cumulative occupational dose of about 24 person-rem could be received by the drivers of the transport trucks. (Auth)(JMF)

5

Bettis Atomic Power Laboratory, West Mifflin, PA

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 25, 1977-July 25, 1977

WAPD-MRP-148; 20 pp. (1977)

The Shippingport Atomic Power Station has remained shut down since February 4, 1974, for repair of the main unit turbine and for modifications for installation and operation of the third nuclear core, the light water breeder reactor (LWBR) core. The remaining five blanket fuel assemblies were delivered. Installation of all reactor components for LWBR core operation has been completed. Initial fill of the reactor vessel was accomplished and the primary plant was preconditioned near the normal average operating temperature. Testing to withdraw and scram all twelve movable fuel assemblies individually was successfully completed. Various planned plant modifications were completed and were undergoing various stages of acceptance testing at the end of the report period. (EDB)(JMF)(RAF)

6

Burns, R.E., J.S. Henderson, W. Pollard, T. Pryor, and Y.M. Chen, National Regulatory Research Institute, Columbus, OH

Funding Nuclear Power Plant Decommissioning - Final Report

DOE/RG/10268-T3; 135 pp. (1982, October)

While the U.S. Nuclear Regulatory Commission (NR

has traditionally regulated the decommissioning activities associated with nuclear power plants, the actual collection of decommissioning funds by a regulated utility is accomplished through a financial arrangement subject to approval by a utility regulatory commission. Several nuclear power plants are now approaching the end of their useful lives. Concurrently the NRC is reassessing its regulations and guidelines on acceptable decommissioning options. The NRC is also reassessing its regulations concerning the assurance of funding for decommissioning. The NRC plans to issue proposed rule changes concerning decommissioning in February 1983. Then, funding for decommissioning must be addressed by the state public utility commissions. (Auth)(PTO)

7

Burton, B.W., V.P. Gutschick, B.A. Perkins, C.L. Reynolds, J.C. Rodgers, J.G. Steger, T.K. Thompson, L.K. Trocki, E.M. Wewerka, and M.L. Wheeler, Los Alamos National Laboratory, Los Alamos, NM

DOE Waste Management Plans - Remedial Actions and Decontamination and Decommissioning

LA-9395-MS; Overview Assessment of Nuclear Waste Management, 90 pp.; (pp. 5-7) (1982, August)

This report identifies seven DOE nuclear waste management programs that have urgent problems requiring remedial actions or follow-up. The seven programs are as follows: shallow land disposal technology development; active uranium mill tailings piles; uranium mine dewatering; site decommissioning; exhumation/treatment of transuranic waste at Idaho National Engineering Laboratory; uranium mine spoils; and medical/institutional wastes. A brief description is included of the site decommissioning problem. Some of the decontamination and site decommissioning activities scheduled for the near future (decommissioning of the Gunite tanks at Oak Ridge National Laboratory and the plutonium facilities at Mound Laboratory) are potentially quite hazardous. They will involve large quantities of radionuclides, will take place in populated areas, and are novel. Relevant documents do not address methods of establishing priorities, development of cleanup criteria, or methods for disposal of the waste. These issues must be addressed before operations are allowed to begin. (Auth)(PTO)

8

Calkins, G.D., U.S. Nuclear Regulatory Commission, Washington, DC

Status of Decommissioning Program of U.S. Nuclear Regulatory Commission

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. II-21 - II-35) (1982, October)

The program consists of the development of a detailed technology information base on the decommissioning of various kinds of nuclear facilities, research to improve the information base, the establishment of decommissioning criteria and the promulgation of regulations and guides to support the safe decommissioning of nuclear facilities. The technology information base is largely completed and research is underway to extend it. Decommissioning criteria dealing with alternatives, timing, planning, radioactive residues and financial assurance have been selected. A draft generic environmental impact statement for decommissioning has been published. The preparation of regulations and regulatory guides is underway. Accordingly, the purposes of the plan are to develop a detailed information base on the technology, safety and costs of decommissioning various nuclear facilities, to prepare an environmental impact statement, to develop a general decommissioning policy, to amend the appropriate regulations and to establish guidance to facilitate decommissioning. Excluded from this particular plan are uranium mills and their associated tailing piles, high-level waste repositories and low-level waste burial grounds. Rulemaking is already underway on these under Part 40, 60, and 61, respectively, to Title 10 of the Code of Federal Regulations. (Auth)(JMF)

9

Connors, D.R., S. Milani, J.A. Fest, and R. Atherton, Bettis Atomic Power Laboratory, West Mifflin, PA

Design of the Shippingport Light Water Breeder Reactor

WAPD-TM-1208; 113 pp. (1979, January)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DESIGN, PLANNING, AND REGULATIONS

A light water breeder reactor (LWBR) core has been developed, designed, fabricated and installed, and is currently operating in the pressurized water reactor plant of the Shippingport Atomic Power Station at Shippingport, Pennsylvania. The goal of the LWBR program is to confirm that breeding can be achieved in a light water reactor system using the thorium/uranium-233 fuel system. The Shippingport LWBR design and operation are described. Design objectives are stated and nuclear, thermal-hydraulic, mechanical and fuel element designs are provided. Major components have been illustrated. (EDB)(PTO)

10

Davis, W.P., T.C. Elswick, J.M. Garner, and J.R. Geichman, Mound Facility, Miamisburg, OH

Coordinated ANSPD(NEW) and OMA Decontamination and Decommissioning (D&D) Program Plan

Report (1982, April 30)

The latest Monsanto Research Corporation (MRC) Program Plan for the extensive decontamination and decommissioning (D&D) of the inactive ANSPD(NEW) and OMA areas at Mound Facility is presented in this document. These inactive areas include: (1) portions of PP Building - both ANSPD(NEW) and OMA areas; (2) portions of R Building - both ANSPD(NEW) and OMA areas; (3) all the Waste Transfer System (including Building 41) between the PP and WD (Waste Disposal) Buildings - ANSPD(NEW) areas. This current plan updates the previous "Coordinated ANSPD(ET) and OMA Decontamination and Decommissioning (D&D) Plan" issued April 30, 1981. The program plan has been formulated on the following basic assumptions: (1) removal of internal glovebox equipment and services prior to packaging; (2) new and OMA funding and activities coordinated in order to effectively utilize resources in areas of joint ownership and to follow a logical sequence of D&D activities; and (3) contamination in the PP and R Buildings' inactive areas reduced to "as low as reasonably achievable" (ALARA) for reuse with minimal restrictions (restricted releases). As complete demolition is planned for the Waste Transfer System, it should be possible to reduce contamination to near unrestricted levels for soil (conditional release). Included in this document are sections on objectives, descriptions, schedules, costs, controls, organization, responsibilities, uncertainties, and current status. The uncertainties section has been included to alert DOE of unresolved issues, pending regulations, undeveloped criteria, and undeveloped technologies that could have immediate and long-term impact on Mound's D&D program. This document will be used as the Engineering Plan for the D&D Operations at Mound and will be revised annually to reflect changing status and parameters. (Auth)(PTO)

11

Design Criteria of Decommissioning of Nuclear Fuel Reprocessing Plants

ICONS-02161; 8 pp. (1975)

This standard provides criteria for designers of nuclear fuel reprocessing facilities to guide them in meeting requirements of Federal regulations governing shutdown and decommissioning. Title 10 Code of Federal Regulations, Chapter 1, Part 50, Appendix F, states in part that "a design objective for fuel reprocessing plants shall be to facilitate decontamination and removal of all significant radioactive waste at the time the facility is permanently decommissioned." Included in the scope of this standard are the following considerations: (1) protection from radiation hazards to personnel and the environment during and after decommissioning; (2) decontamination of plant structures and processes equipment; (3) dismantling or isolation of the facilities; and (4) disposal of contaminated materials. When the owner has deactivated or shut down one process facility but continues to operate on the same site or builds another operating plant on the same site, this deactivation - even if it involves abandonment in place - is not decommissioning in the context of this standard. Deactivation can be partial or can involve complete shutdown of process operation. Even when total plant shutdown is part of deactivation, the plant owner has complete control of the functions or activities remaining on-site and retains the responsibility of surveillance of the deactivated facility to assure public health and safety. This standard provides guidance to designers by giving specific functional criteria for structures and systems (Section 3.0) and by establishing normal operational criteria to minimize problems during the decommissioning stage (Section 4.0). (EDB)(JMF)

12

General Accounting Office, Washington, DC

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DESIGN, PLANNING, AND REGULATIONS

Economic Impact of Closing Zion Nuclear Facility

EMD-82-3; 80 pp. (1981, October)

The Zion nuclear plant's close proximity to the Chicago area has raised questions about the safety of its continued operations. Zion's loss would reduce power supplies below levels considered adequate to maintain reliable service. Should the demand for electricity be less than now projected, the impact would be less severe; however, should plants now under construction be delayed, the impact would be more severe. Purchased power from other utilities is the most immediate way to replace Zion's power, but the existing transmission network may be a limiting factor. New nonnuclear plants can be constructed to replace Zion, but they would not be available before the 1990s. Measures to reduce electric demand also have long-term potential, although their effectiveness will depend on costs, customer acceptance, economic conditions, and regulatory and other government policies. (EDB)(JMF)

13
General Accounting Office, Washington, DC

Review of Costs to Close the Frankford Arsenal

AD-A118-051; 13 pp. (1982, May)

The Army estimates that the costs in closing the Frankford Arsenal will total $66 million - $50 million to discontinue operations and $16 million for other installations to take over previous Frankford missions. On the basis of our review of the support for the Army's estimate, we believe that the $66 million estimate is reasonable. However, caretaker costs will increase the $66 million estimate by about $700,000 annually until Frankford disposal is completed. The increased costs to close Frankford are primarily attributable to (1) an unanticipated operating loss ($17 million) caused by a slippage in the dates of personnel transfers and separations, (2) unanticipated decontamination costs ($9 million), and (3) increased caretaker costs ($7 million). (Auth)(JMF)

14
General Accounting Office, Washington, DC

Cleaning Up Nuclear Facilities - An Aggressive and Unified Federal Program is Needed

PB-82-259698; 78 pp. (1982, May)

The federal government needs to take a more unified and aggressive approach to cleaning up and decommissioning nuclear facilities if the United States intends to effectively meet current and future decommissioning challenges. The limitations of current federal agency decommissioning programs made it difficult to locate facilities in need of decommissioning actions. They also increase decommissioning costs for licensees, for the public and for the federal government. Until the federal government establishes a national decommissioning strategy and designates a lead agency responsible for monitoring implementation of that strategy, these problems will likely continue. More importantly, the chances of hazards to the public's health and safety will be increased because nuclear facilities may not be properly cleaned up. (GRA)(JMF)

15
Harris, V.A., H.J. Moe, M.J. Robinet, and R.A. Wynveen, Argonne National Laboratory, Argonne, IL

Project Management Plan for Decontamination and Decommissioning of New Brunswick Laboratory, New Jersey

Report; 45 pp. (1981, January)

The New Brunswick Laboratory, New Jersey (NBL-NJ) site was used as a general nuclear chemistry laboratory from 1948 to 1977, when it was owned by the U.S. Department of Energy (DOE) and its predecessors. Since 1977, the facility has been deactivated and has undergone preliminary decontamination. All New Brunswick Laboratory operations have been transferred from the New Jersey site to Argonne, Illinois. The vacant buildings are deteriorating and have been vandalized. To reduce potential hazards to the public, DOE intends to have all contaminated structures, equipment, and soils removed from the New Jersey site. The site will then be

released for unrestricted public or private use. The purpose of this project-management plan is to provide a description of the facility and identify and define the administrative and technical direction required to plan and execute the decontamination and decommissioning of NBL-NJ. The NBL-NJ project management plan has been prepared to meet the guidelines of DOE's Surplus Facilities Management Program. (Auth)

16

Kline, W.H., Argonne National Laboratory, Argonne, IL

Plan for Decontamination and Decommissioning the Building 350 Plutonium Fabrication Facility

Report; 60 pp. (1978, June)

The objective of this project is to decontaminate and decommission (D&D) the Argonne National Laboratory (ANL) surplus research Plutonium Fabrication Facility (PFF) so that the area may be used for further nuclear endeavors by DOE's New Brunswick Laboratory (NBL). This work will involve dismantling the gloveboxes, ventilation ductwork, utility systems and the associated internal and external equipment. All are contaminated with various levels of alpha radioactivity, some of which exceed 10(E+9) dpm/100 sq cm. Several portions of the facility will be transferred and reinstalled at the Fuels Technology Center (FTC), while the balance of the radioactive components will be size reduced to fit into acceptable packaging for shipment off-site to either a DOE transuranic (TRU) retrievable storage site or to a licensed commercial low-level nuclear burial ground. Nonradioactive materials will be sold for scrap or disposed of in the laboratory's landfill. The structure housing this facility will then be decontaminated consistent with its intended reuse. (Auth)(JMF)

17

Konzek, G.J., Pacific Northwest Laboratory, Richland, WA

Decommissioning Reference Nuclear Research and Test Reactors

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-115 - VII-128) (1982, October)

The purpose of the study is to provide information on the available technology, the safety considerations, and the probable costs of decommissioning licensed R&T reactors at the end of their operating lifetimes, and is intended to provide background information for use in the development of regulations pertaining to decommissioning. It is also intended for use by research and test (R&T) reactor owners and operators in planning for the decommissioning of their nuclear reactor facilities. Safety and cost information is developed for the conceptual decommissioning of two representative licensed nuclear R&T reactors. Three decommissioning alternatives [DECON (immediate decontamination), SAFSTOR (safe storage followed by deferred decontamination), and ENTOMB (entombment)] are studied to compare the costs (in 1981 dollars), occupational radiation doses, potential radiation dose to the public, and other safety impacts of implementing each of the alternatives. (Auth)(JMF)

18

Lichfield, J.W., and J.C. King, Battelle Pacific Northwest Laboratories, Richland, WA

Interactive Planning System for Developing Decommissioning and Decontamination Plans at Hanford

CONF-770937; ERDA/AESOP 17, Proceedings of Conference, Boston, MA, September 13-15, 1977; (pp. 78-107) (1977)

The history and status of the Hanford Reservation are reviewed. Long-range plans for decommissioning and decontamination (D&D) of facilities must include methods, budget requirements, and schedules required to achieve specific goals for the future use of the reservation. Alternative plans and assessments of their effects are also necessary. Although these have not been completed, the planning methodology is fully developed and supporting computer models are operational. Steps in the planning approach include facility characterization, information management, facility prioritization, D&

mode selection, D&D activity characterization, scenario definition, and integrated planning and plan assessment. The methodology is illustrated by an example. (RWR) (JMF)

19

Miller, C.E., and A.J. Eirich, U.S. Department of Energy, Richland Operations Office, Richland, WA; UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Engineering and Planning for the Shippingport Station Decommissioning Project

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-24 - VII-39) (1982, October)

The purpose of the Shippingport Station Decommissioning Project (SSDP) is to place the Shippingport Atomic Power Station in a long-term radiologically safe condition following refueling of the reactor, to perform decommissioning in such a manner as to demonstrate to the nuclear industry application of decommissioning procedures to a large nuclear power plant, and to provide useful data for future decommissioning projects. The engineering and planning for the decommissioning of the Shippingport Atomic Power Station is currently being performed by Burns and Roe Industrial Services Corporation and Nuclear Energy Services, Inc. for the U.S. Department of Energy (DOE) Richland, Washington Operations Office. Technical direction for the project is provided to DOE by UNC Nuclear Industries. (Auth)

20

Miller, R.L., UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Evaluation of Nuclear Facility Decommissioning Projects Program

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-185 - VII-191) (1982, October)

Major studies have been undertaken in recent years by the U.S. Nuclear Regulatory Commission (NRC) and others on the technology, safety, and costs associated with decommissioning nuclear facilities. The program described in this presentation is being undertaken by the NRC to compile and evaluate the activities of ongoing decommissioning projects. Assessment and evaluation of the methods, impacts, and costs will provide bases for evaluating licensees' decommissioning proposals and for future decommissioning direction and regulation. Program participants include NRC through the Office of Regulatory Research, UNC Nuclear Industries (UNC) through the Office of Surplus Facilities Management, and nuclear facility licensees. The Evaluation of Nuclear Facility Decommissioning Projects (ENFDP) program has been separated into the following tasks: program management, identification of facilities, collection of data, analysis and reporting of field data, and summary comparisons and evaluations. A computerized data collection system has been developed for data accumulation. This computer program incorporates information related to the following: facility classification, including design, configuration, constructor, operator, and operating history; predecommissioning engineering; predecommissioning radionuclide inventory and dose assessment; ALARA efforts; waste disposition, for both contaminated and noncontaminated materials, including packaging, transportation, and disposal site; decommissioning technology with data to be accumulated on costs, radiation exposure, standard and special techniques, special tools, evaluation of decontamination efforts, and termination survey data; and lessons learned. A summary report will be issued to provide the complete decommissioning project history and activities statistics. The format will be standardized for all facilities to permit later comparisons and evaluation. (Auth)(JMF)

21

Montgomergy, C.R., Saxton Nuclear Experimental Corporation, Saxton, PA

Saxton Nuclear Experimental Corporation's Change Request No. 50 to Technical Specification and Request for Amendment No. 8 to License No. DPR-4

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DESIGN, PLANNING, AND REGULATIONS

DOCKET-50-146; License No. DPR-9; 1 p. (1972, April 14)

This document requests authorization to dismantle the Saxton reactor, and to terminate and surrender the operating license, byproduct material license, and special nuclear materials license. (PTO)

22

Morris P.A., U.S. Atomic Energy Commission, Division of Reactor Licensing, Washington DC

Puerto Rico Water Resources Authority: Docket No. 115-4 - Order Authorizing Dismantling of Facility

DOCKET-115-4. 2 pp. (1968, August 11)

This document authorizes the dismantlement of the Bonus reactor by the Puerto Rico Water Resources Authority. After completion of the work a report describing the condition of the structure and a post-decommissioning surveillance program is requested. (PTO)

23

Nuclear Plant Decommissioning Costs

Public Utilities Fortnightly 103(9):54-56 (1979, April)

Following the Three Mile Island accident, utility officials now question whether the massive cleanup costs will fall on investors or ratepayers. However, the Pennsylvania Public Utility Commission has recently handed down a series of opinions on utilities' salvage and cleanup costs which may very well indicate how the commission will treat the cleanup expenses likely to be incurred by Metropolitan Edison Company and its corporate affiliates. For some time the Pennsylvania Commission has rejected utilities' claims for depreciation allowances designed to account for anticipated decommissioning, removal, or cleanup expenses. Recently, the commission has adopted a different tack solely with regard to nuclear facilities. In the 1982 Penn Sheraton Hotel versus the Pennsylvania Public Utility Commission case, an anticipated salvage cost was disallowed. In 1976, the commission rejected a proposal by Metropolitan Edison to assess ratepayers annually for the future cost of decommissioning its Three Mile Island nuclear generating plant. In a 1977 rate application, Pennsylvania Electric Company proposed a $300,000 annual expense allowance to provide for its anticipated $37.2 million share of decommissioning TMI, Unit 1. In a 1978 order, the commission authorized an annual $74,000 expense allowance. Three months later, the commission approved a similar $132,000 annual expense allowance for Metropolitan Edison for decommissioning costs for Three Mile Island Units 1 and 2. (EDB)(PTO)

24

Oertel, G.K., and A.F. Kluk, U.S. Department of Energy, Office of Defense Waste and Byproducts Management, Washington, DC

Waste Management Impacts of U.S. Decommissioning Activities

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982. 712 pp.; (pp. III-1 - III-9) (1982, October)

Decommissioning activities in the United States which have the greatest potential waste management impact are those conducted by the DOE and the licensed activities that are regulated by the NRC. Although nuclear programs have been conducted for almost 40 years, decontamination and decommissioning of nuclear sites and facilities is still in the beginning stages. Policies are being formulated within DOE and NRC; DOE is preparing an order, and NRC is preparing to issue regulations to define policies in March 1983. In general, waste from decommissioning activities will be handled in accordance with the existing management policies of the DOE and NRC. Decommissioning policies will have an impact on waste volumes from the standpoint of cleanup standards, decommissioning modes (i.e., protective storage, entombment, dismantlement), recovery of materials and reuse of facilities. One of the goals of these policies will be to reduce waste volumes to be generated. (Auth)

25

Pierce, E.E., and A.A. Walls, Oak Ridge National Laboratory, Oak Ridge, TN

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DESIGN, PLANNING, AND REGULATIONS

ILW Transfer Line Decommissioning

Research Project; Contract No. ONL-WD13(27)

Several ORNL facilities which were used to process or store radioactive materials for commercially oriented applications have been declared surplus to programmatic needs. The planning activity will involve acquisition of drawings, determination of contamination levels and equipment condition, selection of decommissioning methods for each facility, scheduling of operations and personnel, and coordination of operations. Decommissioning will involve decontamination of facilities and equipment to acceptable levels for alternate use, entombment, or complete or partial removal of the facility as appropriate. The scope of this task includes the installation of asphalt surfaces over Waste Pits 1 and 6, removal or entombment of sections of the abandoned pipeline, and also includes a section of the abandoned ILW pipeline previously referred to as the hydrofracture transfer line. (SSIE)

26

Saxton Nuclear Experimental Corporation, Saxton, PA; General Public Utilities System, Reading, PA

Saxton Decommissioning Plan and Safety Analysis Report

DOCKET-50146-106; 67 pp. (1972, April)

This document describes the plan for decommissioning the Saxton Reactor facility, and presents a safety analysis which demonstrates that the facility will be placed in a status which will not adversely affect the health and safety of the public. The Saxton Reactor will be decommissioned by the Saxton Nuclear Experimental Corporation (SNEC) and a Part 30 By-product Material License covering the remaining by-product material will be requested by GPU Service Corporation. The GPU Service Corporation will be solely and completely responsible for the material licensed under Part 30. The Saxton Reactor decommissioning and the final decommissioned plant configuration will resemble that of the Carolinas Virginia Tube Reactor and Pathfinder Reactor which have been decommissioned, except that all by-product material remaining on the SNEC site and licensed under Part 30 by the Division of Materials Licensing will be contained within the containment vessel. Within the containment more than 99% of the estimated 4 MCi of activity will be contained inside the reactor vessel in the form of induced activity in the vessel walls and in the reactor internals. The reactor vessel will be contained inside the reactor/fuel storage compartment which cannot be breached without the use of special equipment which will not be in service on the site. All irradiated or contaminated material removed during the D&D operations will be decontaminated or shipped off-site for licensed burial in accordance with applicable AEC/DOT regulations. (Auth)(PTO)

27

Skovholt, D.J., U.S. Atomic Energy Commission, Division of Reactor Licensing, Washington, DC

United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority

DOCKET-115-4; 5 pp. (1969, August 11)

By application dated May 26, 1969, the Puerto Rico Water Resources Authority (PRWRA) requested the issuance of an order authorizing decommissioning of the Bonus reactor. PRWRA's application is supported by a two-volume decommissioning plan. Volume 1 describes the plan for dismantling the facility and the final condition of the dismantled facility. Volume 2 is a safety analysis of the decommissioned plant. A previous amendment to the Bonus Operating Authorization No. DPRA-4 issued on November 9, 1968, authorized PRWRA to possess but not operate the Bonus reactor, and to perform certain work in preparation for dismantling the facility. PRWRA plans to use the dismantled nuclear power plant for a period of five years following decommissioning as a public exhibition center. (Auth)(PTO)

28

Solomon, B.D., University of Indiana, Bloomington, IN

U.S. Nuclear-Energy Policy: Provisions of Funds for Decommissioning

Energy Policy (United Kingdom) 10(2):109-119 (1982, June)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DESIGN, PLANNING, AND REGULATIONS

The five recognized methods of decommissioning nuclear power plants are reviewed, and are linked with U.S. nuclear regulatory policy. Although over 60 U.S. nuclear reactors have been decommissioned since 1960, none have been large-scale commercial facilities. Costs of the decommissioning alternatives are estimated, but are acknowledged to be highly tentative and uncertain. Five methods of providing funds for decommissioning are given. Also the actual practices of U.S. electric utilities in obtaining decommissioning funds are analyzed. Revenue-bonding and sinking-fund approaches are argued to be the soundest means to recover decommissioning costs when the uncertainties surrounding decommissioning are considered (EDB)(JMF)

29

Stucker, J.P., C.L. Batten, K.A. Solomon, and W.Z. Hirsch, Rand Corporation, Santa Monica, CA

Costs of Closing the Indian Point Nuclear Power Plant

RAND/R-2857-NYO; 98 pp. (1981)

This report documents a first attempt to derive a total dollar estimate of all monetary costs that would be associated with closing the nuclear generating units at Indian Point, New York. Both the direct costs of closure and many of the secondary costs induced by those direct costs are considered. There are undoubtedly some small cost elements that have not been considered, but both upper and lower estimates, so as to give bounds to the total costs, have been constructed. (EDB)(JMF)

30

U.S. Atomic Energy Commission, Directorate of Licensing, Washington, DC

Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 38

DOCKET-50016-196; 5 pp. (1973, May 31)

Requirements for maintenance and testing the reactor building containment during reactor retirement have been deleted. (FS)(PTO)

31

U.S. Department of Energy, Washington, DC

Environmental Assessment - Decontamination and Decommissioning of the New Brunswick Laboratory, New Jersey Site

DOE/EA-0152; 13 pp. (1981, July 21)

This assessment deals with the decontamination and decommissioning of the New Brunswick Laboratory-New Jersey Site (NBL-NJ) located at New Brunswick, New Jersey. From 1948 to 1977, NBL-NJ developed and performed assay methods for "source materials" - uranium and thorium, and "special nuclear materials"- plutonium, uranium-233, and uranium enriched with uranium-233 and uranium-235. NBL-NJ was also involved in boron-recovery, thorium-extraction and uranium tetrafluoride-production processes. Since 1977, the facility has been deactivated and has undergone preliminary decontamination with all operations at NBL-NJ being transferred from the New Jersey site to Argonne, Illinois. The decontamination and decommissioning (D&D) of NBL-NJ consists of three phases. Phase I - laboratory deactivation and preliminary gross decontamination was completed in 1978. Phase II - structure dismantling and decontamination was started on March 1, 1981 and will require an estimated seven months to complete. Phase III - contaminated soil removal and site restoration will, due to funding limitations, take place in future fiscal years. It is proposed that the NBL-NJ site undergo D&D to a state suitable for unrestricted public or private use. The costs of decontaminating and decommissioning the NBL-NJ site will be at least partially offset by revenues from the sale of the site for private or other unrestricted use. The proposed action is considered to provide the greatest long-term environmental benefit. (Auth)(JMF)

32

U.S. Nuclear Regulatory Commission, Washington, DC

Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation

NUREG-0904; 217 pp. (1982, May)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DESIGN, PLANNING, AND REGULATIONS

This Draft Environmental Impact Statement is issued by the U.S. Nuclear Regulatory Commission in response to the plan proposed by Kerr-McGee Chemical Corporation for the decommissioning of their Rare Earths Facility in West Chicago, Illinois. The statement considers the Kerr-McGee preferred plan and various alternatives to that plan. The action proposed by the Commission is the renewal of the Kerr-McGee license to allow safe storage of the radioactive wastes on-site for a period of 5 years. At the end of this period, the following alternatives will be evaluated: (1) renewal of the license for an additional period of 5 years and the possible imposition of additional conditions or remedial actions; (2) removal of the material to a licensed low-level waste disposal site; and (3) termination of the license and transfer of the property to federal or state ownership. (EDB)(JMF)

33

Westinghouse Electric Corporation, Madison, PA

Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision

DOE/ET/37247-1-Attach. 1-2-3; 164 pp. (1982, January)

The project scope included the complete decontamination and decommissioning (D&D) of the Westinghouse ARD Fuel Laboratories at the Cheswick Site in the shortest possible time. This has been accomplished in the following four phases: (1) preparation of documents and necessary paperwork; packaging and shipping of all special nuclear materials in an acceptable form to a reprocessing agency; (2) decontamination of all facilities, glove boxes and equipment; and loading of generated waste into bins, barrels and strong wooden boxes; (3) shipping of all bins, barrels, and boxes containing waste to the designated burial site; and removal of all utility services from the laboratories; (4) final survey of remaining facilities and certification for nonrestricted use; and preparation of final report. This volume contains the following 3 attachments: (1) plan for full decontamination and decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick; (2) Environmental Assessment for decontamination and decommissioning the Westinghouse Advanced Reactors Division Plutonium Fuel Laboratories, Cheswick, PA; and (3) Ward-386, Quality Assurance Program Description for Decontamination and Decommissioning Activities. (EDB)(JMF)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM SITE SURVEYS

34

Abel, K.H., D.E. Robertson, C.W. Thomas, J.C. Evans, and E.A. Lepel, U.S. Nuclear Regulatory Commission, Washington, DC

Residual Radioactivity Assessment in Nuclear Power Plant: Concentrations, Distribution Inventories

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp.; (pp. 62-101) (Addendum) (1982, October)

A research program is being conducted for the U.S. NRC to provide a data base of residual radionuclide concentrations in commercial nuclear generating stations. The data sampling has been conducted at six sites. The measurement program has been completed for two of the sites. A topical report has been prepared describing the findings at Pathfinder. The report detailing the findings at Humboldt Bay is in preparation. The findings to date indicate no significant radionuclides have been forgotten which might pose additional problems at the time of decommissioning. They also indicate that each reactor site will have a unique set of circumstances associated with its operating history. As examples, Humboldt Bay had an early history of fuel failures which may lead to tramp fuel and fission products spread more widely than at other sites. At Pathfinder the failed superheater led to deposition of vessel-derived metal pieces into piping, creating local hot spots of very high radiation levels. The data in this report and the subsequent topical reports describing each reactor site should provide the U.S. NRC with an appropriate data base of residual radionuclide concentrations and distributions in commercial power reactors. Using this data base, proper decommissioning assessments can then be made. (Auth)(PTO)

35

Alexander, W.A., S. Huang, T.W. Oakes, H.M. Hubbard, and J.S. Eldridge, Oak Ridge National Laboratory, Oak Ridge, TN

Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at Oak Ridge National Laboratory

ORNL/TM-8479; 27 pp. (1982, December)

The Metal Recovery Facility, Building 3505, was operated by the staff of Oak Ridge National Laboratory (ORNL) as a pilot and small-scale production nuclear fuel reprocessing plant from 1952 until 1960. Because further use of this facility is not anticipated, decontamination and decommissioning (D&D) of this facility and site is planned as part of the ORNL D&D program. This report is a review of the radiological contamination characterization of subsurface soil surrounding the 3505 facility. In order to determine the environmental radiological soil conditions, 92 samples at varying depths were collected from 25 cores. Sample tubes were driven into the ground and segments of soil cores were retrieved at depths from the ground surface to subsurface consolidated material. Forty samples of the 92 collected had detectable gamma activities [i.e., less than 2 X 10(E-2) Bq/g (0.5 pCi/g)] of Cs-137. However, only four samples, all from the same borehole, were found to have significant amounts of Cs-137 with a maximum of 1.7 X 10(E+3) Bq/g [4.6 X 10(E+4) pCi/g]. These four samples also contained the highest activities of other radionuclides (Co-60, Sr-90, U-235, U-238, Pu-239, and Am-241). These subsamples came from core number 4DD, which was the deepest core collected. Core 4DD was taken at the southwest corner of the site, which is at the lower elevation of the site. Since most of the activity in this core was found below the bedrock (or shale) in the groundwater region, the contamination is probably not from Building 3505. Additional investigation in the area around core location 4DD will be required to determine the extent of contamination. (Auth)(PTO)

36

Barefoot, E.D., E.A. Cameron, and C.D. Thomas, Jr., EG&G Idaho, Inc., Idaho Falls, ID

Pre-decontamination Gamma-Ray Surface Scans in TMI-2 Containment Building 305 Foot Elevation

GEND-INF-009; 18 pp. (1982, February)

On December 16, 1981 entry was made into the TMI-2 containment building to perform gamma-ray scans on surfaces of the 305-ft level. Five areas were selected for these measurements. Two of them were of surfaces of walls, two were of floor surfaces under the reactor core flood tanks, and the remaining was of a floor surface in an area that had been receiving a great deal of personnel traffic. The results showed contamination levels of

than 1 uCi/sq cm for all of the surfaces, considerably less than was observed at the locations of previous scans. Two of the areas showed no net activity and minimum detectable limits are listed that are less than 0.3 uCi/sq cm. (EDB)(JMF)

37
Battelle Columbus Laboratories, Columbus, OH

Piqua Nuclear Power Facility Radiological Surveillance Program

DOE/NBM-2012241; 7 pp. (1982, March)

Results of the annual radiological survey of the retired Piqua Nuclear Facility in Piqua, Ohio are presented in this report. The overall survey did not reveal the existence of any significant changes within the facility. This survey marked the inception of a surface soil sampling program. Analysis of the soil showed that radioactivity levels are comparable to those found at other locations in Ohio. (DMC)(EDB)(RAF)

38
Booth, L.F., D.W. Groff, G.S. McDowell, J.J. Adler, S.I. Peck, P.L. Nyerges, and F.L. Bronson, Radiation Management Corporation, Northbrook, IL

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri

NUREG/CR-2722; 138 pp. (1982, May)

The results of a radiological survey of the West Lake Landfill, St. Louis County, Missouri, performed by Radiation Management Corporation during the spring and summer of 1981 are presented. Measurements were made to determine external radiation levels, concentrations of airborne contaminants, and the identity and concentrations of subsurface deposits. Results indicate that large volumes of uranium ore residues, probably originating from the Hazelwood, Missouri, Latty Avenue site, have been buried at the West Lake Landfill. Two areas of contamination, covering more than 15 acres and located at depths of up to 20 feet below the present surface, have been identified. There is no indication that significant quantities of contaminants are moving off-site at this time. (Auth)(JMF)

39
Boyns, P.K., EG&G Energy Measurements Group, Las Vegas, NV

An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972

EGG-1183-1657; 27 pp. (1978, June)

The Aerial Measuring Systems (AMS) was used to survey the area surrounding the Dresden Nuclear Power Plant during September 1972. The survey measured terrestrial gamma-ray exposure rate and spectral data. A high-sensitivity detection system collected gamma-ray spectral and gross count data. The data were then processed to construct a map of a 625 square mile area showing the spatial distribution of gamma-ray exposure rates 1 m above the ground. Exposure rates and isotopes identified are consistent with that related to normal terrestrial background radiation. The Dresden area was surveyed in 1968 and 1970. Comparison of the 1968 and 1970 surveys shows no measurable change in the terrestrial gamma exposure rates. Comparison of the 1968 and 1970 surveys indicates a slight decrease in the average terrestrial exposure rate. (Auth)

40
Boyns, P.K., and D.B. Smith, EG&G Energy Measurements Group, Las Vegas, NV

An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979

EGG-1183-1816; 25 pp. (1982, July)

An aerial radiological survey of the Savannah River Plant (SRP) was conducted during June 1979 by EG&G Energy Measurements Group for the DOE. The survey consisted of an airborne measurement of both natural and man-made gamma radiation from the terrain surface in and around the plant site. These measurements allowed a determination of the surface terrestrial spatial distribution of isotopic concentrations and equivalent gamma ray exposure rates from cobalt-60 and cesium-137 contaminants. The results are reported as exposure

rate isopleths for the two isotopes and are superimposed on 1:48,000 scale maps of the area. Gamma ray energy spectra are also presented for the net man-made radioelements. This was the second survey of the entire Savannah River Plant site. The first survey was conducted in June 1974. A comparison of the surveys indicates a decrease in the exposure rates due to man-made isotopes. All areas of man-made activity were in the same location as indicated by the results of the first survey. It appears that no detectable new man-made activity has been released in the survey area since 1974. (Auth) (PTO)

41
Duquesne Light Company, Shippingport, PA

Beaver Valley Power Station and Shippingport Atomic Power Station - 1977 Annual Environmental Report: Radiological - Volume 2

NP-23295; 113 pp. (1978, April 27)

The environmental monitoring conducted during 1977 in the vicinity of the Beaver Valley Power Station and the Shippingport Atomic Power Station is described. The environmental monitoring program consists of on-site sampling of water, gaseous, and air effluents, as well as off-site monitoring of water, air, river sediments, and radiation levels in the vicinity of the site. The report discusses releases of small quantities of radioactivity to the Ohio River from the Beaver Valley Power Station and Shippingport Atomic Power Station during 1977. (EDB) (PTO)

42
Duquesne Light Company, Shippingport, PA

Beaver Valley Power Station and Shippingport Atomic Power Station - 1978 Annual Environmental Report: Radiological - Volume 2

DOE/PNRO-0292-T1; 120 pp. (1978)

The Radiological Environmental Monitoring Program conducted during 1978 in the vicinity of the Beaver Valley Power Station and the Shippingport Atomic Power Station is described. The program consists of on-site monitoring of water, air, river sediments, food pathway samples, and radiation levels in the vicinity of the site. The results of this monitoring during 1978 are discussed. The environmental program outlined in the Beaver Valley Power Station Technical Specifications was followed throughout 1978. There were no radioactive liquid effluents released from the Shippingport Atomic Power Station, because radioactive liquids are processed and recycled within the plant systems. The results of this environmental monitoring program show that Shippingport Atomic Power Station and Beaver Valley Power Station operations have not adversely affected the surrounding environment. (Auth)(PTO)

43
EG&G Energy Measurements Group, Las Vegas, NV

An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979

EGG-1183-1782; 15 pp. (1980, December)

An aerial radiological survey encompassing the Western New York Nuclear Fuel Services Center (NFS) near West Valley, New York was conducted during September 7-12, 1979. The survey data showed that the average ground surface radiation levels for the site and its environs are less than were measured during the 1969 survey when reprocessing was occurring. The area exhibiting above-background radiation levels is decreasing with time due to: (1) radioactive decay; (2) dilution and dispersion of man-made radionuclide reprocessing plant effluents produced from April 1966 to early 1972; and (3) the discontinuation of reprocessing operations. Excluding specific localized NFS site facility areas, the background radiation levels for the recently surveyed area approximate the preoperational background radiation levels. (Auth)(PTO)

44
Englert, J.P., and S.L. Hinnefeld, National Lead Company of Ohio, Cincinnati, OH

Environmental Surveillance Plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New Yc

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM SITE SURVEYS

NLCO-008EV; 55 pp. (1981, September)

The Niagara Falls Storage Site (NFSS) is a United States Department of Energy owned facility used for the storage of low-level radioactive residues. The site occupies 190 acres of the former Lake Ontario Ordnance Works and is located in the Niagara County town of Lewiston, in western New York State. The city of Niagara Falls is approximately eight miles south of the site. The purpose of this report is to describe environmental monitoring programs presently operated by NLO, and to suggest programs and revisions which should be implemented as a result of NLO's remedial actions at the NFSS. (GRA) (JMF)

45

Feimster, E.L., EG&G Energy Measurements Group, Las Vegas, NV

An Aerial Radiological Survey of the U.S. Department of Energy's Mound Facility, Miamisburg, Ohio - Date of Survey: July 1976

EGG-1183-1722; 9 pp. (1978, March)

An aerial radiological survey to measure terrestrial gamma radiation was carried out by helicopter over an area centered on Mound Facility, a 180-acre area adjacent to the southern edge of the city of Miamisburg, Ohio. This survey was part of an effort to document background radiation levels around nuclear processing and handling facilities owned or contracted by the U.S. Department of Energy (DOE). During the survey, gamma ray data were collected over a 12.3 sq km area by: (1) flying an east-west grid of lines spaced 61 m apart; (2) flying slowly over several selected areas; and (3) hovering over several spots of interest. The processed data indicated that the on-site radioactivity was primarily due to radionuclides currently being handled or processed at the facility, and that lesser activity could be attributed to previously handled or processed nuclear materials. Off-site data showed the radioactivity to be due to naturally occurring radionuclides. (Auth)(PTO)

46

Feimster, E.L., EG&G Energy Measurements Group, Las Vegas, NV

An Aerial Radiological Survey of United States Department of Energy Sites in Ames, Iowa, Date of Survey: May 1977

EGG-1183-1686; 15 pp. (1979, July)

An aerial radiological survey to measure terrestrial gamma radiation was carried out over five areas totaling 10 sq km within the town of Ames, Iowa. Gamma ray data were measured over Ames Laboratory, several sections of downtown Ames, and the surrounding area. This was accomplished by flying parallel east-west lines 61 m apart. Processed data indicated that three areas showed increased activity levels of at least twice average background: the reactor; the waste treatment area; and a small area near the airport runway. (Auth)(PTO)

47

Fritzsche, A.E., EG&G Energy Measurements Group, Las Vegas, NV

An Aerial Radiological Survey of Areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15 and 17 Yucca Flat, Nevada Test Site

EGG-1183-1808; 8 pp. (1982, June)

The Aerial Measuring System (AMS), operated by EG&G Inc., Las Vegas, Nevada for the U.S. Department of Energy, was used to conduct a radiometric survey most of Yucca Flat at the Nevada Test Site (NTS). The survey took place from August 8 to September 2, 1978 and included much of Areas 1, 2, 3, 4, 6, 7, 8, 9. and 10 and smaller fractions of Areas 12, 15 and 17. Previous surveys over the NTS were performed using a fixed-wing aircraft. During 1970 and 1971 a total of fourteen areas were surveyed and included all of the NTS accessible to a fixed-wing aircraft. The fixed-wing surveys employed an array of fourteen 10-cm diameter by 10-cm thick NaI(Tl) detectors with flight lines spaced 0.8 kilometers apart, at an altitude of 90 meters. The present series of radiation surveys are being flown with a helicopter system in an effort to provide coverage over a large portion of the NTS, Tonopah Test Range, and surrounding areas as well as improve the sensitivity and spatial resolution. Prior to the present survey, helicopter surveys had been performed over Plutonium Valley (NTS Area 11, August 1975), Frenchman Flat (NTS Area 5, April 1976), Areas 25 and 26 (NTS, September 1976), Clean Slates 1, 2, and

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM SITE SURVEYS

3 and Double Track (Tonopah Test Range, February 1977), and Area 13 (NTS, December 1977). Some of the Yucca Flat survey parameters were: survey altitude, 30 m (100 ft); aircraft speed, 30 m/s (100 ft/s); flight line length, 30 km (19 mi) max; number lines flown, 400; total line length, 8860 km (5500 mi); line spacing, 60 m (200 ft); and total area surveyed, 400 sq km (150 sq mi). Following to the aerial survey and interpretation of the aerial data, soil samples were gathered at 54 Yucca Flat locations at areas of man-made activity. The soil samples were gathered by the Desert Research Institute (DRI) and counted on a high purity germanium (HPGe) detector in order to obtain activity profile measurements versus soil depth. These profiles were to be used to obtain activity inventory estimates from the aerial data. (Auth)(JMF)(RAF)

48

Hilton, L.K., EG&G Energy Measurements Group, Las Vegas, NV

An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980

EGG-1183-1766; 10 pp. (1980, December)

An airborne radiological survey of an 11 sq km area surrounding the San Onofre Nuclear Generating Station was made January 9-17, 1980. Count rates observed at 60 m altitude were converted to exposure rates at 1 m above the ground and are presented in the form of an isopleth map. Detected radioisotopes and their associated gamma ray exposure rates were consistent with that expected from normal background emitters, except directly over the plant. (Auth)(PTO)

49

Huey, E.A.

Report on Preliminary Geological, Hydrological and Radiological Survey at the Weldon Spring Quarry During 1976 and 1977

Report (1978, December 14)

The purpose of this survey is to determine what future action should be taken at the Weldon Spring Quarry in order to protect the environment from contaminated solids which have been buried at the quarry. During September and October of 1976, work was performed to improve site conditions and drill test holes at the quarry. In addition to obtaining geologic data, these test wells were drilled so that water samples could be taken to determine if contaminants were leaching out from the materials which have been buried at the quarry. During 1977, a six-month water sampling program was initiated. From the data contained in this report, there is no doubt that soluble contaminants have and will continue to escape from the quarry via groundwater through fissures, voids, etc. in the earth's strata. The severity of the effect of the contaminants on the environment and the feasibility and economics of various decommissioning plans for the quarry will have to be explored before proceeding. A possible minimal solution would be the placement of fill within the quarry and grading this fill so that rainfall on the quarry would run off to the west. At present, all rainfall on the quarry either evaporates or seeps into the earth transmitting soluble contaminants to the groundwater. Another possibility is to place materials from decommissioning the Weldon Spring Chemical Plant in the quarry, seal with an impervious layer of clay, and grade so surface water would run off to the west. A more positive solution would be the entombment of the contaminated materials in the quarry. The feasibility of this solution will require extensive study. The grouting of the earth strata under the contaminated materials is highly questionable. Another potential solution is the transfer of contaminated materials from the quarry to another disposal site. (Auth)(PTO)

50

Janke, D.H., H.W. Reno, and L.E. Wickham, EG&G Idaho, Inc., Idaho Falls, ID

Environmental Surveillance for the INEL Radioactive Waste Management Complex

EGG-2128; 49 pp. (1981, December)

The 1980 environmental surveillance report for the Radioactive Waste Management Complex (RWMC) of the Idaho National Engineering Laboratory contains data and discussions about radiological monitoring of the atmospheric, hydrologic, and geologic environments of the RWMC. Included are discussions of selected no

diological pollutants (e.g., chloride). It is concluded that RWMC operations have produced localized effects on existing environments. Additional discussions include results of routine surveillance of two surplus facilities, the Stationary Low-Power Reactor No. 1 Surplus Area and the Organic Moderated Reactor Experiment. (EDB) (JMF)

51

Janke, D.H., and T.P. Zahn, EG&G Idaho, Inc., Idaho Falls, ID

Environmental Surveillance for the INEL Radioactive Waste Management Complex

EGG-2209; 38 pp. (1982, September)

The Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering Laboratory (INEL) was established in 1952 for the disposal of solid radioactive waste generated in national defense programs. Since 1970, transuranic waste (TRU) has been segregated at the facility and placed in above-ground retrievable storage. The monitoring program focuses on detecting movement of radionuclides and nonradiological pollutants in and around the RWMC. Monitoring activities within the RWMC facility are conducted by EG&G Waste Programs Branch personnel. Monitoring outside of the facility is performed by the Department of Energy-Idaho Operations Office (DOE-ID) Radiological and Environmental Sciences Laboratory (RESL). The United States Geological Survey (USGS) monitors subsurface water beneath the INEL. Additional monitoring activities are conducted at two surplus INEL facilities, the Stationary Low-Power Reactor No. 1 (SL-1) surplus area and the Organic Moderated Reactor Experiment (OMRE) area. The SL-1 contains buried contaminated building remnants in several pits and trenches. The OMRE area is a decontaminated and decommissioned reactor facility for unrestricted public use. Both facilities are nonoperational and require less surveillance. This report presents, discusses, and evaluates the 1981 monitoring data for the RWMC and surplus facilities. (Auth) (JMF)

52

Jobst, J.E., EG&G Energy Measurements Group, Las Vegas, NV

An Aerial Radiological Survey of the Argonne National Laboratory and Surrounding Area, Argonne, Illinois - Date of Survey: May 1977

EGG-1183-1824; 26 pp. (1982, December)

An aerial radiological survey was conducted over the facilities of the Argonne National Laboratory in Argonne, Illinois, on May 2-13, 1977. The survey was flown at an altitude of 46 m by a helicopter containing 20 sodium iodide detectors. The line spacing was also 46 m. Enhanced gamma exposure rate levels, which could be attributed to Argonne operations, were observed at many locations. Approximately one-third of the 27 soil samples obtained within the laboratory boundaries show concentrations of radionuclides attributable to laboratory operations, such as tritium, cobalt-60, and separated uranium. The remainder show only the radionuclides common to natural soil and fallout cesium. (Auth)(PTO)

53

Jobst, J.E., EG&G Energy Measurements Group, Las Vegas, NV

An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977

EGG-1183-1775; 29 pp. (1981, January)

An aerial radiological survey was conducted over the facilities of the Fermi National Accelerator Laboratory (Fermilab) near Batavia, Illinois on May 12-14, 1977. The survey was flown at an altitude of 91 m by a helicopter containing 20 sodium iodide detectors. The line spacing was also 91 m. Enhanced gamma exposure rate levels, which could be attributed to Fermilab operations, were observed at seven locations. One additional anomaly, not related to the laboratory, was also discovered. (Auth)(PTO)

54

Jobst, J.E., EG&G Energy Measurements Group, Las Vegas, NV

Aerial Radiological Surveys of Rockwell

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM SITE SURVEYS

International Facilities, Canoga Park, California - Date of Surveys: June and July 1978

EGG-1183-1751; 27 pp. (1979, October)

Aerial radiological surveys were conducted over two facilities operated by the Energy Systems Group, a Division of Rockwell International. The first survey, conducted on June 26-27, 1978 at an altitude of 46 m, was over the headquarters facility in urban Canoga Park, California. The second, on June 29-30 and July 5-8, 1978 was flown at 61 m altitude over the Santa Susana Field Laboratories in the Santa Susana Mountains, about 15 km west-northwest of the headquarters. Twenty sodium iodide detectors were mounted on a helicopter. Enhanced gamma exposure rate levels were observed during both surveys; these levels could be attributed to industrial operations at the survey sites. (Auth)(PTO)

55

Jobst, J.E., and R.A. Semmler, EG&G Energy Measurements Group, Las Vegas, NV

An Aerial Radiological Survey of the Watts Bar Nuclear Plant and Surrounding Area, Spring City, Tennessee

EGG-1183-1842; 17 pp. (1982, September)

An aerial survey of terrestrial gamma radiation was performed during the period April 10 through April 20, 1982 over a 16-kilometer by 16-kilometer (10-mile by 10-mile) area approximately centered on the Watts Bar Nuclear Plant near Spring City, Tennessee. Gamma radiation spectral data were collected while flying a helicopter over a regular pattern of parallel lines spaced 150 meters (500 feet) apart at an altitude of 90 meters (300 feet). All radiation measurements taken at flight altitude are corrected for altitude variations, cosmic radiation, and helicopter background in order to generate exposure rates from terrestrial sources extrapolated to 1 meter above ground level. The data are presented as isoradiation contour maps and show a strong correlation with geological features of the area. The terrestrial radiation levels fall between 3 and 10 microroentgens per hour (uR/h) except for one isolated area measuring between 10 and 20 uR/h over the bottom-ash pile of the coal-fired power plant at Watts Barr which is adjacent to the nuclear plant. All gamma radiation detected within the survey area, including the ash pile, was associated with naturally occurring radionuclides. Direct ground-based measurements at 1-meter height were also taken at four scattered sites within the survey area. These values agree with the contour intervals determined from the aerial measurements and differ from the mean value of adjacent contours by no more than 20%. (Auth)(JMF)

56

Kanehiro, B.Y., V. Guvanasen, A. Smith, and R. Sterrett

Preliminary Characterization and Assessment of the Weldon Spring Low-Level Waste Disposal Site

LBL-12100; Analytic of a report; (pp. 201-203) (1981, July)

The Weldon Spring Quarry was the site for disposal of low-level radioactive wastes between 1960 and 1969, having been previously used for disposal of TNT-contaminated soils during the 1940s. The quarry occupies an 8.6-acre site 4 miles west of the Weldon Spring Chemical Plant and about 20 miles west of St. Louis. The two main objectives of this study are: (1) to characterize and assess the present situation at the site and (2) to obtain sufficient data for predicting the future of the site under existing conditions as well as possible changing conditions in the future. Perhaps the most important finding to date is that uranium has been found outside the quarry both in solid samples of alluvium taken during drilling and in water samples from the wells after completion. Although these wells are close to the quarry walls (approximately 400 ft) the implication is that there is potential for future problems with the municipal wells located down gradient from the quarry. (EDB)(JMF)

57

National Lead Company of Ohio, Feed Materials Production Center, Cincinnati, OH

Weldon Spring Decommissioning Study - Quarry Supplement

Report; 21 pp. (1975)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM SITE SURVEYS

This study was conducted to determine the feasibility of decommissioning the quarry or the possible use of the quarry as a safe and acceptable site for the disposition of radioactive wastes now stored at the Weldon Spring site or any wastes that may be generated by any decommissioning effort at the Weldon Spring site. (Auth)(PTO)

58

Pennak, A.F., J.H. Cavendish, and E.W. Mautz, *National Lead Company of Ohio, Feed Materials* Production Center, Cincinnati, OH

Weldon Spring Decommissioning Study

NLCO-1121; 87 pp. (1975, June 20)

This study was conducted to consider and determine the relative merits and feasibility of available methods for partial or total decommissioning of the ERDA-Weldon Spring site, including the residue slurry storage pits situated therein. Evaluation of potential hazards encountered in the operation of the residue pits as they exist at present, provides the following conclusions: (a) the risk of contaminating underground aquifers used for drinking water purposes is minimal; (b) with proper maintenance of the area and embankments, there is only insignificant risk of pollutant discharge through embankment breeches; (c) seepage or leakage either under or through the embankments is essentially non-existent, and is in no way connected with the existence of the low levels of radioactivity found in on-site and off-site surface drainage; (d) the minor seepages of effluents through the outlet weirs of pits 1, 2, and 3 can be and will be stopped by the plugging of the outlet pipes from the weirs as now planned; (e) the risk of physical harm to trespassers is minimal because of the limited access to the site of the residue pits, and the formidable fence and radioactive material warning signs; and (f) radioactivity at the residue pits is calculated to be at such low levels as to cause insignificant exposures to caretakers in the performance of their usual duties. (Auth)(PTO)(RAF)

59

Simpson, D.R., and J.F. Emery, Oak Ridge National Laboratory, Oak Ridge, TN

Radiological Assessment of the Decontamination and Decommissioning of a Small-Scale Fuel-Reprocessing Plant

CONF-811025; Analytical Chemistry and Nuclear Technology, Proceedings of the 25th Conference, Gatlinburg, TN, October 6, 1981; (6 pp.) (1981, October)

Decontamination and Decommissioning (D&D) of surplus radiological facilities is becoming a major concern as buildings built during the 1940's and 1950's reach the end of their useful lives. Prior to the start of a D&D project, a detailed radiological characterization of the facility is required to determine the nature and extent of residual contamination. The Oak Ridge National Laboratory (ORNL) has recently begun such a characterization of Building 3505, originally called the metal recovery facility, which served as a small-scale fuel reprocessing plant during the 1950's. Extensive contamination remains within areas of the facility, including transuranic (TRU) materials. Laboratory analyses were used in conjunction with in situ measurements of dose rate and contamination levels to determine the current status of the building and surrounding area. This information will be used to estimate the amount of decontamination required and the quantity of radioactive waste. (Auth)(PTO)

60

Tipton, W.J., EG&G Energy Measurements Group, Las Vegas, NV

Aerial and Ground-Based In Situ Measurements for Evaluation and Implementation of Radioactive Site Cleanup

CONF-821103; American Nuclear Society 1982 Winter Meeting, Proceedings of a Conference, Washington, DC, November 14-18, 1982, 813 pp.; (p. 57); Transactions of the American Nuclear Society 43:57 (1982, November)

The Remote Sensing Laboratory has provided in situ measurement support to three major cleanup projects: the Enewetak Atoll cleanup; the cleanup of the Gnome site in New Mexico; and the Phase 1 cleanup at Middlesex, New Jersey. Two distinct types of support were provided. The first involved conducting large-area aerial radiological surveys utilizing a helicopter platform equipped with large arrays of sodium iodide detectors. The second involved more detailed ground-based measurements obtained with high-purity germanium detectors. An aerial survey was flown over the Middlesex

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM SITE SURVEYS

Sampling Plant in Middlesex, New Jersey in 1978. Through fiscal year 1982, aerial surveys have been flown over 12 FUSRAP sites and 19 UMTRAP sites. The Middlesex survey helped to define radium-226 activity within and adjacent to the site and also identified two areas away from the site containing anomalous levels of radium-226. These two areas, first identified from the survey data, were primary objectives of the Middlesex Phase 1 cleanup conducted in 1980. (Auth)(PTO)

61

Voss, M.D., Ames Laboratory, Ames, IA

Environmental Monitoring Summary for Ames Laboratory: Calendar Year 1981

IS-4798; 18 pp. (1982, April)

The summarized data and conclusions from the Ames laboratory effluent monitoring program are presented. The major areas of radiological monitoring were effluent air and water from the decommissioned Ames Laboratory Research Reactor (ALRR) site and the City of Ames, Iowa, sewage plant. The radioisotope of significance in the ALRR effluent air was tritium (H-3). The yearly individual dose at the ALRR exclusion fence was estimated to be 3.79 X 10(E-4) man-rem. The estimated dose to the entire population within an 80 km (50 mile) radius of the ALRR was 6.18 X 10(E-4) man-rem. These values are 7.59 X 10(E-5)% and 6.25 X 10(E-7)%, respectively, of the doses derived from the concentration guides. Tritium was the predominant isotope in the effluent water discharged to the City of Ames sewage system. After dilution with other waste water from the ALRR site, the potential dose was 0.08[illegible]% of the dose derived from the concentration guides. (EDB)(JMF)

62

Weidner, R.B., and M.W. Boback, NLO, Inc., Feed Materials Production Center, Cincinnati, OH

Weldon Spring Storage Site - Environmental Monitoring Report for 1979 and 1980

NLCO-1176; 54 pp. (1982, April 19)

The U.S. Department of Energy (DOE) Weldon Spring Site (WSS) consists of two separate radioactive waste storage properties near Weldon Spring, Missouri: a 52-acre site which is a remnant of the Weldon Spring Feed Materials Plant; and a nine-acre abandoned rock quarry. The larger property has four pits which contained settled sludge from uranium and thorium processing operations. At the quarry, part of the excavation contains contaminated building rubble, scrap, and various residues. During 1979 and 1980, these storage locations were managed by NLO, Inc., contract operator of the DOE Feed Materials Production Center near Cincinnati, Ohio. Air and water samples were collected to provide information about the transfer of radionuclides in the off-site environment. Monitoring results, summarized in this report, show that uranium and radium concentrations in off-site surface and well water were within DOE Guide values for uncontrolled areas. At off-site locations, radon-222 concentrations in air were well within the Guide value. (Auth)(PTO)

63

Wynveen, R.A., V.R. Veluri, W.H. Smith, M.J. Robinet, and H.J. Moe, Argonne National Laboratory, Argonne, IL

Interim Radiological Site Characterization and D&D Status Report - New Brunswick Laboratory, New Jersey Site

ANL-OHS/HP-81-101 (Rev.); 56 pp. (1982, April)

Decontamination and decommissioning was conducted at the New Brunswick Laboratory in New Jersey from March 2, 1981 to September 29, 1981. During that period, all twelve buildings and a cooling tower were dismantled and removed from the site. The only remaining portion of a building for which there is still concern for radioactive contamination is the concrete slab with embedded drain lines, from the former I Building. The site in its present condition has several areas of contamination but they are all contained underground and do not present an immediate hazard. A surveillance and monitoring program is being maintained which includes continued analysis of samples from site vegetation and test wells which will be performed at approximately 3-month intervals. These analyses will serve as early indicators of potential changes in the radiological condition of the site. Changes, if any, are expected to be slow enough to allow early corrective action. (Auth)(JMF)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DECONTAMINATION STUDIES

64

Bennett, W.S., and A.L. Taboas, Argonne National Laboratory, Argonne, IL

Decontamination of Transuranically Contaminated Metallic Waste

CONF-800334; Nuclear Energy, Conservation, and Solar Energy, Proceedings of the Second U.S. Department of Energy Environmental Control Symposium, Reston, VA, March 17-19, 1980, Vol. 2; (pp. 117-130) (1980)

Decontamination of metallic TRU wastes to the point where they can be managed as low-level wastes is technically feasible and economically desirable. In the past, decontamination technology has concentrated on surface washes which are seldom sufficient. Recent developments which concentrate on removing the outer metal surface layers produce far more effective decontamination. Facilities presently under design are incorporating several of these newer processes. These advanced processes are in various stages of development, ranging from laboratory feasibility to full scale demonstrations. Five new decontamination facilities are being designed and will utilize the decontamination technology reviewed here. (EDB)(JMF)

65

Freas, D.G., and W.J. Madia, Battelle Columbus Laboratories, Columbus, OH

Decontamination of Battelle-Columbus Laboratories' Plutonium Facility

CONF-821103; American Nuclear Society 1982 Winter Meeting, Proceedings of a Conference, Washington, DC, November 14-18, 1982, 813 pp.; (pp. 59 60); Transactions of the American Nuclear Society 43:59-60 (1982, November)

The Battelle-Columbus plutonium facility was a contact-handled R&D laboratory covering an area of 5350 sq ft. It contained 28 glove boxes and two fume hoods, and was contaminated with both plutonium-239 and plutonium-238. Actual D&D work was begun in January 1978 by removing all equipment from gloveboxes and laboratory areas. Contaminated waste generated in this program was packaged and disposed of in four basic types of containers that were approved by the recipient waste sites. Surface smear surveys were made of all walls and surfaces in the facility. Soil samples were taken in the trench area to insure that all contamination had been removed from the facility and environs. The results of this survey led to the removal of the holding tanks and disposal of a considerable volume of contaminated soil. The decontamination program is expected to be complete in the summer of 1982. (Auth)(PTO)

66

Garde, R., E.J. Cox, and A.M. Valentine, Los Alamos National Laboratory, Los Alamos, NM

Los Alamos DP West Plutonium Facility Decontamination Project 1978-1981

LA-9513-MS; 29 pp. (1982, September)

The DP West Plutonium Facility operated by the Los Alamos National Laboratory, Los Alamos, New Mexico was decontaminated between April 1978 and April 1981. The facility was constructed in 1944-1945 to produce plutonium metal and fabricate parts for nuclear weapons. It was continually used as a plutonium processing and research facility until mid-1978. Decontamination operations included dismantling and removing gloveboxes and conveyor tunnels; removing process systems, utilities, and exhaust ducts; and decontaminating all remaining surfaces. This report describes glovebox and conveyor tunnel separations, decontamination techniques, health and safety considerations, waste management procedures, and costs of the operation. (Auth)(PTO)

67

Garde, R., E.J. Cox, and A.M. Valentine

Los Alamos DP West Plutonium Facility Decontamination Project

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-67 - IV-79) (1982, October)

The DP West Plutonium Facility operated by the Los

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DECONTAMINATION STUDIES

Alamos National Laboratory, Los Alamos, New Mexico, was decontaminated between April 1978 and April 1981. The facility was constructed in 1944-1945 to produce plutonium metal and fabricate parts for nuclear weapons. It was continually used as a plutonium processing and research facility until mid-1978. Decontamination operations included dismantling and removing gloveboxes and conveyor tunnels; removing process systems, utilities, and exhaust ducts; and decontaminating all remaining surfaces. This report describes glovebox and conveyor tunnel separations, decontamination techniques, health and safety considerations, waste management procedures, and costs of the operation. (Auth)

68

Halter, J.M., R.G. Sullivan, and J.L. Bevan, Pacific Northwest Laboratories, Richland, WA

Surface Concrete Decontamination Equipment Developed by Pacific Northwest Laboratory

PNL-4029; 42 pp. (1982, August)

A major problem associated with nuclear facility decontamination and decommissioning is how to economically demolish and dispose of contaminated concrete. Removing only the contaminated portion of the concrete can substantially reduce costs. Evaluation of various methods for removing concrete surfaces shows that several techniques presently used require excessive manpower, time, and energy. Many times more material is removed than necessary, when removal of 1/4 to 1/2 in. of contaminated surface layer is sufficient. To accomplish this, two unique decontamination methods have been developed at the Pacific Northwest Laboratory (PNL): the concrete spaller and the water cannon. The concrete spaller removes concrete by exerting radial pressure against the sides of a shallow, cylindrical hold (about 2 in. deep X 1 in. diameter) drilled into the surface. Two operators using a platform model can remove approximately 100 sq ft of concrete surface in an hour. An air-powered rotary hammer mounted on a track drills the holes while an operator follows with the hand-held spaller. A vacuum system removes the drilling dust to prevent the spread of contamination. The platform is designed to be handled by most forklifts available today. It is fast and convenient, and the rubble produced is moderately sized for easy handling. Two types of water cannons were tested: a high-speed (rapid-fire) water jet and a modified .458 magnum rifle. It was thought that the high-speed jet would have a distinct advantage over the modified rifle, but because of its weight and size it had to be mounted on a backhoe, which resulted in very slow positioning times. The .458 magnum water cannon fires a small glycerine stick that is formed into a high-velocity stream by a nozzle mounted at the barrel's end. Two operators, one loading the glycerine charges and the other firing the cannon, can remove 9.5 sq ft of concrete surface in an hour. The total cost of using the .458 magnum water cannon was estimated as about $17.75/sq ft of concrete surface. The unit is compact, making it easy to handle, and useful on small surfaces in confined areas. Also, the glycerine tends to capture or encapsulate the dust, preventing most airborne contamination. The concrete spaller is the most efficient technique: it removes the concrete surface faster than the water cannons and at a lower cost (as little as $3.00/sq ft of concrete surface). However, the .458 magnum water cannon may be well suited for small or hard-to-reach locations. (Auth)(JMF)

69

Hazelton, R.F., and M.W. McCoy, Pacific Northwest Laboratory, Richland, WA

Cost-Benefits of a Mobile, Trailer-Contained, Vibratory Finishing Decontamination Facility

PNL-3795; 42 pp. (1982, July)

The objective of this study was to determine the cost-benefits of a vibratory finishing process, developed at Pacific Northwest Laboratory (PNL), which has been used successfully to remove a variety of transuranic (TRU) contaminants from surfaces of metallic and nonmetallic wastes. Once TRU contaminants are removed, the metallic and nonmetallic materials can be disposed of as low-level waste (LLW). Otherwise, these materials would be disposed of in geologic repositories. This study provides an economic evaluation of the vibratory finishing process as a possible method for use in decontaminating and decommissioning retired facilities at Hanford and other sites. Specifically, the economic evaluation focuses on a scoping design for a mobile, trailer-contained facility, which could be used in the field in conjunction with decontamination and decommissioning operations. The capital cost of the mobile facility is estimated to be about $1.09 million including contingency and working capital. Annual operating costs, inclu-

disposal costs, are estimated to be $440,000 for processing about 6340 cu ft/yr of pre-sectioned, TRU-contaminated material. Combining the operating cost and the capital cost, annualized at a discount rate of 10%, the total annual cost estimate is $602,000. The unit cost for vibratory finishing is estimated to be about $11/cu ft of original reference glove box volume. All costs are in first quarter 1981 dollars. Although not directly comparable, the unit cost for the vibratory finishing process is very favorable when considered beside typical, substantially higher, unit costs for processing and geologically disposing of TRU-contaminated materials. However, the costs of vibratory finishing in a fixed facility would be less than those for a mobile facility, principally because the amount of labor could be reduced. A rough estimate for processing the same quantity of material in a fixed vibratory finishing facility, assuming it could be placed in available space in an existing building, indicated that the unit cost would be about $6.70/cu ft of the original reference glove box volume The accuracy of this cost estimate is plus or minus 30%. It is therefore recommended that a detailed cost estimate be prepared if a mobile facility is designed. (Auth)(JMF)

70

Hermetz, R.E., Mound Facility, Miamisburg, OH

The Use of Urethane Foam in the Decontamination and Decommissioning of Nuclear Facilities

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. V-66 - V-71) (1982, October)

The decontamination and decommissioning (D&D) of nuclear facilities described here is taking place at Mound Facility, an installation operated for the Department of Energy by Monsanto Research Corporation, and located in southwestern Ohio. The D&D work at Mound is underway in three areas: the Plutonium Processing Building, the Research Building, and the Waste Transfer System. All areas will be returned to a condition suitable for reallocating the area for other efforts. This work, started in 1978, is a multimillion-dollar effort scheduled to continue through 1987. Urethane foam is being used in a two-part spray system. It is used to coat interior surfaces of gloveboxes for the purpose of 'fixing' contamination. This reduces the effort and cost of providing a safe and easily handled package. It is also used as packing material to stabilize the loads inside shipping containers. These urethane foams have proven to be cost-effective and time-saving. (Auth)

71

Irving, B.A., Pacific Northwest Laboratory, Richland, WA

Three Mile Island Concrete Decontamination Experience

PNL-SA-8855; CONF-800542; Concrete Decontamination, Proceedings of a Workshop, Seattle, WA, May 28-29, 1980, 206 pp.; (pp. 169-178) (1980)

A discussion is presented of concrete decontamination needs, both past and future, resulting from the March 28, 1979, accident at the Three Mile Island Unit II power facility. Included is a description of the initial facility, the conditions immediately following the accident, the immediate post accident recovery phase, the long-term activities for recovery of the diesel generator building, the auxiliary building, and the decontamination of the fuel handling building. Discussion is included of specific decontamination projects associated with both coated and uncoated concrete surfaces. Identification of methods and equipment employed to achieve controlled access to facility components is presented. Source and level of contamination are identified which enables correlation to methods utilized. (EDB)(JMF)

72

Pirro, J., Burns and Roe Industrial Services Corporation, Paramus, NJ

West Valley Feasibility Study

DOE/ET/44207-1; 573 pp. (1981)

The purpose of this report is to present a technical assessment of several proposed methods of decontaminating cell surfaces and removing equipment from the Western New York Nuclear Service Center, West Valley, NY. Five decontamination assessments were evaluated.

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DECONTAMINATION STUDIES

Decontamination of cell surfaces and decontamination and removal of fuel reprocessing cell equipment are required to permit human entry into the cells for the installation of waste solidification equipment. The methods varied from thorough destructive decontamination to equipment removal without decontamination followed by cell wall and floor decontamination. (CAS)(PTO)

73

Schaich, R.W., Oak Ridge National Laboratory, Oak Ridge, TN

The Decontamination of the Curium Source Fabrication Facility

CONF-821103; American Nuclear Society 1982 Winter Meeting, Proceedings of a Conference, Washington, DC, November 14-18, 1982, 813 pp.; (pp. 58-59); Transactions of the American Nuclear Society 43:58-59 (1982, November)

The ORNL Curium Source Fabrication Facility was decontaminated, using standard techniques, to an acceptable contamination level for reuse in future DOE programs. The decontamination program resulted in a minimum of liquid and solid wastes being generated and met the ALARA principle of low radiation dose to personnel. (Auth)

74

Shoemaker, D.C., Rockwell Hanford Operations, Richland, WA

Decontamination of the 233-S Building Loadout Hood

CONF-810217; Waste Management '81, The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs, and Public Communications, R.G. Post (Ed.), Proceedings of an American Nuclear Society Topical Meeting, Tuscon, AZ, February 23-26, 1981, 1210 pp.; (pp. 1023-1034) (1981)

This paper deals with the decontamination experience gained during the decontamination and decommissioning (D&D) operations of the loadout hood within the 233-S Building. The retired 233-S Building (Plutonium Concentration Facility) is being decommissioned as a demonstration project to develop baseline cost, technology, and operational data for the D&D of alpha-contaminated facilities. The loadout hood within the facility is a plutonium nitrate loadout system highly contaminated with transuranics. This paper consists of a brief description of the facility and loadout hood, a summary of the engineering and field work performed, and an evaluation of the technology and methods used. (EDB)(PTO)

75

Shoemaker, D.C., and A.W. Graves, Rockwell Hanford Operations, Richland, WA

Decontamination of the 233-S Building Loadout Hood

RHO-SA-187; CONF-800753; Decontamination Technology Transfer, Proceedings of the U.S. Department of Energy Transuranic Waste Management Program Meeting, Richland, WA, July 29-30, 1980; (p. 26) (1980)

This paper summarizes the engineering and field work conducted to decontaminate the 233-S building loadout hood, a plutonium nitrate loadout facility which was highly contaminated with transuranics. The scope of work supporting the loadout hood decontamination effort included a detailed physical and radiological characterization, decontamination/fixation to reduce surface contamination to levels which would allow structural dismantling to be conducted with minimum airborne contamination, and dismantling to remove contaminated components. Decontamination operations were performed in a deliberate, systematic manner in order to generate data for evaluating the technology and methods used. Pre-dismantling decontamination and fixation efforts were designed to clean loadout hood internal surfaces in-place to nondetectable surface contamination levels as an alternative to dismantling in a loose contamination environment. Results of this approach as well as the effectiveness of a HEPA filtered vacuum cleaner, and several different decontamination chemicals and fixatives are evaluated. Recommendations based on lessons learned are made for future decontamination and decommissioning operations. (EDB)(JMF)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DECONTAMINATION STUDIES

76

Smith, D.L., EG&G Idaho, Inc., Idaho Falls, ID

Decontamination and Decommissioning of Fuel Reprocessing Cells at the Idaho Chemical Processing Plant

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-177 - IV-190) (1982, October)

This paper describes the decontamination and decommissioning of Fuel Process Cells A and B at the Idaho Chemical Processing Plant (ICPP). The cells were inactive and were decommissioned in February and July 1981. Twenty cells remain in operation at the fuel reprocessing facility. Several safety precautions were taken during cell decommissioning: (1) a tent was built over the Cell A hatch to prevent contamination spread; (2) subatmospheric pressure was maintained inside the cells; and (3) work inside the cells was performed by radiation-trained personnel fully dressed in anti-contamination clothing and supplied-air respirators. Workers used pipe cutters and hand-held band saws to cut piping. All waste from both cells was handled as transuranic waste. The total waste volume generated during this project was 28 cu m. Following removal of equipment from the cells, each cell was decontaminated, radiologically characterized, and photographed. (Auth)(JMF)(RAF)

77

Sontag, S.P., R.G. Brengle, and J.M. Dahlke, Rockwell Hanford Operations, Richland, WA

Removal of Sodium for the Sodium Reactor Experiment Primary System

CONF-800401; Liquid Metal Technology for Energy Systems, Proceedings of the Second International Conference, Richland, WA, April 20-24, 1980; (pp. 8.6 - 8.12) (1980)

Removal was accomplished by mechanical and chemical means. Passivation by denatured ethanol was effective for bulk sodium, sodium contained in torturous geometries, and large surface area sodium deposits (frost). Sodium removal from zero gap crevices was not consistently achieved. Disposal of sodium ethoxide containing alcohol was done by adsorption and land burial but is now not acceptable. (EDB)(JMF)

78

Torrisi, S.P., and A.F. Lillie, U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Aberdeen, MD; Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA

Decontamination of the Frankford Arsenal

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-80 - IV-92) (1982, October)

During Frankford Arsenal's 161 years of operation, a variety of activities were conducted, including munitions manufacture, materials R&D, development of propellant and cartridge-actuated devices, and various procurement missions. In 1976, the facility was declared as excess to Army needs, and plans were put into effect to decontaminate and clean up the Arsenal before transferring the property to the General Services Administration (GSA) for subsequent disposition and release for unrestricted use. The contaminants present at the Arsenal included depleted uranium (from development and test activities associated with armor-piercing rounds) and radium (used for fire-control instrumentation/equipment). Most of the radiological contamination at the Arsenal was discovered as the actual decontamination work progressed. Contamination was found behind and underneath building structures (e.g., the target plates in the 316 and 521 firing ranges, the flooring in 46) where the presurvey effort could not have mapped the extent of the contamination. The resulting "search and destroy" operation conducted in the contract-identified buildings was the only viable option available to accomplish the radiological decontamination to the levels required for release of the Arsenal for unrestricted use. Future programs of this type should be viewed in light of this experience. The soil cleanness criterion generated during the Frankfort program (and subsequently approved by the NRC as a guideline for the program) provides a solid precedent for

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DECONTAMINATION STUDIES

future cleanup jobs. The radioactive contamination was of the fixed type. High-pressure foaming of surfaces was ineffective in removing this type of contamination, physical removal of material using scabblers and jackhammers was required. This process is tedious and sometimes slow, but it is very effective. (Auth)(JMF)(RAF)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DISMANTLEMENT AND DEMOLITION

79

Aerojet-General Corporation, Sacramento, CA

Quarterly Progress Report No. 45 for Second Quarter, CY 1968 Covering the Period of January, February, and March 1968

RN-Q-0045; 265 pp. (1968, April)

The NRX-A6 disassembly was completed on February 27, 1968. Postoperative examination of the test article has been essentially completed. Analysis indicates that the reactor operated at or above the designed temperature for 60 minutes without severe degradation of the core elements. The final pre-cold flow testing of the EXCF engine assembly was completed at ETS-1. Cold-flow testing is scheduled to start early in April 1968. Disassembly, clean-up, and reassembly operations of the XE-1 engine continued at NRDS. Testing is scheduled for September 1968. XE-2 UTSM assembly continued at Sacramento and is 90% complete. Aerojet-proposed NERVA technical and programmatic requirements were submitted to SNPO-C on February 1968. Trade-off studies have been performed for the 75,000-lb-thrust engine to determine the relative sensitivity of various parameters and their effect on engine system performance. Other design, testing, and development results are reported. (NSA)(PTO)

80

Boardman, T.J., and T.A. Paulett, Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA

HNPF Retirement Disposition of Sodium

AI-AEC-MEMO-12736 (1968, September 30)

The removal of all bulk sodium from the HNPF site and the chemical reaction of residual sodium in the system are described. A list of all activity specifications and operating procedures covering the tasks at each phase of the operation is provided. The plans, performance, and results of the procedures are described. (DG)

81

Boardman, T.J., and T.A. Paulett, Aerojet-General Corporation, Sacramento, CA

Quarterly Progress Report No. 46 for Third Quarter, CY 1968 Covering the Period of April, May, and June 1968

RN-Q-0046; 301 pp. (1968, April)

XECF was subjected to a successful cold-flow test on ETS-1 on April 11, 1968, after which it was transferred by the EIV to the E-MAD cold bay for external UTSM modification. Subsequently, the XECF has been transferred to E-MAD hot bay, where a remote-cycle demonstration of removal and replacement of the UTSM will be accomplished. The XECF UMA will be returned to Sacramento next quarter for upgrading to the XE-1 configuration. Assembly of the XE-1 is continuing at NRDS, and the XE-2 UMA is being held at Sacramento until all readiness review items have been completed. SNPO-C provided a program requirements document (PRD) for the NERVA engine to Aerojet-General on May 3, 1968 for a 750,000-lb-thrust engine. This document was reviewed, discussed with SNPO and SNPO-C on June 5, 1968, and is being used as the program requirements baseline for the NERVA Program. As a result of the NERVA Task Force activities and the PRD, definitive programs were started to resolve the following major problem areas that are required for definition of the NERVA engine: crew shielding; turbopump selection; and thrust spoiling. (Auth)(PTO)

82

Christensen, E.L., R. Garde, and A.M. Valentine, Los Alamos Scientific Laboratory, Los Alamos, NM

Demolition of Building 12, An Old Plutonium Filter Facility

LA-UR-74-591; CONF-740406; Proceedings of the Second Atomic Energy Commission Pollution Control Conference, Albuquerque, NM, April 16, 1974 (1974, April 16)

The decommissioning and disposal of a plutonium contaminated filter facility at Los Alamos, along with the health physics, waste management, and environmental aspects of the demolition, are described. The filter system had provided ventilation for the main plutonium processing plant at Los Alamos from 1945 until 1974. (Auth)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DISMANTLEMENT AND DEMOLITION

83

Christensen, E.L., R. Garde, and A.M. Valentine, Los Alamos Scientific Laboratory, Los Alamos, NM

Demolition of Building 12, An Old Plutonium Filter Facility

LA-5755; 20 pp. (1975, January)

The decommissioning and disposal of a plutonium-contaminated air filter facility that provided ventilation for the main plutonium processing plant at Los Alamos from 1945 until 1973 are described. The health physics, waste management, and environmental aspects of the demolition are also discussed. (Auth)

84

Clark, J.W., and C.H. Wodtke, Union Carbide Corporation, Linde Company, Birmingham, AL; Oak Ridge National Laboratory, Oak Ridge, TN

Torch Cuts Off "Hot" Plates - Underwater Cutting Solves Radioactive Disposal Problem

The Iron Age 188(2):90 (1961, July 13)

Several perforated diffuser plates had to be removed from inside the highly radioactive core vessel of the Homogeneous Reactor Experiment at Oak Ridge National Laboratory during a maintenance operation. The 1/8 in. Zircaloy-2 plates were 18 ft below working level, and the only way to reach them was through a 2-in. diameter access port. Linde Plasmarc cutting equipment successfully cut the plate into small enough pieces for removal through the access port. (RAF)

85

Dodd, B., and A.G. Johnson, Oregon State University, Corvallis, OR

Decommissioning of the Oregon State University AGN-201 Reactor

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-124 - IV-135) (1982, October)

A brief description and history of Oregon State University's (OSU) AGN-201 Reactor is presented. This is followed by an outline of the disassembly procedure and a description of the radiation protection aspects of the complete decommissioning. The OSU AGN-201 reactor was a small research and training reactor designed to operate at a maximum power of 0.1 watt. The core of the reactor is made up of a number of 0.25-m diameter discs consisting of a mixture of polyethylene and UO2. The uranium is enriched to approximately 20% in uranium-235. The core, along with the top and bottom graphite reflector is enclosed in an aluminum tank designed to contain any fission product gases produced. No major problems were encountered in the disassembly process, no radioactive contamination was found on the reactor components, and the radiation dose rates involved were very low. The only measurable radioactivity was on those items known to contain radioactive materials. (Auth) (JMF)

86

Harper, J.R., and R. Garde, Los Alamos National Laboratory, Los Alamos, NM

The Decommissioning of a Tritium Contaminated Laboratory

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-136 - IV-149) (1982, October)

A tritium laboratory facility at the Los Alamos National Laboratory, Los Alamos, New Mexico, was decommissioned in 1979. The project involved dismantling the laboratory equipment and disposing of the equipment and debris at an on-site waste disposal/storage area. The laboratory, constructed in 1953, was in service for tritium research and fabrication of lithium tritide components until 1974. The major features of the laboratory included 25 meters of gloveboxes and hoods, associated vacuum lines, utility lines, exhaust ducts, electrodryers, blowers, and laboratory benches. This report presents detail

the decommissioning, health physics, waste management, environmental surveillance, and costs of the operation. (Auth)

87
Kline, W.H., T.J. Lahey, and H.J. Moe, Argonne National Laboratory, Argonne, IL

Decommissioning a Plutonium Fabrication Facility

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-52 - IV-66) (1982, October)

In 1973, Argonne National Laboratory began consolidating and upgrading its plutonium-handling operations with the result that a research fuel-fabrication facility shutdown and was declared surplus. Sixteen of the 23 gloveboxes which comprised the system were dismantled and relocated for reuse or placed into controlled storage during 1974 but, due to funding constraints, full-scale decommissioning did not start until 1978. Since that time the 14 remaining contaminated gloveboxes, including all internal and external equipment as well as the associated ventilation systems, have been assayed for radioactive content, disassembled, size reduced to fit acceptable packaging and sent to a U.S. Department of Energy transuranic (TRU) retrievable-storage repository or to a low-level nuclear burial site. The project required 4 1/2 years to complete, 30 man-years of effort, produced some 560 cu m (20,000 cu ft) of radioactive waste of which 70% was TRU, and cost around 2.2 million dollars. (Auth) (JMF)(RAF)

88
Lawrence Livermore Laboratory, Livermore, CA

Pluto Quarterly Report No. 11, January-March 1962

UCRL-6890; 187 pp. (1962, April 4)

Information is presented concerning the Tory-2A disassembly operations; BeO and ceramic materials properties; and Tory-2C neutronics, control system, and core structures. (DCC)

89
Lawrence Livermore Laboratory, Livermore, CA

Pluto Quarterly Report No. 12, April-June 1962

UCRL-6992; 231 pp. (1962, July 10)

Information is presented concerning the disassembly of the Tory-2A core; fuel element fabrication; physical properties of BeO; Tory-2C physics calculations; Tory-2C control rod drives and control system electronics; and Tory-2C core structures. (DCC)

90
Link, B.W., and A.F. Voigt, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA; Ames Laboratory, Ames, IA

Decommissioning of Ames Laboratory Research Reactor

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-19 - IV-38) (1982, October)

The Ames Laboratory Research Reactor (ALRR) was constructed between 1961 and 1965 on a 35-acre open site about 1 1/2 miles from the Iowa State University campus and the rest of the Ames Laboratory facilities. Initial criticality was attained in February and full power in July 1965. Full-time operation was initiated in June 1966. Final reactor shutdown occurred on December 31, 1977, with an accumulation of 1.52 X 10(E+4) megawatt days. The reactor decommissioning program was initiated at that point, and was essentially completed by October 1, 1981. Total radiation exposure for the decommissioning program was 69.4 man-rem distributed among 92 persons. The total cost of the program was 4.335 million dollars. Although the initial intent was to be able to release the facility for unrestricted use on completion of decommissioning, the widely dispersed presence of low-level fixed radioactivity on reactor room surfaces and in imbedded piping resulted in the application of a "monitored use" criterion. (Auth)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DISMANTLEMENT AND DEMOLITION

91

Lynch, T.W., and R. Mooers, Nuclear Control Corporation, Anaheim, CA

Demolition and Removal of a Research Reactor Biological Shield

Transactions of the American Nuclear Society 39:996-998 (1981)

The Ames Laboratory Research Reactor (ALRR) biological shield was demolished by manipulating a hydraulic ram with a backhoe boom. Approximately 190 cu yd of magnetite and 125 cu yd of regular concrete was broken, boxed, and transported for burial. The working distance gained by using this semi-remote equipment was significant in reducing exposure from contact field of up to 16 R/hr. The high production rate of conventional equipment also decreased residence time and absorbed dosages to personnel. The entire project was completed in 13 weeks which also included approximately 55 cu yd of additional facilities for a total of 320 cu yd. While radiation doses to personnel were kept to acceptable levels, it is evident that larger scale projects will require utilization of more sophisticated remote technologies. It is significant that conventional equipment was used successfully without modification. (PTO)

92

Norman, C.

Long-Term Problem for the Nuclear Industry

Science 215:376-379 (1982, January)

Dismantling the 24-year-old Shippingport Atomic Power Station over the next two years will test whether the nuclear industry can safely dispose of high-level radioactive facilities. Recent findings that some components will remain radioactive longer than anticipated may require dismantling instead of the permanent entombment the industry was planning. The five-year dismantlement will cost $40 million and generate 11,7000 cubic meters of radioactive waste. Larger reactors will be even more costly. Current regulations require utilities to choose between dismantlement, safe storage, or entombment of contaminated materials. Each has its problems, but the industry objects to an evolving policy for dismantling and an accompanying requirement for a segregated decommissioning fund that would be set aside before a reactor begins operating or during plant lifetime. The latter would require an adequate insurance mechanism to cover premature shutdown. (DCK)(EDB)(JMF)

93

Phillips, D.A., Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA

SRE Underwater Plasma Arc Cutting Development Test Report

DOE/SF/75008-T6; 69 pp. (1976)

Methods and equipment for cutting stainless steels and carbon steels in air and under water using plasma arc torches are discussed. (LCL)(PTO)

94

Predergast, J.T., Savannah River Laboratory, Aiken, SC

Decommissioning Alternatives for Savannah River Plant High-Level Waste Tank 16

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-85 - VII-98) (1982, October)

As part of the waste management operations at the Savannah River Plant (SRP), 24 waste tanks will be removed from service in the next 10 years. These tanks stored high-activity fission-product waste from nuclear fuel reprocessing operations at SRP. Waste Tank 16, in H Area at SRP had earlier been removed from service in 1972 due to containment problems and later emptied. This report, using Tank 16 as a basis, assesses costs and radiological doses for four methods of decommissioning: 30-year layaway, immediate entombment, immediate dismantlement, and 30-year delayed dismantlement. The 30-year layaway alternative would cost about $0.9 million with a workforce dose of about 2 man-rem. Immediate entombment would cost about $4 million with

occupational dose of 10 man-rem. Immediate dismantlement would cost about $36 million; the workforce dose would be approximately 93 man-rem. The 30-year delayed dismantlement alternative would cost about $32 million with an associated workforce dose of 47 man-rem. All costs are in 1982 dollars and are not discounted. (Auth)(JMF)

95

Quarterly Progress Report No. 48 for First Quarter, CY 1969 Covering the Period of October, November, and December 1969

RN-Q-0048; 246 pp. (1969, February)

Progress in the NERVA engine development program during the first quart . of CY-1969 is reported. (JWR) (PTO)

96

Smith, D.L., EG&G Idaho, Inc., Idaho Falls, ID

Final Report - Decontamination and Decommissioning of TAN Radioactive Liquid Waste Evaporator System (PM-2A)

EGG-2236; 47 pp. (1983, March)

This report describes the decontamination and decommissioning of the Test Area North (TAN) liquid waste evaporator system (PM-2A). The PM-2A facility included the aboveground evaporator system, two underground holding tanks and feedlines, an electrical distribution subsystem, and one aboveground concrete tank. Much surface soil of the PM-2A area was also radioactively contaminated. Stabilization of the liquid and sludge in the holding tanks, a major task, was achieved by pumping most of the liquid into 55-gallon drums and mixing it with cement. The drums were buried in the Radioactive Waste Management Complex (RWMC). The remaining liquid and sludge were dried in place by layers of diatomaceous earth. The most contaminated surface soil was removed, and the area backfilled with clean topsoil and graded, reducing the surface radiation field to background. A 6-foot high chain link fence now surrounds the area. Most of the area was seeded to 'ed wheatgrass. (Auth)(PTO)

97

Thompson, M.L., and E.F. Kurtz, General Electric Company, Sunnyvale, CA

General Electric Fuels Laboratory Decontamination and Decommissioning

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-162 - IV-172) (1982, October)

The General Electric Fuels Laboratory was a licensed facility located at the Vallecitos Nuclear Center (VNC), near Pleasanton, California, and was utilized for mixed oxide, (Pu+U)O2, fuel fabrication and development since 1962. Principal functions included the fabrication of test and demonstration fuel for six test reactors and four commercial reactors; development and demonstration of innovative processes for plutonia and urania-plutonia conversion, mixed oxide fuel fabrication, fuel rod and bundle fabrication, and scrap recovery and recycle; material property studies; and specialized activities such as inspection and coating of the SNAP 27 power source for the Apollo moon missions. This paper describes the decontamination and decommissioning activities initiated in 1979 and completed in 1982. The primary activities included Special Nuclear Materials (SNM) conversion, packaging and shipping; and equipment and glovebox decontamination, removal, packaging and shipping. (Auth)(JMF)

98

U.S. Atomic Energy Commission, Directorate of Licensing, Washington, DC

Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 37

DOCKET-50016-192; 2 pp. (1973, April 25)

A technical specifications change which allows the sodium level in the reactor vessel to be lowered to facilitate retirement of parts of the primary system of the Enrico Fermi Atomic Power Plant, Unit 1 is described. (JWR)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM DISMANTLEMENT AND DEMOLITION

99

Ureda, B.F., Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA

KEWB Facilities Decontamination and Disposition: *Final Report*

AI-ERDA-13159; 51 pp. (1976, February)

The decontamination and disposition of the KEWB facilities, Buildings 073, 643, 123, and 793, are complete. All facility equipment, including reactor enclosure, reactor vessel, fuel handling systems, controls, radioactive waste systems, exhaust systems, electrical services, and protective systems were removed from the site. Buildings 643, 123, and 793 were completely removed, including foundations. The floor and portions of the walls of Building 073 were covered over by final grading. Results of the radiological monitoring and the final survey are presented. (Auth)(EDB)(JMF)

100

Voigt, A.F., Ames Laboratory, Ames, IA

Decommissioning the Ames Laboratory Research Reactor: A Brief Pictorial Report

IS-4787; 50 pp. (1981)

The Ames Laboratory Research Reactor (ALRR) was designed in 1960-1961 and constructed in 1961-1965. It achieved criticality on February 17, 1965 and was put in full operation on July 12, 1965. Full time operation at its full power of 5 megawatts was begun in June 1966 and continued through December 1977, producing a total of 15,200-megawatt days of thermal energy. The decision to shut down the reactor at the end of 1977 was made in the summer of 1977. Planning and document preparation for decommissioning began at that time. The goal of removing all reactor-related radioactivity and the realization that the building constituted a valuable asset led DOE to select removal of the reactor pedestal as the degree of decommissioning to be undertaken and budgeted. In planning, the work was divided into the following four phases and each of these into a number of tasks: (1) placing the reactor in stand-by status; (2) disposal of removable parts; (3) deactivation; and (4) removal of reactor pedestal. This report gives a detailed account of this operation with photos taken at various stages of the operation. (GRA)(JMF)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM LAND DECONTAMINATION AND RECLAMATION

101

Boothe, G.F., Rockwell Hanford Operations, Richland, WA

Surface Soil Contamination Standards for Rockwell Hanford Operations

RHO-SA-153; CONF-791234; Environmental Decontamination, Proceedings of a Workshop, Oak Ridge, TN, December 4-5, 1979, 256 pp.; (p. 18) (1979, December)

The four basic radiation protection criteria (external radiation, ingestion of radioactivity, concentrations of radioactivity in air, and concentrations of radioactivity in water) can be met for each type of contamination by deriving contamination limits in the manner described below and adopting the most restrictive limit as a standard. Four separate limits for average soil contamination are developed below. These limits are derived from four conditions that may result in human radiation dose: external radiation, ingestion of soil, airborne radioactivity, and radioactivity in water. The most restrictive limit for each radionuclide is taken as the average surface soil contamination standard. The average surface soil contamination standard is then used to develop aerial contamination standards and spot contamination standards. (Auth)

102

Boothe, G.F., Hanford Engineering Development Laboratory, Richland, WA

Surface Soil Contamination Standards

RHO-CD-782; 24 pp. (1979, October)

The purpose of this document is to define surface soil contamination limits for radioactive materials below which posting, restrictions and environmental controls are not necessary in order to protect personnel and the environment. The standards can also be used to determine if solid waste or other material is contaminated relative to disposal requirements. The derivation of the standards is given. (EDB)

103

Brouns, R.A., and C.L. Timmerman, Pacific Northwest Laboratory, Richland, WA

In Situ Vitrification of Contaminated Soil: Pilot-Scale Field Testing

Transactions of the American Nuclear Society 41:99-100; CONF-820609; American Nuclear Society 1982 Annual Meeting, Proceedings of a Conference, Los Angeles, CA, June 6-10, 1982; (pp. 99-100) (1982, June)

The application of in situ vitrification to buried simulated wastes was first tested in the laboratory on an engineering scale by melting about 45 kg of Hanford soil per test. After developing reliable materials, electrical systems, startup techniques, operating sequences, and scale-up correlations, a pilot-scale system was designed and tested in late 1981. This paper describes the test setup and results of initial pilot-scale in situ vitrification field tests. (Auth)(PTO)

104

Carroll, J.W., J.M. Marzec, and A.M. Stelle, Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA

RMDF Leach Field Decontamination - Final Report

ESD-DOE-13385; 61 pp. (1982, September)

The objective of the decontamination effort was to place the Radioactive Materials Disposal Facility (RMFD) leach field in a condition suitable for release for unrestricted use. The RMDF at the Santa Susana Field Laboratory (SSFL) of the Energy Systems Group (ESG) of Rockwell International is used to support the decommissioning activities of other government facilities at the SSFL. Certain features of the RMDF are no longer required for the decommissioning support operation. These are decommissioned as time and money permit. One of these features, the leach field, served as an on-site sanitary sewer disposal area before the central sewage disposal system accepted the sanitary wastes. Radioactively contaminated soil was excavated from the leach field to produce a condition of contamination as low as reasonably achievable (ALARA). The contaminated soil was boxed and shipped to an NRC-licensed burial site at Beatty, Nevada, and to the DOE burial site at Hanford, Washington. The soil excavation project successfully reduced the contamination level in the leach field to

background levels, except for less than 0.6 mCi of Sr-90 and trace amounts of Cs-137 that are isolated in cracks in the bedrock. The cracks are greater than 10 ft below the surface and have been sealed with a bituminous asphalt mastic. A pathways analysis for radiation exposure to humans from the remaining radionuclides was performed, assuming intensive home gardening, and the results show that the total first year whole body dose equivalent would be about 0.1 mrem/year. (Auth)(JMF)

105

Fore, C.S., R.A. Faust, and R.H. Brewster, Oak Ridge National Laboratory, Information Division, Oak Ridge, TN

Cleanup and Treatment of Radioactively Contaminated Land Including Areas Near Nuclear Facilities: A Selected Bibliography

ORNL/EIS-199; 241 pp. (1982, September)

Since January 1972, the Nevada Applied Ecology Information Center (NAEIC) of the Hazardous Materials Information Center, Information Center Complex, Information Division, Oak Ridge National Laboratory, has provided technical information support to the Nevada Applied Ecology Group (NAEG) relevant to the movement of plutonium and the transplutonics in the environment. In October 1977, NAEG began focusing its efforts on the cleanup and treatment of radioactively contaminated land. This annotated bibliography of 337 references summarizes the literature published on this subject area. Specifically, this bibliography focuses on literature concerned with: the methods of cleanup and treatment being applied - chemical, physical, or vegetative stabilization; the types of equipment being used; and the influence of climatic conditions on the method selected for use. The emphasis in such literature is placed on hazardous site cleanup efforts that have been completed as well as those that are in progress and are being planned. Appendix A includes 135 additional references to literature identified by NAEIC but not included in the bibliography because of time and funding constraints. Appendix B consists of a table that identifies the cleanup and treatment research conducted at specific sites. All of the information included in this bibliography is stored in a computerized form that is readily available upon request to NAEG or its contractors. (Auth)

106

Fraley, L., Jr., Colorado State University, Department of Radiology and Radiation Biology, Fort Collins, CO

Revegetation Following Artificial Disturbance

COO-2743-2; 18 pp. (1977, April)

Seedbeds were prepared and seedlings developed in May, August, and September of 1976 using five different seed mixtures at Rocky Flats. The mixture consisted of crested wheatgrass, western wheatgrass, sand dropseed, buffalograss, and sideoats grama. The vegetation that received chronic exposure to irradiation appeared to be at equilibrium as measured by diversity or coefficient of community with a 50% response value of approximately 15 R/hr. Recovery patterns in the short-term seasonally exposed vegetation and those non-irradiated plots that were burned, scraped or rototilled were essentially the same as the previous year. Diversity values had returned to normal in all plots. Cover by BOUTELOUA GRACILIS had returned to normal in the burned plots and in those partially damaged by ionizing radiation. The cover of B. GRACILIS was essentially zero in the plots that were scraped and in those that were damaged by ionizing radiation. Experiments to relate chromosome damage in plants by alpha emitters were initiated. No results have been obtained to date. (RAF)(PTO)

107

Fraley, L., Jr., Colorado State University, Department of Radiology and Radiation Biology, Fort Collins, CO

Revegetation Following Artificial Disturbance

COO-2743-3; 8 pp. (1978, May 2)

Two seedings at the Rocky Flats Plant were made. All studies related to this project were discontinued during August 1977. The irradiation at the grasslands site continued. No changes were detected in the chronic irradiation studies. Vegetation in the disturbed plots (irradiated, burned, scraped, or tilled) continued to recover and/or move through secondary succession. Chromosome aberration studies continued using P-32 internal to

plant and an external gamma source to induce the aberrations. ORNITHOGALUM VIRENS was selected as a model species. (Auth)(PTO)

108

Fraley, L., Jr., Colorado State University, Department of Radiology and Radiation Biology, Fort Collins, CO

Revegetation Following Artificial Disturbance

COO-2743-4; 28 pp. (1978, May 2)

The objectives of this study were: (1) to determine a rapid and feasible method of revegetation; (2) to determine a revegetation method such that the vegetation will revert to a "natural" system as rapidly as possible; and (3) to develop a predictive model for soil movement by wind during the revegetation period. This three-year report is divided into two sub-project reports; one dealing with the Rocky Flats Plant and one dealing with the grasslands irradiation study. (PTO)

109

Navratil, J.D., and R.L. Kochen, Rockwell International, Energy Systems Group, Rocky Flats Plant, Golden, CO

Decontamination of Soil Containing Plutonium and Americium

RFP-3139; 8 pp. (1982, March 27)

A primary process has been developed to reduce the volume of soil contaminated with plutonium and americium. The process consists of wet screening methods which reduce the volume of contaminated soil by approximately 65%. Investigations of secondary and tertiary processes were initiated. The processes consist of attrition scrubbing and wet screening with various dispersing agents, and calcination. The attrition scrubbing-screening yields additional soil volume reduction. Final volume reduction was obtained by calcining the contaminated fraction of the processed soil. (Auth)

110

Orcutt, J.A., and E.R. Sorom, Reynolds Electrical and Engineering Company, Inc., Las Vegas, NV

The Gnome Site Decontamination and Decommissioning Project

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-173 - IV-176) (1982, October)

The Gnome site, located approximately 48 kilometers southeast of Carlsbad, New Mexico, was selected in 1960 for the first experiment in the Plowshare Program. Gnome was detonated December 1, 1961 in bedded rock salt, 361 meters below the surface, with a nuclear yield of 3.1 kilotons. During 1968-1969, a decontamination and decommissioning (D&D) operation was accomplished within guidelines that specified removal of all contaminated material above 0.1 mR/hr beta plus gamma as measured with a 30 mg/sq cm Geiger-Mueller portable survey instrument. During an inspection of the site in April 1972, exposed radioactive debris was discovered in the salvage yard and the contaminated waste dump. The contaminated debris had previously been covered by 0.6 meter of clean earth fill. Radiation threshold levels of concern and measurement had also become more conservative since the 1968-1969 cleanup. For these reasons, in July 1977, DOE/Headquarters directed DOE/Nevada to design a D&D plan for the Gnome site. The plan incorporated three distinct phases. During Phase I, both aerial and ground radiological surveys were conducted on the site. Radiological decontamination criteria were established, and a decontamination plan was developed based on the radiological survey results. During Phase II, site preparatory and rehabilitation work was completed. The actual land area decontamination was accomplished during Phase III with conventional earthmoving equipment. A gravity water injection system deposited 36,700 metric tons of contaminated soil and salt in the Gnome cavity. After completion of the decontamination and decommissioning operations, the Gnome site was returned to the Bureau of Land Management for unrestricted surface use. (Auth)(JMF)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM LAND DECONTAMINATION AND RECLAMATION

111

Soldat, J.K., M.A. Mueller, W.E. Kennedy, Jr., and B.E. Vaughan, Battelle Pacific Northwest Laboratories, Richland, WA

Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences

PNL-4100 (Part 2); 157 pp. (1982, February)

A review of existing and proposed radioactive soil contamination standards and guidelines was conducted for United Nuclear Corporation (UNC), Office of Surplus Facilities Management. The more applicable standards were reviewed, evaluated, and summarized. Information pertaining to soil contamination for both facility operation and facility decommissioning was obtained from a variety of sources. Most of the information reviewed was consistent with the philosophy of maintaining exposures at levels as low as reasonably achievable (ALARA). (EDB)(JMF)

112

Stevens, J.R., R.L. Kochen, D.W. Rutherford, G.A. Riordan, and I.C. Delaney, Rockwell International, Energy Systems Group, Rocky Flats Plant, Golden, CO

Comparative Scrub Solution Tests for Decontamination of Transuranic Radionuclides from Soils

RFP-3161; 31 pp. (1982, August)

Soil decontamination tests were done using three scrubbing solutions on five different transuranic-contaminated soils from Department of Energy sites. The soils came from Rocky Flats, Colorado; Hanford, Washington; Mound Facility, Ohio; Idaho National Engineering Laboratory, Idaho; and Los Alamos National Laboratory, New Mexico. Decontamination was effected by physical and chemical means. A pH 12.5 scrub effected decontamination by serving as a hydraulic grading and attrition scrub medium; this solution did not solubilize the actinide contamination. A 2% HNO2, 0.2% HF, 2% pine oil, and 5% Calgon solution achieved decontamination by physical and chemical means; this solution solubilized both particulate actinides and actinides dispersed on the surface of soil particles. A 2N HCl scrub was also used to effect decontamination by physical and chemical means; this reagent solubilized soil constituents by removing contamination that had migrated into mineral surfaces. Only Rocky Flats soil was effectively decontaminated by the high pH solution although all soils had an enrichment of the activity in the -150-mesh fraction. Attrition scrubbing with both acid solutions had a better decontamination efficiency for the +150-mesh fraction for Hanford, INEL, and LANL soils. In addition, the acid solutions solubilized some of the plutonium and had a decontamination effect on the fine fractions. (EDB)(JMF)(RAF)

113

Stevens, J.R., and D.W. Rutherford, Rockwell International, Energy Systems Group, Rocky Flats Plant, Golden, CO

Separation of Transuranic Radionuclides from Soil by Vibratory Grinding

RFP-3296; 16 pp. (1982, August)

Experiments were conducted to test the effectiveness of a vibratory grinder (Roto-Finish - Spiratron ST-1) for the separation of transuranic elements such as plutonium from contaminated soil. Four scrubbing solutions were tested to add varying degrees of chemical action to the physical action of the attrition grinder. The scrub solutions were: water; aqueous NaOH - pH 12.5 (high pH solution); 2% HNO3, 0.2% HF, 5 wt % Calgon, 2 vol % pine oil (weak acid plus surfactant); and 2N HCl (strong acid). All four scrub solutions reduced the greater than 35-mesh portion of the test soil from approximately 7000 dpm/g plutonium-239 to approximately 30 dpm/g or less. The weak acid/surfactant and the strong acid solutions produced the best decontamination. The high pH, weak acid/surfactant, and strong acid solutions all appeared to increase the rate of decontamination as compared to water only. These experiments decontaminated 85% of the Rocky Flats soil tested to levels which could meet EPA screening levels for unrestricted use. (EDB)(JMF)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM WASTE DISPOSAL

114

Brown, C.M., Rockwell International, Energy Systems Group, Rocky Flats Plant, Golden, CO

Economic Evaluation of Volume Reduction for Defense Transuranic Waste

RFP-3245; 34 pp. (1982, March)

This topical report is an economic evaluation comparing the costs of volume reduction of stored and newly generated U.S. Department of Energy (DOE) transuranic wastes (TRU) with the savings in transportation and disposal of the wastes. The study is intended to provide information to help determine the strategy, technology development, and facility plans for the placement of DOE TRU waste in the Waste Isolation Pilot Plant (WIPP). This study was performed in support of the Transuranic Lead Organization. The organization provides technology for management of TRU waste from the point of generation through readiness for delivery to a permanent repository. Part of its activities includes a system analysis effort to provide comprehensive, systematic methodology and support to understand the options for national long-term management of TRU waste. The analysis effort supports two program responsibilities which include identifying and integrating technical issues into a national program strategy and providing cost/benefit analysis for alternate strategies, technologies, and facility plans. (Auth)(JMF)

115

Brown, C.M., Rockwell International, Energy Systems Group, Rocky Flats Plant, Golden, CO

Economic Comparison of Centralizing or Decentralizing Processing Facilities for Defense Transuranic Waste

DOE/AL/TRU-8003; 38 pp. (1980, July)

This study is part of a set of analyses under direction of the Transuranic Waste Management Program designed to provide comprehensive, systematic methodology and support necessary to better understand options for national long-term management of transuranic (TRU) waste. The report summarizes activities to evaluate the economics of possible alternatives in locating facilities of process DOE-managed TRU waste. The options considered are: (1) facilities located at all major DOE TRU waste generating sites; (2) two or three regional facilities; and, (3) central processing facility at only one DOE site. The study concludes that processing at only one facility is the lowest cost option, followed, in order of cost, by regional then individual site processing. (Auth)(JMF)

116

Carter, W.L., B.C. Finney, C.W. Alexander, J.O. Blomeke, and J.M. McNair, Oak Ridge National Laboratory, Oak Ridge, TN

Spent Fuel and Waste Inventories and Projections

ORO-7[illegible]8; 88 pp. (1980, August)

Current inventories of commercial spent fuels and both commercial and U.S. Department of Energy radioactive wastes were compiled, based on judgments of the most reliable information available from government sources and the open literature. Future waste generation rates and quantities to be accumulated over the remainder of this century are also presented. This is based on a present projection of U.S. commercial nuclear power growth and expected defense-related activities. Spent fuel projections are based on the current DOE/EIA estimate of nuclear growth, which projects 180 GW(e) in the year 2000. It is recognized that the calculated spent fuel discharges are probably high in view of recent reactor cancellations; hence adjustments will be made in future updates of this report. Wastes considered, on a chapter-by-chapter bases, are: spent fuel, high-level wastes, transuranic wastes, low-level wastes, mill tailings (active sites), and remedial action wastes. The latter category includes mill tailings (inactive sites), surplus facilities, formerly utilized sites, and the Grand Junction Project. For each category, waste volume inventories and projections are given through the year 2000. The land usage requirements are given for storage/disposal of low-level and transuranic wastes, and for present inventories of mill tailings. (EDB)(JMF)

117

Cohen, J.J., C.F. Smith, M.E. Spaeth, F.J. Ciminesi, P.T. Dickman, and D.A. O'Neal, Science Applications, Inc., Pleasanton, CA; Reynolds Electrical and Engineering Company, Inc., Las Vegas, NV

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM WASTE DISPOSAL

Assessment of Change in Shallow Land Burial Limits for Defense Transuranic Waste

DOE/NV/00410-72 (1983, March)

There is an emerging consensus within the waste management technical community that the current concentration limit of 10 nCi/g for shallow land burial (SLB) of transuranic (TRU) waste is excessively restrictive. A concentration limit for SLB in the range of 100 to 1000 nCi/g is reasonable and justifiable based upon these reasons: (1) resultant increase in collective radiation dose (total population dose) would be very small, and the net detriment to public health would be negligible; (2) increasing the limit is cost-effective and could save hundreds of millions of dollars for the national economy over time; (3) the hazard resulting from the increased SLB limit for TRU would be significantly less than that due to many naturally occurring mineral deposits and/or human activities; (4) expenditure directed toward health and safety conform to the economic law of diminishing returns. Excessive restriction of the TRU concentration limit for SLB needlessly diverts limited resources from other areas of health and safety where they might be more beneficially applied; and (5) despite considerable effort, this study did not find any compelling technical argument to maintain the limit for TRU in SLB at 10 nCi/g. Several scientific assessments of the 10 nCi/g limit indicate that the limit could be increased. Atomic Energy Commission Manual Chapter 0511 which provided this initial guidance in 1973, stated specifically that the limit value "is subject to modification." Abundant evidence has subsequently been gathered to justify a modification. Considering this evidence, from both a public health and an economic standpoint, raising the allowable concentration limit for near surface burial of transuranic wastes is justified. This report is comprised of the following chapters: Overview; History and Background; Special Concerns Associated with TRU Waste; Summary of Previous Studies Providing Concentration Guidelines for TRU Disposal; Natural Analogs Indicate a Higher TRU Concentration Guideline is Reasonable; Comparison with Lead Provides a Useful Perspective on the Potential Hazards of Transuranic Waste; TRU Quantities and Distribution; Predicted Radiological Consequences Related to TRU Concentrations; Cost/Benefit Analysis; Economic Impacts; and Conclusions Derived from Current Study. (Auth)(PTO)

118

Commander, J.C., Aerojet Nuclear Company, Idaho Falls, ID

Decontamination and Decommissioning of the EBR-1 Complex, Topical Report No. 1 - Removal of NaK from EBR-1 Storage Pit

ANCR-1166; 13 pp. (1974, June)

Radioactively contaminated waste from the First Experimental Breeder Reactor (EBR-1) Mark II core meltdown has been stored at the EBR-1 storage pit since 1955. The objective of this activity was to remove the waste material from the storage pit to another temporary storage area. Prior to performance of this work, it was necessary to conduct a radiation survey, perform a radiation and chemical hazards evaluation, select alternative storage, develop an operating procedure, and fabricate special handling tools. The radiation survey indicated activity levels of 200 mR/hr at the top of the sodium-potassium eutectic alloy (NaK) storage pit, and levels at contact with the waste packages ranging from 500 mR/hr to 7 R/hr. The radiation hazards evaluation established the shielding requirements and the necessity for remote handling tools for removal of the waste packages from the pit. In addition, it was established that no criticality accidents could occur as a result of rearranging the waste packages. The chemical hazards evaluation provided assurance that the work of moving the waste packages could be accomplished without risk of explosion due to the reaction of the NaK with potassium superoxide (KO2). A survey of excessed National Reactor Testing Station (NRTS) facilities was performed which resulted in the selection of the Army Re-Entry Vehicle Facility Site (ARVFS) bunker for temporary storage of the radioactively contaminated waste packages. NaK removal, transportation and restorage procedures were developed and approved by AEC-ID. The procedure and all required equipment and handling tools were checked out during a rehearsal conducted prior to the scheduled work of NaK removal from EBR-1. The radioactively contaminated packages of NaK were removed from the EBR-1 storage pit on April 4, 1974 and transported across the NRTS to the ARVFS bunker where they were placed in temporary storage, secure from public access. All actions associated with this activity were conducted safely and with no incidents. (Auth)(PTO)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM WASTE DISPOSAL

119
EG&G Idaho, Inc., Idaho Falls, ID

Directions in Low-Level Radioactive Waste Management - Transporting Low-Level Waste: Effects of Regional Management

DOE/LLW-6Tb; 8 pp. (1982, November)

This publication discusses the beneficial effects that regional management can have on transporting low-level radioactive wastes. Locations of the three currently operating disposal sites, one each in South Carolina, Washington, and Nevada, are widely dispersed and far from the sources of much of the nation's low-level waste. Establishment of regionally located sites would effectively reduce the distance, cost, and hazards of transport. Cited analytic work provides quantitative support of this appraisal. This information is intended, primarily, to assist state officials - executive, legislative, and agency - in the management of commercial low-level radioactive waste. (Auth)(JMF)

120
EG&G Idaho, Inc., Idaho Falls, ID

Waste Classification, a Proposed Methodology for Classifying Low-Level Radioactive Waste

DOE/LLW-14T; 50 pp. (1982, December)

Since low-level radioactive waste presents both a chemical and a radiological hazard, it is desirable that management practices take this into account. This paper describes a waste classification system that could provide a basis for such management practices. The classification method formulates the hazard of waste as the ratio of potential exposure or intake to a selected limit. Potential exposure or intake incorporates four factors: (a) the nature and (b) amount of toxic materials disposed in the soil, (c) the availability of the waste to enter an environmental pathway potentially exposing humans, and (d) the decay products. The system could provide guidance on how mixed wastes should be separated for disposal, and the degree of disposal isolation each waste material or shipment needs. Examples of the system's use are proided. (Auth)

121
EG&G Idaho, Inc., National Low-Level Radioactive Waste Management Program, Idaho Falls, ID

Directions in Low-Level Radioactive Waste Management - Low-Level Radioactive Waste Disposal: Commercial Facilities No Longer Operating

DOE/LLW-6Tf; 18 pp. (1982, October)

This publication discusses three commercial facilities, no longer operating, that have received and now contain low-level radioactive waste. The facilities are located at West Valley, New York; Maxey Flats, Kentucky; and Sheffield, Illinois. All three of the facilities were selected and developed in the 1960's. The onset of water management problems caused the closure of the sites at West Valley and Maxey Flats in 1975 and 1977, respectively. Closure of the Sheffield site occurred in 1978, after the operator experienced site problems and consequent lengthy delays in its license renewal procedures. This document provides detailed explanation of the history, basis for closure, and status of each facility. The information is intended to assist state officials (executive, legislative, and agency) in planning for, establishing, and managing low-level waste disposal facilities. (Auth) (PTO)

122
EG&G Idaho, Inc., National Low-Level Radioactive Waste Management Program, Idaho Falls, ID

Directions in Low-Level Radioactive Waste Management - An Analysis of Low-Level Waste Disposal Facility and Transportation Costs

DOE/LLW-6Td; 50 pp. (1983, April)

This publication presents a general overview of the costs involved in low-level radioactive waste disposal, including disposal site costs, consequent prices to be paid by waste generators who use the site, and transportation costs. A number of variables influence site costs: the type of site, the size of the site, the rate of return on investment, and method of financing. Site costs are passed on to waste generators, who also bear the costs of transporting waste material to the site. The costs arrived at,

though based on researched data, should be considered only as general estimates. Exact costs are necessarily dependent on specific disposal site conditions and the distance of sources of waste generation to the disposal facility. This information is primarily intended to assist state officials (executive, legislative, and agency) in planning for low-level waste disposal facilities. (Auth)(PTO)

123

EG&G Idaho, Inc., National Low-Level Radioactive Waste Management Program, Idaho Falls, ID

Criteria Needs for Siting, Licensing, Operation, Closure, Stabilization, and Decommissioning of Shallow Land Disposal Sites for Radioactive Waste

DOE/LLW-4T; 43 pp. (1982, November)

The unavailibiity of commercial radioactive waste disposal sites can be attributed to many factors. However, one significant factor has been the lack of criteria, standards, and guidelines in the proper management of LLW. Some disposal sites have encountered problems, resulting in their closure due to the lack of guidance based on sound technical data. Without clear, comprehensive, and nationally accepted criteria, standards, and guidelines, decisions will be fragmented, nonuniform, and will probably result in much slower decision making processes for the proper management of low-level radioactive waste. This document has been developed by state and local government radiation control personnel to identify those areas in which new or additional criteria are needed for the proper management of low-level radioactive waste. When such criteria have been developed, the decisions that must be made to ensure the proper management of low-level radioactive waste should be uniform, but even more importantly, information will be available to make timely decisions. It is strongly recommended that all generators of low-level radioactive waste make every reasonable effort to reduce the volume of such generated waste. Another strong recommendation of the committee is for the development of incentives to encourage community acceptance of a shallow land burial site. Also, guidance is needed in methods of properly informing the general public of benefits and risks of a low-level radioactive disposal site. Finally, the committee believes low-level radioactive waste accountability needs to be improved on a state-by-state basis. A "cradle-to-grave" manifest system will help in this accountability. (Auth) (JMF)(RAF)

124

Fore, C.S., Oak Ridge National Laboratory, Information Division, Oak Ridge, TN

Transportation of Radioactive Materials: The Legislative and Regulatory Information System

ORNL/TM-7439; TTC-0280; 59 pp. (1982, June)

The U.S. Department of Energy is carrying out a national program to assure the safe shipment of radioactive materials. As part of this overall effort, the Hazardous Materials Information Center of Oak Ridge National Laboratory has developed the comprehensive Legislative and Regulatory Information System, which contains information on federal-, state-, and local-level legislative and regulatory actions pertaining to the shipment of radioactive materials. Specific subject areas chosen to highlight particular transportation restrictions include: (1) identification of state agency responsible for regulating transportation; (2) type of escorts required; (3) areas requiring prior notification; (4) areas requiring permits or licenses; and (5) areas totally banning transportation of all radioactive materials. Other legislative information being categorized and of immediate relevance to the transportation issues is covered under the areas of disposal, storage, and management of radioactive materials; establishment of additional regulations; emergency response regulations; moratoriums on power plant construction and siting; radiation safety and control studies; and remedial action studies. The collected information is abstracted, indexed, and input into one of the two data bases developed under this information system - current Legislation Data Base and Historical Legislation Data Base. An appendix is included which provides a summary of the state and local laws affecting the transportation of radioactive materials throughout the United States. The Legislative and Regulatory Information System is supported by the Transportation Technology Center located at Sandia National Laboratories, Albuquerque, New Mexico. This system is intended to serve the research and development community and its projects, and the information stored with the data bases is available upon request to those researchers and decision makers representing governmental, academic, industrial, and foreign interests. (Auth)

125

Guilbeault, B.D., NUS Corporation, Rockville, I

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM WASTE DISPOSAL

The 1979 State-by-State Assessment of Low-Level Radioactive Wastes Shipped to Commercial Burial Grounds

NUS-3440 (Rev. 1) (1980, November)

This report was issued for the first time in 1979. It attempted to classify radioactive wastes into four broad categories and to allocate volumes to each of these categories by state of origin. Where published data, such as U.S. Nuclear Regulatory Commission (NRC) records and U.S. Department of Energy (DOE) Solid Waste Information Management Systems (SWIMS) reports existed, they were used as the bases for part of the allocations. Reports that could be interpolated from a national basis to a regional (state) basis were also used. This revision addresses the LLW that was disposed at the three operating commercial burial facilities in 1979. A significant portion of the estimates of the quantity and distribution of low-level radioactive wastes contained in this report have been obtained by extrapolation or estimation from secondary sources. A reported volume of 79,914 cu m of radioactive waste containing 477,435 curies was buried at commercial burial grounds in 1979. (Auth)(PTO)

126

Hall, M.D., Rockwell Hanford Operations, Richland, WA

Near-Field Impact of 216-U-10 (U-Pond) Decommissioning on the Unconfined Aquifer

RHO-LD-157; 122 pp. (1981, November)

The Hanford Site has operated an active liquid waste disposal facility since 1944. Infiltration of liquid effluents from surface ponds, trenches, and high-volume cribs has been directly responsible for the formation of a conical groundwater mound in the unconfined aquifer below 200 West Area. This mound covers more than 143 sq km (56 sq mi) of the unconfined aquifer. As of 1980, the crest of the mound was approximately 139 m (490 ft) above mean sea level, indicating a water table rise of 24 m (80 ft) beneath 200 West Area since 1944. The proposed decommissioning of the 216-U-10 surface infiltration pond (U-Pond) has raised the question of the future impact of decommissioning on the unconfined aquifer below the site, and the unconfined groundwater monitoring network. In order to determine the impact of decommissioning, a finite-difference computer model has been calibrated and validated against historical water level measurements; the model has accurately represented the past and present response of the unconfined aquifer to inflow from 11 liquid waste disposal sites. This computer model was used to predict the water level decline in the unconfined aquifer in response to U-pond decommissioning. The analysis assumes all inflow into U-pond will be shut off in 1982. The model predicts declines of about 10 meters (33 feet) within the unconfined aquifer 7 years after U-pond shutdown. The model predictions were used to assess the impact of water table declines associated with U-pond shutdown on Rockwell Hanford Operations and Pacific Northwest Laboratory groundwater monitoring networks; 19 wells will require redrilling, reperforating, or cleaning before 1989 if U-pond is decommissioned in 1982. (EDB)(JMF)

127

Mitre Corporation, Metrek Division, McLean, VA

Information Base for Commercial Radioactive Waste Management

DOE/ET/40110-1; 276 pp. (1982, July)

This report provides an overview of DOE's responsibilities and plans for the management of radioactive wastes generated as part of the commercial fuel cycle, as well as that from industry, research, and medical institutions in the U.S. The information provided in the report is organized by waste types into the following chapters: High-level Waste; Spent Nuclear Fuel; Repository Development; Low-level Waste; Uranium Mill Tailings; and Wastes from Decommissioning and Decontamination. Chapter 7, "Uranium Mill Tailings," contains the following subsections: Mill Tailings from Inactive Mill Sites; Grand Junction Uranium Mill Tailings; Mill Tailings from Active Mill Sites; and Transportation. Chapter 8, "Decontamination and Decommissioning," includes the subsections: Formerly Utilized MED/AEC Sites; DOE-Owned Surplus Facilities; Licensed Commercial Facilities; and Transportation. (PTO)(RAF)

128

Notz, K.J., Oak Ridge National Laboratory, Oak Ridge, TN

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM WASTE DISPOSAL

Radwaste Inventories and Projections: An Overview

ORNL/TM-8322; 35 pp. (1982, July)

The Integrated Data Base (IDB) program is sponsored by the Department of Energy (DOE) to provide fully integrated and reconciled inventories, characteristics, and projections (including alternative cases) for spent nuclear fuel and all categories of radioactive waste. The summary papers included in this compendium are drawn from a special session on "Radwaste Inventories and Projections" given at the American Nuclear Society National Meeting in Los Angeles, June 1982. In addition, two other papers are included that were not given at that meeting in order to properly round out this overview. The IDB program works with, draws on, and provides supporting information to DOE and its contractors in the areas of systems analysis, spent fuel, high-level waste, TRU waste, low-level waste, airborne waste, fuel recycle and transportation, waste isolation, and remedial action programs. The following papers cover: a broad overview of data needs and functions (Chapter 1); the IDB inventory and projection functions (Chapters 2 and 3); systems analysis application (Chapter 4); data needs for national waste terminal storage (Chapter 5); and applications to and from LLW, HLW, and TRU waste (Chapters 6, 7, and 8). The major results published thus far by the IDB program have been two reports on spent fuel and radwaste inventories and projections. The most recent report (Spent Fuel and Radioactive Waste Inventories and Projections as of December 31, 1980, DOE/NE-0017, September 1981) was issued last year. Another updated version is scheduled to be released in September 1982. In addition, supplemental reports dealing with alternatives or providing more detailed backup data will be issued in the future. The program also maintains, updates and utilizes ORIGEN2 (A.G. Croff, ORIGEN2 - A Revised and Updated Version of the Oak Ridge Isotope Generation and Depletion Code, ORNL-5621, July 1980), the most widely used of all the isotopic generation and depletion codes. (Auth)(JMF)

129

Notz, K.J., W.L. Carter, and A.H. Kibbey, Oak Ridge National Laboratory, Oak Ridge, TN

Integrated Data Base for Spent Fuel and Radwaste: Inventories

Transactions of the American Nuclear Society 41:81-83; CONF-820609; American Nuclear Society 1982 Annual Meeting, Proceedings of a Conference, Los Angeles, CA, June 6-10, 1982; (pp. 81-83) (1982, June)

The Integrated Data Base (IDB) program provides and maintains current, integrated data on spent reactor fuel and radwaste, including historical data, current inventories, projected inventories, and material characteristics. The IDB program collects, organizes, integrates, and where necessary, reconciles inventory and projection (I/P) characteristics information to provide a coherent, self-consistent data base on spent fuel and radwaste. The data base is divided into subject categories based on waste type. The categories include: remedial action; mill tailings; decommissioning of commercial facilities; low-level; high-level; transuranic; airborne; spent fuel; transportation; and reprocessing wastes. (Auth)(PTO)

130

Oak Ridge National Laboratory, Oak Ridge, TN

Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics

DOE/NE-0017-1; 341 pp. (1982, October)

Current inventories and characteristics of commercial spent fuels and both commercial and U.S. Department of Energy radioactive wastes were compiled, based on the most reliable information available from government sources and the open literature, technical reports, and direct contacts. Future waste and spent fuel to be generated over the next 10 years, and characteristics of these materials are also presented, based on a present DOE/EIA projection of U.S. commercial nuclear power growth and expected defense-related and industrial and institutional activities. Materials considered, on a chapter-by-chapter basis, are: spent fuel; high-level waste; transuranic waste; low-level waste; remedial action waste; active uranium mill tailings; airborne waste; and decommissioning waste. For each category, current and projected inventories are given through the year 2020. The land usage requirements are given for storage/disposal of low-level and transuranic wastes and for the present inventories of inactive uranium mill tailings. For each waste category the radioactivity and thermal power are calculated. Isotopic compositions and cost data are given for each waste type and for spent fuel. (Auth)(PTO)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM WASTE DISPOSAL

131

Pietrzak, R.F., and R. Dayal, Brookhaven National Laboratory, Upton, NY

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites

NUREG/CR-2192; BNL-NUREG-51409 (Vol. 1, Nos. 3-4); 35 pp. (1982, March)

The chemical and radionuclide composition of trench waters is important in understanding radionuclide transport at shallow land burial sites. In the past, the Maxey Flats site has been sampled by Brookhaven National Laboratory four times over a six-year period. A construction project has been initiated at the Maxey Flats burial site by the State of Kentucky to minimize rainwater infiltration by covering the disposal trenches with plastic sheeting. A sampling trip was undertaken to obtain water samples before the trenches were completely covered. In this report, we present the results of field measurements made on samples collected during the fifth sampling trip. (Auth)

132

Powers, E.W., UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Waste Containers for Decommissioning

DOE/RLO-SFM-82-6; 225 pp. (1982, September)

This container directory has been prepared by the Office of Surplus Facilities Management (OSFM) primarily to assist U.S. Department of Energy (DOE) field offices and contractors involved in the shipment of decommissioning waste. The directory is based on information provided by DOE decommissioning program field offices, their contractors, and by container manufacturers and other interested non-governmental container users. The directory includes only containers with potential for use in decommissioning projects. Such containers usually have large volumes and, in some cases are simply strong tight containers that have been used on decommissioning projects. Specialized containers such as those used for packaging isotope sources, fuel elements, etc., are not included in the directory. However, other directories that include special containers are referenced. It is the responsibility of the user of any of the referenced packaging to assure themselves that the packaging is adequate for its intended use and meets all the pertinent policy and regulatory requirements. (Auth)(JMF)

133

U.S. Department of Energy, Idaho Operations Office, Idaho Falls, ID

Environmental and Other Evaluations of Alternatives for Management of Defense Transuranic Waste at the Idaho National Engineering Laboratory

IDO-10103 (Vol. 1); 283 pp. (1982, April)

The management of transuranic waste products from defense operations by the U.S. Department of Energy encompasses many alternatives dependent upon various environmental and sociological factors. This document contains technical studies of the actions of buried transuranic wastes such as modeling subsurface migration and the resulting environmental effects. Other areas covered are public response; environmental contamination by accidental releases; hazards to waste-management workers; and various methods of transportation to disposal sites. (JMF)

134

U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, DC

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Summary

NUREG-0782 (Vol. 1); 68 pp. (1981, September)

The four volume draft environmental impact statement (DEIS) is prepared to guide and support publication of a proposed new regulation, 10 CFR Part 61, for the land disposal of low-level radioactive waste. The analysis in the DEIS includes a systematic analysis of a broad range of alternatives relating to the form and content of waste, the engineering design of disposal facilities, the method

of operation of the facilities, institutional controls, financial assurances, and administrative and procedural requirements. From the analysis, four main performance objectives are established in the proposed regulation relating to (1) minimizing long-term social commitment and costs, (2) minimizing long-term environmental releases, (3) minimizing long-term impacts to humans potentially inadvertently intruding into disposed waste, and (4) assuring short-term operational safety. Based upon the analysis and overall performance objectives, a number of technical, financial, procedural, and administrative requirements are also developed. (Auth)

135

U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, DC

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Main Report

NUREG-0782 (Vol. 2); 68 pp. (1981, September)

The four volume draft environmental impact statement (DEIS) is prepared to guide and support publication of a proposed new regulation, 10 CFR Part 61, for the land disposal of low-level radioactive waste. The analysis in the DEIS includes a systematic analysis of a broad range of alternatives relating to the form and content of waste, the engineering design of disposal facilities, the method of operation of the facilities, institutional controls, financial assurances, and administrative and procedural requirements. From the analysis, four main performance objectives are established in the proposed regulation relating to (1) minimizing long-term social commitment and costs, (2) minimizing long-term environmental releases, (3) minimizing long-term impacts to humans potentially inadvertently intruding into disposed waste, and (4) assuring short-term operational safety. Based upon the analysis and overall performance objectives, a number of technical, financial, procedural, and administrative requirements are also developed. (Auth)

136

U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, DC

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices A-F

NUREG-0782 (Vol. 3); 68 pp. (1981, September)

The four volume draft environmental impact statement (DEIS) is prepared to guide and support publication of a proposed new regulation, 10 CFR Part 61, for the land disposal of low-level radioactive waste. The analysis in the DEIS includes a systematic analysis of a broad range of alternatives relating to the form and content of waste, the engineering design of disposal facilities, the method of operation of the facilities, institutional controls, financial assurances, and administrative and procedural requirements. From the analysis, four main performance objectives are established in the proposed regulation relating to (1) minimizing long-term social commitment and costs, (2) minimizing long-term environmental releases, (3) minimizing long-term impacts to humans potentially inadvertently intruding into disposed waste, and (4) assuring short-term operational safety. Based upon the analysis and overall performance objectives, a number of technical, financial, procedural, and administrative requirements are also developed. (Auth)

137

U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, DC

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q

NUREG-0782 (Vol. 4); 68 pp. (1981, September)

The four volume draft environmental impact statement (DEIS) is prepared to guide and support publication of a proposed new regulation, 10 CFR Part 61, for the land disposal of low-level radioactive waste. The analysis in the DEIS includes a systematic analysis of a broad range of alternatives relating to the form and content of waste, the engineering design of disposal facilities, the method of operation of the facilities, institutional controls, financial assurances, and administrative and procedural requirements. From the analysis, four main performance

objectives are established in the proposed regulation relating to (1) minimizing long-term social commitment and costs, (2) minimizing long-term environmental releases, (3) minimizing long-term impacts to humans potentially inadvertently intruding into disposed waste, and (4) assuring short-term operational safety. Based upon the analysis and overall performance objectives, a number of technical, financial, procedural, and administrative requirements are also developed. (Auth)

138

U.S. Nuclear Regulatory Commission, Washington, DC

Disposal or On-site Storage of Thorium or Uranium Wastes from Past Operations

Federal Register 46(205):52061-52063 (1981, October)

This notice discusses five options for NRC approval of disposal or on-site storage of thorium or uranium wastes from past nuclear operations. The options are contained in a Branch Technical Position for administration by the Uranium Fuel Licensing Branch, Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards. Effective January 28, 1981, NRC regulations in 10 CFR 20, "Standards for Protection Against Radiation," were amended to delete 20.304 which provided general authority for disposal of radioactive materials by burial in soil. Under the amended regulations, licensees must apply for and obtain specific NRC approval to dispose of radioactive materials in this manner under the provisions of 10 CFR 20.302. A case-by-case review was believed to be needed to assure that burial of radioactive wastes would not present an unreasonable health hazard at some future date. Under the amended regulations, it is incumbent on an applicant who wants to bury radioactive wastes to demonstrate that local land burial is preferable to other disposal alternatives. (Auth)(JMF)

139

Vath, J.E., Oak Ridge National Laboratory, Oak Ridge, TN

U.S. Department of Energy Activities in w-Level Radioactive Waste Treatment

IAEA-SR-57/42; CONF-811056; Management of Radioactive Waste from Nuclear Power Plants, Proceedings of a Seminar, Karlsruhe, Federal Republic of Germany, October 5-9, 1981; (19 pp.) (1981)

This paper describes current research, development, and demonstration programs sponsored by the U.S. Department of Energy (DOE) in the area of low level radioactive waste (LLW) treatment. During the twelve-month period ending September 30, 1981, 14 primary DOE contractors were involved with over 40 LLW disposal technology projects. Three specific projects or task areas have been selected for discussion to illustrate new and evolving technologies, and application of technology developed in other waste management areas to LLW treatment. The areas to be discussed include: microwave plasma torch incinerator; application of waste vitrification; and decontamination of metal waste by melting. (Auth)(PTO)

140

Wynveen, R.A., H.J. Moe, and M.J. Robinet, Argonne National Laboratory, Argonne, IL

Waste Identification, Characterization and Disposal During the D and D of a Non-Reactor Nuclear Facility

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VI-39 - VI-53) (1982, October)

The principal health physics concern during the D&D of the New Brunswick Laboratory in New Jersey was assuring that no contaminated material was released for unrestricted use. The release criteria were based on removable and total contamination per 100 sq cm of surface area. To increase the odds of not missing contaminants, all surfaces were surveyed at least three times with three portable instruments having different detection characteristics. In addition, smears were accomplished to measure removable contamination. Detailed documentation was done for all surveys. The structures were dismantled rather than demolished. All objects above the contamination criteria were placed

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM WASTE DISPOSAL

directly into shipping bins. Two major difficulties were assuring detection of alpha contamination under painted surfaces in the plutonium area and maintaining high sensitivity gas-flow proportional survey instruments. The project was completed in 7 months with an average of less than 12 people at a cost of less than 10 person-years. Less than 50 pages of procedures were sufficient to satisfactorily complete the effort. The D&D site was left in a stable condition. (Auth)(JMF)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

141
Bettis Atomic Power Laboratory, West Mifflin, PA

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1976-January 25, 1977

WAPD-MRP-147; 14 pp. (1977)

The Shippingport Atomic Power Station has remained shut down since February 4, 1974 for repair of the main unit turbine and for modification, installation and operation of the third nuclear core, the light water breeder reactor (LWBR) core. The receipt and storage of all new movable fuel assemblies for the LWBR core was completed. Seven (of the twelve) blanket modules were received and installed in the reactor vessel. In addition, seven movable fuel assemblies were also installed in the reactor vessel. Receipt, storage, and installation in the reactor vessel of all fuel assemblies is expected to be completed early in the next report period. Repairs to the main unit turbine generator are essentially complete. Modification effort on the upgrading of the Shippingport reactor safety systems, including auxiliary control room, containment isolation system, and safety injection system is in the final stage of completion. The Nuclear Regulatory Commission (NRC) issued in November 1976 a supplement to its Safety Evaluation Report (SER) in which it completed the review of all uncompleted items in the initial SER of July, 1976. The NRC concluded that "the light water breeder reactor core may be operated in the Shippingport Atomic Power Station as proposed without undue risk to the health and safety of the public." (EDB)(JMF)(RAF)

142
Bettis Atomic Power Laboratory, West Mifflin, PA

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program)

WAPD-MRP-150; 46 pp. (1978)

The Shippingport Atomic Power Station was operated with the light water breeder reactor (LWBR) core at high power levels during the energy shortage created by the strike, delaying the planned shutdown about one month. After returning to power operation following the shutdown, the station operated in both base load and swingload modes, completing 50 planned swingload cycles. Evaluated core test data taken during the shutdown and during core power operations continue to show that the core operates in accordance with its design predictions. Subsequent to achieving power operation following the planned maintenance shutdown, only routine periodic maintenance was required to maintain the operational readiness of the plant. (EDB)(RAF)

143
Bettis Atomic Power Laboratory, West Mifflin, PA

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1978-January 25, 1979

WAPD-MRP-151; 45 pp. (1979)

The Shippingport Atomic Power Station was operated with the light water breeder reactor core at high power levels (base load) until the planned maintenance shutdown from September 15 to October 7, 1978. After returning to power operation, the station was operated in a combination baseload-swingload mode to demonstrate load follow capability of the LWBR core. Evaluation of the core test data taken during the shutdown and during core power operations continue to show that the core is operating in accordance with design predictions. During the periods of power operation only routine corrective and periodic maintenance was required to maintain the operational readiness of the plant. At the end of this report period, the LWBR core had accumulated 9440 EFPH. (EDB)(RAF)

144
Bettis Atomic Power Laboratory, West Mifflin, PA

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1979-July 25, 1979

WAPD-MRP-152; 32 pp. (1979)

The Shippingport Atomic Power Station operated at essentially full power until March 23, 1979, when a scheduled maintenance and testing shutdown began.

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

During cold physics testing, the measured value of the flow coefficient of reactivity was higher than determined during previous testing. As a result, the shutdown was extended to evaluate the flow coefficient of reactivity in more detail. The additional test data gave strong evidence that the flow reactivity effect is principally one of small core module radical displacements due to module bending and taking up of radial clearances. Evaluation of the thermal effects of the increased flow coefficient of reactivity resulted in changes to core protection setpoints and station operating procedures without changing core thermal criterial or allowable power. The revised setpoints were based on the conservative assumption that the flow coefficient of reactivity was three times the value measured during the test program. Additional testing has been scheduled to monitor the flow coefficient of reactivity periodically. During return of the station to power operation on May 24, 1979, a rubbing noise was detected internal to the main unit generator. The station was shut down to investigate the noise which was found to originate from the hydrogen circulator fan. After fan repairs were completed the Station returned to power operation on July 23, 1979. All other evaluated core test data taken during the shutdown and during core operations continue to show that the core operates in accordance with design predictions. During the periods of power operation only routine periodic maintenance was required to maintain the operational readiness of the plant. (EDB)

145
Bettis Atomic Power Laboratory, West Mifflin, PA

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1980-July 25, 1980

WAPD-MRP-154; 37 pp. (1980)

The Shippingport Atomic Power Station was operated with the light water breeder reactor (LWBR) core primarily at high power levels (base load) until February 29, 1980, when a planned semi-annual shutdown for maintenance and testing began. The design objective of 15,000 equivalent full power hours (EFPH) of operation was achieved on February 24, 1980. Power operation was resumed on April 19, 1980, and continued through the end of the report period, accumulating 17,190 EFPH on July 25, 1980, except for reductions in power or brief shutdowns to perform planned testing, swing load operations, and maintenance. The periodic flow coefficient of reactivity measurements continued to meet the criteria on which the revised core protection setpoints and station operating procedures (see WAPD-MRP-152) were based. The program of load swings to demonstrate load follow capability was continued during this period with the performance of an additional 49 swing loads for a total of 203 load swings since initial operation. (EDB) (RAF)

146
Bettis Atomic Power Laboratory, West Mifflin, PA

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1979-January 25, 1980

WAPD-MRP-153; 38 pp. (1980)

The Shippingport Atomic Power Station was operated with the light water breeder reactor core at high power levels (base load) throughout this report period except for reductions in power or brief shutdowns to perform planned testing. Evaluation of core test data taken during this period continues to show that the core is operating in accordance with design predictions. Periodic flow coefficient of reactivity measurements is reported which all meet the criteria on which the revised core protection setpoints and station operating procedures were based. (EDB)(RAF)

147
Bettis Atomic Power Laboratory, West Mifflin, PA

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1981-July 25, 1981

WAPD-MRP-156; 43 pp. (1981)

The Shippingport Atomic Power Station was operated with the light water breeder reactor (LWBR) core primarily at high power levels (base load) until April 24, 1981, when a planned semi-annual shutdown for testing and maintenance began. Station startup commended May 27, 1981. High power operation was achieved on June 4, 1981, and continued through the end of the report period, when the LWBR core had achieved 27,022 EFPH. Several brief reductions in power and the

station shutdowns occurred during this period. Maximum allowable thermal power continued to be 80% of 236.6 MW thermal with reactor coolant flow at 100%, coolant pressure at 1600 psig and average temperature at 521 deg F. (EDB)(JMF)(RAF)

148
Bettis Atomic Power Laboratory, West Mifflin, PA; U.S. Department of Energy, Washington, DC

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1980-January 25-1981

WAPD-MRP-155; 43 pp. (1981)

The Shippingport Atomic Power Station was operated with the light water breeder reactor (LWBR) core primarily at high power levels (base load) until September 12, 1980 when a planned semi-annual shutdown for testing and maintenance began. During this operating period, the originally planned core lifetime of 18,000 equivalent full powers (EFPH) of operation was achieved on August 31, 1980. Station startup commenced on November 5, 1980. The station was shut down on November 13, 1980, and while in this plant condition, a primary coolant leak was discovered on the 1 in. bonnet vent line of a 1C loop manual isolation valve. Repairs were completed and satisfactorily tested. The station returned to power operation on November 26, 1980. Power operation continued through the end of the report period. (EDB)(PTO)

149
Blumberg, R., Oak Ridge National Laboratory, Oak Ridge, TN

Decommissioning Reactors

Oak Ridge National Laboratory Review 15(1):28-32 (1982)

Oak Ridge National Laboratory (ORNL) involvement in reactor decommissioning began with development of the tools and techniques for the Elk River Reactor in Minnesota, the world's first decommissioning project. The author reviews the problems involved in three basic methods: entombment, safe storage plus delayed dismantlement, and prompt dismantlement. He describes the experience at the Elk River Reactor and outlines plans for the Shippingport plant. The need for early retirement of several plants because of radiation embrittlement will involve new problems and require new skills. (DCK)(JMF)

150
Bull, B., Jones, Hirsch and Bull, New York, NY

Federal Bailout of Nuclear Industry a Waste of Funds

Energy User News 7(20): 18 pp. (1982, May 17)

After 35 years, federal subsidies to the nuclear industry seem to have no end, indicating a mix of bad economics and an unmastered technology. The costs of plant cancellations, plans to mothball partially completed plants, and other examples of mismanagement are alarming Wall Street and raising utility rates. Justifications for continuing the nuclear program now emphasize, not their merits, but the high cost of shutdown. This, plus the inability to find appropriate storage sites for nuclear wastes and the recent discovery of deterioration in reactor vessels, brought a response from the administration aimed at reviving the industry by reducing safeguards and regulations and expanding subsidies. (DCK)(PTO)

151
Coleman, J.A., U.S. Department of Energy, Washington, DC

Decommissioning at the U.S. Department of Energy

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. II-1 - II-8) (1982, October)

The U.S. Department of Energy (DOE), and its predecessor agencies, have been decommissioning nuclear facilities for over 20 years. Currently, some 90 projects involving approximately 500 surplus facilities in the DOE Surplus Facilities Management Program are sched-

uled for decommissioning over the next 20 years. These sites have resulted from both civilian nuclear research and defense-related government operations located throughout the United States. They include such installations as reactors and support facilities, solid waste burial grounds, fuel reprocessing facilities, radiochemical laboratories, stacks, tanks, pipelines, waste treatment systems, and materials recovery facilities. Requirements under the National Environmental Policy Act are met before decommissioning operations begin. The wastes generated are transported and disposed of at DOE sites in accordance with applicable DOE and U.S. Department of Transportation (DOT) regulations. Part of the DOE's overall effort is the development of technological approaches to facilitate the completion of decommissioning tasks. Ways to improve the efficiency of methods, reduce costs, and improve overall environmental and health protection are constantly sought. These new techniques are not only made widely known to those programs in DOE responsible for decommissioning actions, but are also made available to the nuclear community at large. The approach taken by DOE in planning and implementing decommissioning includes the following major elements: (1) identify the need for decommissioning; (2) consider alternatives for disposition of the facility; (3) decide on the interim actions to be taken - surveillance and maintenance - until cleanup can begin; (4) plan for the most effective use of decommissioning resources in terms of eliminating hazards to the public, workers, or others that may be on the property, minimizing costs of maintenance and surveillance, and restoration of the property to a useful condition; (5) maintain a current record of needs, priorities, costs and schedules for decommissioning actions; and (6) implement decommissioning actions as resources permit. (Auth)(JMF)(RAF)

152

Combs, A.B., W.P. Davis, T.C. Elswick, J.M. Garner, and J.R. Geichman, Mound Facility, Miamisburg, OH

Mound's Decommissioning Experience, Tooling, and Techniques

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp.; (pp. 1-9)(Addendum) (1982, October)

Monsanto Research Corporation has been decommissioning radioactively contaminated facilities since 1949. Decommissioning operations are currently underway on three plutonium-238 contaminated facilities (about 50,000 sq ft) that contained 1100 linear ft of gloveboxes; 900 linear ft of conveyor housing; 2650 linear ft of dual underground liquid waste lines; and associated contaminated piping, services, equipment, structures, and soil. As of June 1982, over 29,000 curies of plutonium-238 have been removed in waste and scrap residues. As a result of the current and previous decommissioning projects, valuable experience has been gained in tooling and techniques. Special techniques have been developed in planning, exposure control, contamination control, equipment removal, structural decontamination, and waste packaging. (Auth)(PTO)

153

Davis, A.C., Bettis Atomic Power Laboratory, West Mifflin, PA

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1981-January 25, 1982

WAPD-MRP-157; 43 pp. (1982)

The Shippingport Atomic Power Station was operated with the light water breeder reactor (LWBR) core primarily at high power levels (base load) until December 11, 1981, when a planned semi-annual shutdown for testing and maintenance began. Station startup commenced January 17, 1982, and continued through the end of the report period, when the LWBR core had achieved 24,689 EFPH. Several brief reductions in power and three brief station shutdowns occurred during this period. Maximum allowable thermal power continued to be 80% of 236.6 MW thermal with reactor coolant flow at 100%, coolant pressure at 1600 psig and average temperature at 521 deg F. It has been decided that LWBR core power operation at the Shippingport Atomic Power Station will be terminated October 1, 1982. (EDB)(RAF)

154

Dornsife, W.P., Pennsylvania Department of Environmental Resources, Bureau of Radiation Programs, Harrisburg, PA

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

Decommissioning of Radioactively Contaminated Facilities from a State Perspective

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. II-36 - II-43) (1982, October)

Due to increased responsibility and awareness on the part of the states, the decommissioning of radioactively contaminated facilities is becoming of greater concern. This paper discusses those issues which are felt to be of greatest concern to the states and recommends some directions for their resolution. These issues are: (1) disposal of decommissioning wastes; (2) residual radioactivity levels; (3) decommissioning of facilities which are state regulated; (4) funding for decommissioning; and (5) timing and mode of decommissioning. (Auth) (RAF)

155

Kittinger, W.D., B.F. Ureda, and C.C. Conners, Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA

Lessons Learned in Decommissioning the Sodium Reactor Experiment

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-1 - IV-18) (1982, October)

The Sodium Reactor Experiment was decommissioned, and the objective of permitting the future unrestricted use of the building and site was attained. It was decommissioned using a variety of decontamination and dismantling techniques. This project involved the tasks of management, planning, engineering, tooling development, procedure development, mockup, contracts, personnel, training, sodium removal, nuclear systems dismantlement, remote cutting and handling, explosive cutting, safety and contamination control, exposure control, decontamination, excavation, sampling and survey, and waste management. To accomplish these tasks required making refinements and innovations in the decommissioning technology. Several lessons from the project will be useful to future decommissioning projects. (Auth)

156

Meyers, S., U.S. Department of Energy, Washington, DC

DOE Nuclear Waste Management Program

CONF-810217; Waste Management '81, The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs, and Public Communications, R.G. Post (Ed.), Proceedings of an American Nuclear Society Topical Meeting, Tuscon, AZ, February 23-26, 1981, 1210 pp.; (pp. 11-20) (1981)

This paper discusses the current DOE activities that address both the technical and institutional concerns associated with the management of nuclear waste. It covers both civilian and defense nuclear waste programs. Subjects covered include: waste isolation; commercial low-level waste management; near-term needs; remedial actions; decontamination and decommissioning of surplus facilities; and others. (EIX)(PTO)

157

Miller, R.L., and J.A. Adams, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Evaluation of Nuclear Facility Decommissioning Projects

NUREG/CR-2985 (1982, December)

This document presents, in summary form, information pertaining to the decommissioning of the Elk River Reactor. The purpose of this type of report is to provide the NRC and its licensees comparative data to assist in their assessment of decommissioning alternatives and ALARA methods for future decommissioning projects. Data were assembled in a form that permitted input into a computerized data handling system. The computer program used produces a flexible data accumulation, manipulation, and retrieval system which provides

decommissioning performance information such as: ALARA responsiveness; cost estimate accuracy; schedule adherence; project labor hours and costs; exposure accountability; and radwaste generation and disposition. Samples of computer reports are included in the report. Decommissioning of other reactors, including NRC reference decommissioning studies, will be described in similar reports. (Auth)(PTO)

158

Miller, R.L., and B.W. Link, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Evaluation of Nuclear Facility Decommissioning Projects - Summary Report: Enrico Fermi-1 Reactor

NUREG/CR-3116; 32 pp. (1983, February)

This report summarizes information concerning the decommissioning of the Enrico Fermi-1 reactor. Decommissioning data from available documents and other decommissioning records were input into a computerized data-handling system in a manner that permits specific information to be readily retrieved. The information is presented both in detail in its computer output form, and as a manually assembled summarization, generated for the purpose of highlighting the more important aspects of the decommissioning program. The Enrico Fermi-1 operated from 1963 till shutdown in 1972. It was decommissioned because of inadequate funding for continuation of the experimental program. The decommissioning mode selected was SAFSTOR; total decommissioning costs in 1974 dollars was $7,164,988. The personnel exposure was 2804 man-rem and the activity of the waste generated was about 5000 curies. (Auth)(PTO)

159

Murphy, E.S., and G.M. Holter, Pacific Northwest Laboratories, Richland, WA

Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents

NUREG/CR-2601 (Vol. 1); 326 pp. (1982, October)

This report contains the results of a study sponsored by the Nuclear Regulatory Commission (NRC) to conceptually evaluate post-accident decommissioning of light water reactors (LWRs). The primary purpose of this study is to provide information on the available technology, the safety considerations, and the probable costs of post-accident decommissioning and of accident cleanup activities that precede the decommissioning. Information from this study is intended as background data and to form a basis for the modification of existing regulations and the development of new regulations pertaining to decommissioning activities. (Auth)

160

Murphy, E.S., and G.M. Holter, Pacific Northwest Laboratory, Richland, WA

Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents

NUREG/CR-2601 (Vol. 2); 410 pp. (1982, October)

This report contains the results of a study sponsored by the Nuclear Regulatory Commission (NRC) to conceptually evaluate post-accident decommissioning of light water reactors (LWRs). The primary purpose of this study is to provide information on the available technology, the safety considerations, and the probable costs of post-accident decommissioning and of accident cleanup activities that precede the decommissioning. Information from this study is intended as background data and to form a basis for the modification of existing regulations and the development of new regulations pertaining to decommissioning activities. (Auth)

161

Murphy, E.S., and G.M. Holter, Pacific Northwest Laboratory, Richland, WA

Post-Accident Cleanup and Decommissioning of a Reference Pressurized Water Reactor

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-198 - VII-213) (1982, October)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

This paper summarizes the results of a conceptual study to evaluate the technical requirements, costs, and safety impacts of the cleanup and decommissioning of a large pressurized water reactor (PWR) involved in an accident. The costs and occupational doses for post-accident cleanup and decommissioning are estimated to be substantially higher than those for decommissioning following the orderly shutdown of a reactor. A major factor in these cost and occupational dose increases is the high radiation environment that exists in the containment building following an accident which restricts worker access and increases the difficulty of performing certain tasks. Other factors which influence accident cleanup and decommissioning costs are requirements for the design and construction of special tools and equipment, increased requirements for regulatory approvals, and special waste management needs. Radiation doses to the public from routine accident cleanup and decommissioning operations are estimated to be below permissible radiation dose levels in unrestricted areas and within the range of annual doses from normal background. (Auth)

162

Neely, N., D. Gillespie, F. Schauf, and J. Walsh, SCS Engineers, Covington, KY; Municipal Environmental Research Laboratory, Cincinnati, OH

Survey of On-Going and Completed Remedial Action Projects

EPA-600/2-81-246; 242 pp. (1981, September)

During the summer of 1980, a nationwide survey was conducted to determine the status of remedial actions applied at uncontrolled hazardous waste disposal sites. Over 130 individuals were contacted to obtain information on such remedial action projects. A total of 169 sites were identified as having been subject to corrective action. Remedial actions were found to have been implemented at many kinds of hazardous waste disposal facilities including drum storage areas, incinerators, and injection wells, but most frequently landfill/dumps and surface impoundments. At the sites receiving such remedial actions, groundwater was found to be the most commonly affected medium, followed closely by surface water. Although several types of remedial measures were identified, remedial activities usually consisted of containment and/or removal of the hazardous waste. Sufficient money was often not available for complete environmental cleanup (e.g., extraction and treatment). The survey determined that a lack of sufficient funds and/or selection of improper technologies was responsible for remedial actions having been applied effectively at only a portion of the uncontrolled hazardous waste disposal sites. Nine sites were studied in detail to document typical pollution problems and remedial actions at uncontrolled hazardous waste disposal sites. (GRA) (JMF)

163

Nemec, J.F., and J.D. White, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA; U.S. Department of Energy, Richland Operations Office, Richland, WA

United States Department of Energy Surplus Facilities Management Program

UNI-SA-95; CONF-820933; Radioactive Waste Management, Proceedings of an International Conference, Winnipeg, Manitoba, Canada, September 12, 1982; (14 pp.) (1982, August)

Many nuclear facilities that were used throughout the early development of nuclear energy have no current use and have been retired. However, these facilities have residual radioactive contamination levels requiring controls. Under the authority of the Atomic Energy Act, as amended, the United States Department of Energy established the Remedial Action Program to assure the safe caretaking and disposal (decommissioning) of such facilities. About 500 government-owned facilities requiring remedial action have been identified and cataloged. Approximately 75% of these sites are located on the Hanford Site in southeastern Washington state. The U.S. Department of Energy's Richland Operations Office is responsible for administering this program. (Auth) (PTO)

164

Oak, H.D., and G.M. Holter, Pacific Northwest Laboratories, Richland, WA

Decommissioning a Boiling Water Reactor Nuclear Power Plant

PNL-SA-8261; CONF-800607; American Nuclear Society 1980 Annual Meeting, Proceedings of a Conference, Las Vegas, NV, June 9-12, 1980; (7 pp.) (1980, May)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

Decommissioning is required after final shutdown of a nuclear power plant to protect the public from the residual radioactivity present. This paper summarizes the major results of a 2-year, multi-discipline study sponsored by the U.S. Nuclear Regulatory Commission to develop plans and estimate the cost and safety factors for conceptually decommissioning a reference boiling water reactor (BWR) nuclear power plant. The NRC-sponsored study provides background information for the development of regulations pertaining to decommissioning and can be used by utilities in planning decommissioning of their BWR power plants. The study is one in a series of commercial nuclear facility decommissioning studies in which all cost estimates are given in 1978 dollars and each facility is assumed to be located on the same reference site. (Auth)(JMF)

165

Philadelphia Electric Company, Philadelphia, PA

Decommissioning Peach Bottom Unit 1 - Final Report

NP-23584; 129 pp. (1978)

This report documents the activities of decommissioning Peach Bottom 1, the first high-temperature gas-cooled reactor (HTGR) to operate in the United States. It also presents the status of systems in the reactor facility. A portion of this report covers the radiological conditions encountered and their impact on work progress. One of the principal observations during the D&D operations was that the plant had relatively low contamination levels compared to a PWR- or BWR-type reactor. In addition, the removal and disposal of the piping and other systems was relatively easy. (Auth)(PTO)

166

Rohlfer, D.K., NLO, Inc., Feed Materials Production Center, Cincinnati, OH

Summary Report on NLO Remedial Projects at the DOE-Niagara Falls Storage Site

NLCO-011EV; 81 pp. (1981, November)

This summary report describes NLO's accomplishments in support of DOE's objectives for management of the NFSS, discusses problems encountered in meeting those objectives, and provides recommendations that may facilitate completion of the remedial projects initiated by NLO. The DOE-NFSS is located in Niagara County, New York, and has been used for the storage of uranium refining process residues from 1944 to the present. NLO, Inc. has managed the DOE-NFSS from 1972 through September 1981. During that time NLO's mission evolved from the provision of a maintenance/surveillance capability to planning and management of a large scale remedial project. Project work has been advanced on three fronts: assessment studies; detailed engineering; and remedial work. Additionally, radiological monitoring and administrative controls have been improved. The entire NFSS, plus major offsite drainageways have been radiologically characterized. Complete construction contract packages have been prepared for demolition of Building 401, construction of e decontamination facility, and construction of seals for two residue storage structures. An extensive groundwater monitoring system and additional radon monitoring equipment have been installed at the site. (PTO)

167

Rosenthal, P.W., Bettis Atomic Power Laboratory, West Mifflin, PA

Test Evaluation Shippingport Atomic Power Station LWBR Project (LWBR Development Program), July-August 1977

WAPD-LWBR-TE-401; 30 pp. (1978, November)

The report provides evaluation of the Shippingport Atomic Power Station reactor plant container leak rate data obtained after installation and prior to criticality of the light water breeder reactor core. The container leak rate at a test pressure of 24.4 + or - 0.1 psig was determined to be 0.220% and 0.189% of the container volume per day by the reference vessel and absolute methods, respectively. These values are well below the test allowable limit of 0.27% of the container volume per day. The accuracy of the leak rate measuring instrumentation was verified by further testing which employed a calibrated flow meter. (EDB)(RAF)

168

Singley, W.J., Bettis Atomic Power Laboratory, West Mifflin, PA

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control (1965-1975)

WAPD-TM-1309; 39 pp. (1978, January)

The four stainless steel-tubed steam generators in the Shippingport Atomic Power Station were replaced in 1964 with larger, horizontal, NiCrFe alloy 600-tubed units consistent with a power uprating of the plant. Each of the four alloy 600-tubed units experienced tube leakage attributed to corrosion by water treatment chemicals (sodium phosphates) which concentrated locally on the tubes in inadequately flushed crevices. Corrective and preventive actions include tube plugging, flow blockage, conversion to all-volatile (hydrazine-morpholine) chemistry and replacement of the two steam generators with the straight tube design. Eddy current inspection after four years of all-volatile chemistry use showed a diminished rate of crevice corrosion and no tube denting. (EDB)(RAF)

169

Speer, R.D., G.H. Lazarus, and H.W. Higgins, Model Interstate Scientific and Technical Information Clearinghouse, Denver, CO

Nuclear Power Reactors: An Overview of Selected Issues

PB-80-180649; 40 pp. (1979, April)

A brief overview of the more immediate issues of nuclear power plants affecting state legislatures is provided. Four areas are discussed: radiological emergency planning; decommissioning; federal/state controls; and liability. The section on radiological emergency planning outlines the lead role of the U.S. Nuclear Regulatory Commission (NRC), and lists federal agencies with supportive responsibilities. The report of the General Accounting Office (GAO), released at the time of the Three Mile Island incident, is reviewed. Nuclear facilities which have requested NRC's inspection cadre to observe emergency drills from 1975-1978 are listed. The section on decommissioning defines the term and explains financial issues, unresolved issues, and the existing criteria for decommissioning with respect to reactors and fuel cycles. A digest of nuclear reactor decommissioning is presented in tabular form. e discussion of federal/state controls sketches the background, lists issues, and outlines the extent of federal/state control with respect to land use, generation, sale or transmission of electric power, economic considerations, environmental impacts, emergency procedures, employee safety, and transportation. The concluding section on liability discusses implications of the Price-Anderson Indemnity Act of 1957. Appendices include references, a glossary of terms, a list of reactor types and locations, and a list of federal agency radiation authorities. (GRA)(PTO)

170

Stelle, A.M., Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA

S8ER Facilities Decommissioning - Final Report

ESG-DOE-13237; 49 pp. (1979, February 28)

In 1974, the SNAP 8 Experimental Reactor (S8ER) Facility at the Santa Susana Field Laboratories (SSFL) of the Energy Systems Group (ESG) of Rockwell International was declared excess to the government's program needs. The resulting decommissioning program, commenced in 1976, provided for complete removal of all radioactive materials remaining from the operation of two SNAP space-type compact reactors. Careful study indicated that the safest and most economical removal of the reactor containment vessel, which had induced radioactivity and was located in the building, would be by totally razing the facility. To safeguard against any inadvertent spread of radioactive material, the steel-frame building itself was used to provide as much weather and wind protection for the radioactive material removal activities as possible; therefore, it was taken down in pieces as the excavation progressed and control measures permitted. Concrete substructure vaults were decontaminated and demolished to gain access to soil adjacent to the facility that might have been contaminated. The reactor containment vessel was excavated, removed, and shipped to the burial site, complete with its original concrete shield attached. Radioactive materials removed by excavation or decontamination were boxed and trucked to the licensed, commercial burial ground at Beatty, Nevada. The extra heavy and wide load of the reactor containment vessel required special handling and routing normally associated with conventional shipments of this size. The project was completed with minimal radia-

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

tion exposure of workers and no reportable off-site exposure. The overall cost of the demolition and disposal of the facility is presented for comparison with other, similar proposed projects. Direct comparison is difficult, however, because some unusual circumstances concerning mixed government and private ownership and the ongoing but unrelated government-sponsored support activities at the ESG/SSFL have masked some of the resultant costs. For example, the close proximity of the Radioactive Material Disposal Facility (RMDF) proved significant in reducing radioactive material disposal costs. (Auth)

171

Thompson, M.L., E.F. Kurtz, and G.C. Berg, General Electric Company, Advanced Reactors Systems Department, Sunnyvale, CA

General Electric Fuels Laboratory Decontamination and Decommissioning

GEFR-00616-1 (1982, July)

The General Electric Fuels Laboratory was a licensed facility located at the General Electric Vallecitos Nuclear Center (VNC), near Pleasanton, CA, and was utilized for mixed oxide fuel fabrication and development since 1962. The processing area of the Fuels Laboratory occupied over 4000 sq ft of floor space and included glove boxes, fume hoods, and associated equipment. After planning and cost estimating, the first phase of D&D was the removal and shipment of special nuclear material. The second phase was a decontamination test program which was performed at the same time as the removal and shipment of special nuclear materials. Prior to decontamination of gloveboxes, process equipment was flushed and cleaned, removed from the glove box, nondestructively assayed, and packaged for disposal. Waste was shipped to the DOE Hanford Waste Facility. The Fuels Laboratory D&D was successfully completed without incident. (PTO)

172

Thompson, M.L., E.F. Kurtz, and G.C. Berg, General Electric Company, Advanced Reactors Systems Department, Sunnyvale, CA

General Electric Fuels Laboratory Decontamination and Decommissioning - Appendices

GEFR-00616-2 (1982, July)

This report contains appendices A-H for the main report, GEFR-00616-1. The appendices are as follows: (a) Drop Test - Model 9136 Shipping Package; (b) Vacuum Test - Model 9136 Shipping Package; (c) Shipping Package Loading Work Guide; (d) Model 9136 Shipping Packages Load and Stress Analysis; (e) Quality Assurance Records; (f) Waste Shipment Details; (g) DOE Equipment Disposition; and (h) Work Plan. (PTO)

173

U.S. Department of Energy, Assistant Secretary for Nuclear Energy, Washington, DC

Remedial Actions

DOE/NE-0042; The Federal Nuclear Energy Program: A Synopsis; (pp. 22-23) (1983, January)

This section of the report contains a description of each of the four DOE Remedial Action Programs: Surplus Facilities Management Program; Grand Junction Remedial Action Program; Formerly Utilized Sites Remedial Action Program; and Uranium Mill Tailings Remedial Action Program. Also included is a milestone chart for each of the programs from FY82 through FY94. (PTO)

174

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Methodology for Establishing Decommissioning Priorities

RLO/SFM-82-7 (1982, June)

The purpose of this document is to describe the process that the Surplus Facilities Management Program (SFMP) uses to establish and periodically re-evaluate the program priorities and budgets for decommissioning projects. This document describes only the process (methodology) used in establishing priorities for decommissioning projects. The actual priority rankings are not included here because they are dynamic and must be changed as updated information becomes available. The decommissioning project priority process consists of two phases. In the first phase, six factors are evaluated

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

each project. These factors are: (1) DOE legal and contractual requirements; (2) economic impact of immediate versus delayed decommissioning; (3) health risks of delayed decommissioning; (4) future site plans; (5) cost effective program management; and (6) other special factors that may be unique to individual projects. The second phase of the priority process involves an evaluation of each project relative to the others, using the six factors listed above and a system for establishing the relative importance of each of these factors. The methods used to perform this comparative analysis and to establish a final priority listing are also described later in this document. (Auth)(PTO)

175

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Surplus Facilities Management Program - Program Plan, FY 1983-1987

RLO/SFM-82-2 (Vol. 1) (1982, October)

This program plan is the principal control document issued by the U.S. Department of Energy's Surplus Facilities Management Program (SFMP). It is formally revised each fiscal year primarily to address sequential five-year planning periods; however, it may be revised more frequently to provide long-range program planning updates and current administrative and procedural information. The first issue of the plan, RLO/SFM-79-2 (issued 10/79), was published as a single volume and covered the period FY 1980-1984. The current issue, addressing FY 1983-1987, is divided into three volumes. Volume 1 presents SFMP administrative policies, guidelines, and procedures. Program participants are expected to comply with the requirements and instructions set forth in this document, as well as all referenced regulations, criteria, standards, etc. It is not intended that SFMP administrative policy supersede the normal programmatic responsibilities of the participating field offices. Volume 1 consists of nine chapters, which are as follows: Chapter 1, Introduction; Chapter 2, Program Administration; Chapter 3, Public Information; Chapter 4, Facility Acceptance; Chapter 5, Maintenance and Surveillance; Chapter 6, Project Priorities; Chapter 7, Technology Development; Chapter 8, NEPA Compliance; and Chapter 9, Project Planning. A list of abbreviations, referencing SFMP participating organizations, project sites, and facility designations, and a glossary of terms are also provided at the back of Volume 1. (Auth)(PTO)

176

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Surplus Facilities Management Program - Program Plan, FY 1983-1987

RLO/SFM-82-2 (Vol. 2) (1982, October)

The program plan is the principal control document issued by the U.S. Department of Energy's Surplus Facilities Management Program (SFMP). It is formally revised each fiscal year primarily to address sequential five-year planning periods; however, it may be revised more frequently to provide long-range planning updates and current administrative and procedural information. The first issue of the plan, RLO/SFM-79-2 (issued 10/79), was published as a single volume and covered the period FY 1980-1984. The current issue, addressing FY 1983-1987, is divided into three volumes. Volume 2 presents the commercial program work breakdown structure, task/project descriptions, milestone and cost schedules, budget summaries, a current inventory of all SFMP commercial projects and facilities, site descriptions, long range project schedules, and waste volume projections. Volume 2 consists of two chapters and five appendices: Chapter 10, Work Breakdown Structure - Commercial; Chapter 11, Program Description - Commercial; Appendix A, Budget Summary FY 1983-1987 - Commercial; Appendix B, Inventory of Projects/Facilities - Commercial; Appendix C, Site Descriptions - Commercial; Appendix D, Long Range Schedule - Commercial; Appendix E, Waste Volume Projections - Commercial. (Auth)(PTO)

177

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Surplus Facilities Management Program - Program Plan, FY 1983-1987

RLO/SFM-82-2 (Vol. 3) (1982, October)

The program plan is the principal control document issued by the U.S. Department of Energy's Surplus Facilities Management Program (SFMP). It is formally revised each fiscal year primarily to address sequential five-year planning periods; however, it may be revised

more frequently to provide long-range program planning updates and current administrative and procedural information. The first issue of the plan, RLO/SFM-79-2 (issued 10/79), was published as a single volume and covered the period FY 1980-1984. The current issue, addressing FY 1983-1987, is divided into three volumes. Volume 3 presents the defense program work breakdown structure, task/project descriptions, milestone and cost schedules, budget summaries, a current inventory of all SFMP defense projects and facilities, site descriptions, long range project schedule, and waste volume projections. Volume 3 consists of two chapters and five appendices: Chapter 10, Work Breakdown Structure - Defense; Chapter 11, Program Description - Defense; Appendix A, Budget Summary FY 1983-1987 - Defense; Appendix B, Inventory of Projects/Facilities - Defense; Appendix C, Site Descriptions - Defense; Appendix D, Long Range Schedule - Defense; and Appendix E, Waste Volume Projections - Defense. (Auth)(PTO)

178
UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Commercial Program

UNC/OSFM-82-12a; 62 pp. (1982, September)

Highlights from the progress reported by the area offices for commercial program work include: (1) Chicago - Building 350 Decommissioning - Dismantling and subsequent disposal of the 100-foot long conveyor line was completed this month. Additionally, removal and packaging of the 6,000-pound extrusion press stationary platen was completed. Two of the extrusion press components remain to be removed from the PF-10A glovebox. (2) Idaho - Monticello Site Remedial Action - Results of the first round of groundwater sampling from the installed well support previous indications that the uranium content in the shallow aquifer exceeds the interim Safe Drinking Water Act Standards. Continued monitoring of the wells is planned. (3) Oak Ridge - Weldon Spring Site Surveillance - Repair activities on Raffinate Pit No. 4 dike were initiated in accordance with the informal DOE stipulation in place regarding remedial actions at Weldon Spring. (b) CEER Reactor Decommissioning - Identification of the preferred contractor for the CEER decontamination project is in a "hold" condition pending final resolution of the FY83 funding for the project. (c) Niagara Falls Storage Site - Construction of the R-10 dike continued this month. As a result of the delays incurred following discovery of sand lenses during the initial excavation process, completion of the R-10 dike construction was extended to mid-November 1982, with an estimated cost impact of approximately $400K. (4) Richland - Remedial Action Program Information Center - Volume three of the bibliography ORNL/EIS-154 will be distributed in November. (b) Program Administration - The outline for the Statement of Work for the Shippingport Station Decommissioning Project was completed and distributed internally for review. (5) San Francisco - (a) Nuclear Materials Development Facility - The planning effort for the D&D was completed on schedule. (b) Sodium Reactor Experiment Facility Decommissioning - All remaining D&D was completed at the SRE, including selected areas at the Interim Storage Facility and the Radioactive Material Disposal Facility. (PTO)(RAF)

179
UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Commercial Program

UNC/OSFM-83-3a; 72 pp. (1983, January)

Highlights from the progress reported by the area offices for commercial program work include: (1) Albuquerque - Mound ANSPD Areas Decommissioning - The glovebox removal phase (milestone No. 3) in building PP-52 has been completed ahead of schedule; (2) Chicago - Building 350 (Plutonium Gloveboxes) Decommissioning - The extrusion press main hydraulic cylinder housing was extracted from PF-10A. The temporary plastic closure was then removed from around the glovebox. The remaining items (base plate, crane rail I-beams, corner posts and roof) were removed, size reduced as necessary and packaged, completing the decommissioning of this glovebox. Decommissioning of glovebox PF-12 has been concluded with the removal of two 6000-pound upright end supports of the Cincinnati Shear; (3) Oak Ridge - Niagara Falls Storage Site (NFSS) Remedial Action - The draft project plan was issued for review and comment on January 4, 1983. DOE-RL, DOE-OR, and BNI discussed comments at a meeting held in Oak Ridge

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

January 19, 1983. It was determined that the project plan in its present form was lacking sufficient detail for evaluation. The decision was made to revise the plan to show both FUSRAP and SFMP work and that detailed cost, schedule, and design information would be included as appendices. A partial resubmittal of the revised plan was made January 31, 1983. A subsequent meeting was held, and it was determined that further modifications were required. Tentative schedule for reissue of the plan is now March 8, 1983. Site work included the completion of a survey of the surface areas in the northwest quadrant. The EIS Scoping Meeting is now set to be held in Lewiston, New York, on February 17 and 19, 1983; (4) Richland - Program Administration (Commercial) - DOE-RL and OSFM received official notification of the FY 1983 funding levels for both Defense D&D and Commercial Surplus Facilities Programs this month. OSFM then notified the field offices of their respective funding levels for the current fiscal year. Prior to this notification, work on decommissioning projects had to be maintained at FY 1982 funding levels under the continuing resolution; and (5) San Francisco - Nuclear Materials Development Facility (Building 055) Decommissioning - The revised TRU limits found in DOE Order 5820.1 were applied to the isotopic composition of the plutonium used in the facility. Because of Pu-241 and Am-241 present in the compositions, a correction factor was used on the limits of 100 nCi/g and 4000 dpm/sq cm lowering them to 73 nCi/g and 2924 dpm/sq cm, respectively. The final survey results of four previously decontaminated gloveboxes were compared against these new lower limits and all were found to be acceptable. (Auth)(PTO)

180

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Defense Program

UNC/OSFM-83-15a; 51 pp. (1983, January)

Highlights from the progress reported by the area offices for defense program work include: (1) Albuquerque - Special Metallurgical (SM) Building - Efforts on the building of filtration system are continuing. The prefilter subassembly has been completed. The HEPA filter support frames are in place and the prefabrication of the room walls is 75% complete. No further deterioration of existing walls and ceilings has been noted; (2) Chicago - New Brunswick Laboratory - Radiological analysis (gross alpha and beta) of the samples obtained in November from the on-site monitoring wells has been completed and all are within the normal background range; (3) Oak Ridge - Metal Recovery Facility (MRF) Decommissioning - A strategy meeting was held by ORNL management personnel in early January to formulate the SFMP and engineering plan for decommissioning the Metal Recovery Facility. The consensus of the meeting participants was that: the condition of the facility requires a decontamination effort to be undertaken in the near term; the potential for reuse of the facility after decontamination does exist and should be explored; and the conceptual design effort (CDR) should be conducted to reevaluate the proposed D&D methods and update the current cost and schedule estimates; (4) Richland - (a) 100-F Area Decontamination - A memorandum of understanding for use of decontamination and decommissioning workers for performing UNC-managed decommissioning work has been drafted. The decontamination and decommissioning (D&D) Worker is a new classification in seniority group 004 of the Hanford Atomic Metal Trades Council. This is an entry-level position allowing transfer after one year to Nuclear Trainee, a prerequisite position before becoming a Nuclear Operator. Ten D&D workers and one supervisor will be required for FY 1983 decommissioning work. (b) Program Administration - DOE-RL and OSFM received official notification of the FY 1983 funding levels for both the Defense and Commercial Surplus Facilities Programs this month. The OSFM then notified the field offices of their respective funding levels for the current fiscal year. Until this notification was received, work on decommissioning projects had to be maintained at FY 1982 funding levels. The OSFM Information Services provided 65 copies of the International Decommissioning Questionnaire Summary to the OECD Nuclear Energy Agency (NEA) in Paris, France for distribution to members of the NEA Radioactive Waste Management Committee. This report will be formally submitted to the Committee at their meeting in Paris on February 23-24, 1983 with a proposal for endorsement. If recommendations made in the report are endorsed by the Committee and subsequently by the NEA Steering Committee, a public announcement of endorsement will be made to the leaders of the 23 NEA member countries. The report, based on the 1982 Questionnaire prepared by OSFM and coordinated by the NEA, recommends the following: (1) long-range decommissioning planning, including financial provisions, should be emphasized; (2) more work should be done on existing decommissioning techniques to make them more cost-effective; (3) management strategies for waste disposal should be provided soon; (4)

international agreement on radioactive release limits should be established; and (5) international decommissioning information exchange should be pursued for the mutual benefit of interested countries. (Auth)(PTO)

181

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Defense Program

UNC/OSFM-83-16; 64 pp. (1983, February)

Highlights from the progress reported by the area offices for commercial program work include: (1) Chicago - New Brunswick Laboratory - Some uranium results and a few preliminary plutonium analyses of the samples obtained in November from the offsite open ditch into which the NBL storm sewers drain have been received; (2) Idaho - INEL Site Planning and Risk Assessment - Decision analyses for the TAN/TSF-3 concrete pad at the MTR-657 Plug Storage Facility was completed and published. The concrete pad will be completely removed and the area released for unrestricted use. Contaminated items will be removed from the Plug Storage holes and the facility released for future nuclear use; (3) Oak Ridge - ILW Transfer Line - Final design specifications for isolating and sealing of the two leak sites are complete. The group responsible for site-specific low-level waste studies requested addition of a small area contiguous with one of the sites after a review of the data and specifications. This addition will not change the scope of the project and can be handled within the contingency already included in project estimates; (4) Richland - Strontium Semiworks (201-C) Decommissioning - The 201-C Facility Radiological Characterization Plan, (SD-DD-AP-001), was issued; (b) Program Administration - The FY 1985 Budget Submittal for the Defense Waste Management Decontamination and Decommissioning Program was completed and transmitted to DOE-HQ on schedule. Information Services met with the DOE representative to the Nuclear Energy Agency (NEA) to prepare the SFMP's proposal regarding expansion and publication of the joint DOE-NEA International Decommissioning Questionnaire Report. The DOE representative presented the proposal to the NEA Radioactive Waste Management Committee in Paris February 23-24, 1983. The NEA Committee approved the SFMP proposal for expansion of the questionnaire. (Auth)(PTO)

182

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Commercial Program

UNC/OSFM-83-4a; 73 pp. (1983, February)

Highlights from the progress reported by the area offices for commercial program work include: (1) Albuquerque - Mound ANSPD Areas Decommissioning - Glovebox floor service removal has been completed in PP-142 (F-line side) Access Corridor and final decontamination of the concrete floor was started; (2) Chicago - Building 350 (Plutonium Decommissioning) - The remaining portion of the 22-inch diameter normal exhaust duct that was removed last month and a 30-foot section of the 20-inch diameter purge exhaust duct extracted from the building this month, were size reduced and packaged for disposal. Decommissioning operations are scheduled to be completed in March, leaving only waste shipments and the final report to be completed; (3) Idaho - Monticello Mill Site - A rough draft of the Monticello Mill Site Environmental Report (or ADM) was completed. Data collection in support of the Site Analysis Report is continuing, as is work on the exposure pathways and health effects sections of the report; (4) Oak Ridge - (a) Molten Salt Reactor Experiment (MSRE) Decommissioning - The annual reheat of the stored fuel salts was completed ahead of schedule to avoid conflict with other operations. Reheating of the salts is done to recombine fluorine that has precipitated out of the salts during the radiological decomposition of the material; (b) ORNL Planning and Risk Assessment - A draft of the Surveillance and Maintenance Plan was completed and is being reviewed internally before distribution. Draft versions of two chapters of the Long-Range Plan, Decommissioning Alternatives and Design/Performance Criteria were submitted for review; (c) Weldon Spring Site (WSS) - On February 5, 1983, DOE-HQ, DOE-OR, BNI, and DOA representatives participated in a briefing for Congressman Harold Volkmer on the status of WSS remedial actions. The Congressman seemed pleased with the briefing and subsequent tour of the facilities. On February 9, 1983, a joint meeting between DOE and DOA was held at WSS for the purpose of discussing the possibility of a cooperative effort between the two agencies. Action items were developed and a follow-up meeting was tentatively scheduled for the latter part of March at the

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

Aberdeen Proving Grounds in Maryland; and (c) Niagara Falls Storage Site (NFSS) - A status review meeting was held at DOE-OR offices on February 2, 1983, and attended by DOE-HQ, DOE-OR, DOE-RL, BNI, and ANL. The status review included discussions on funding, NEPA activities the NFSS water discharge permit, and design criteria. As a result of the meeting, DOE-HQ approved a change in criteria for concentrations of radium-226 in soils from 5 pCi/g to 15 pCi/g. The NFSS EIS scoping meetings were held in Lewiston, New York, on February 17 and 19, 1983. The meetings were attended by approximately 90 people. The main concerns expressed were that NFSS should be totally decommissioned and returned to Lewiston for unrestricted use, AFRIMET should be held completely liable for all costs associated with K-65 residues and that ocean dispersal of wastes was an unacceptable alternative. The revised project management plan was scheduled for completion on March 15, 1983; (5) Richland - (a) Shippingport Station Decommissioning Project (SSDP) - The tests for all 17 activity specifications have been submitted in final form, thereby completing the task 3 milestone. Information provided to DOE-HQ which defined the impacts of status turnover dates earlier than October 1, 1984, both on FY 1984 funding requests and on the schedule for selecting a Decommissioning Operations Contractor. Impacts which would result from SFMP having to provide SSDP funds from the currently planned FY 1984 budget ($15.36 million BA, and $16.0 million BO) were also defined. Approval has been received from ASNE for the DOE-RL Source Evaluation Board (SEB). DOE-RL has recommended to DOE-HQ that all dry Low Specific Activity waste and dry or dewatered waste acquired from liquid waste processing be transported via truck to Savannah River for disposal. Savings in excess of $250K would be realized over the transport to Hanford due to the shorter distances involved; (b) Program Administration - OSFM gave a presentation while at DOE-HQ concerning a U.S. (SFMP) proposal to the Nuclear Energy Agency (NEA). The proposal, which will be presented to the NEA, involves expanding a Decommissioning Questionnaire to make it more useful as a tool for assessing specific exchange activities between interested countries. The U.S. DOE representative to NEA will be meeting with the agency's Radioactive Waste Management Committee in Paris, February 23-24, 1983; and (6) San Francisco - Santa Susana Field Laboratory (SSFL) - Copies of the SRE documentary film have been received by DOE-RL. (Auth)(PTO)

183

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Defense Program

UNC/OSFM-83-13a; 48 pp. (1982, October-November)

Highlights from the progress reported by the area offices for defense program work include: (1) Albuquerque - Special Metallurgical (SM) Building Surveillance - The possibility of contamination from roof leaks forced all but the trade/craft people at the rear of the building to be relocated into a separate facility; (2) Chicago - New Brunswick Laboratory Decommissioning - The first quarterly surveillance and maintenance visit to the New Brunswick Laboratory site was made on November 17-19, 1982. Everything appeared secure. The earth cover over the main building floor slab showed no sign of corrosion, the grass and other vegetation had not grown to any extent since it was last mowed in late August, and no evidence of intrusion was observed. A visual inspection of the fence revealed no openings, but several more bent posts were noted along the Westco side. This damage, however, has not reduced the security of the side. All ten monitoring wells were sampled; (3) Idaho - INEL Defense Facilities (Surveillance) - A waste tank stored at one of the TAN Outside Areas began to show significant deterioration of its covering. Since this could potentially result in the spread of contamination, it was decided to remove the tank to the Radioactive Waste Management Complex (RWMC). This action was completed; (4) Oak Ridge - (a) ORNL Surplus Facilities Surveillance - Decontamination of the cell access area at the Curium Facility is in progress. Completion is anticipated during December; (b) ILW Transfer Line - Final design specifications for isolating and sealing of the two leak sites are complete. Drawings and scheduling of the work were transmitted to the CPAF contractor. Cost estimates are now being prepared by UCC-ND and the CPAF contractor; and (c) Metal Recovery Facility (MRF) Decommissioning - The final report on the summary of radiological characterization activities at Building 3505 entitled, "Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at ORNL" has been published and issued; and (5) Richland - Program Administration - The 1982 International Decommissioning Symposium was held in Seattle, Washington, October

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

10-14, 1982. Total attendance was 400, of which 120 were foreign visitors, representing 13 countries. The annual SFMP Budget and Planning Conference was held in Miamisburg, Ohio, on November 9-11, 1982. Representatives from all participating field offices and their contractors attended the three-day conference. Reviews of FY 1982 activities as well as proposed FY 1983 activities were presented by all participants. A tour of the Mound facilities was provided to attendees. Major problems include: (1) Albuquerque - Special Metallurgical (SM) Building - During preparations for the installation of a second row of absolute filters in the exhaust system, it was determined that the walls were not as air tight as they needed to be in order to meet standards for protection of the environment. Attempts to rectify this condition are currently underway. Should a more intensive approach be needed than is currently being taken, additional funding may be necessary. Planned work includes: (1) Chicago - New Brunswick Laboratory Decommissioning - Work in December will consist of preparing and starting the analysis of the monitoring-well samples taken in November. In addition, effort will continue to further develop and test the methodology which will be used at NBL-NJ to determine the radioactive content and concentration of the on-site sewers, any associated contaminated oil, and the pitchblende. (Auth) (PTO)

184

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Commercial Program

UNC/OSFM-82-8a; 63 pp. (1982, May)

Highlights from the progress reported by the area offices for commercial program work include: (1) Albuquerque - Mound ANSPD Areas Decommissioning - During removal of overhead utility services in the access corridors of PP-140 and 141, an OSHA lost time injury occurred when a mechanic fell from a step ladder and injured his back. This was the first OSHA injury the project has had to date. The last oversized TRU shipping container from the ANSPD decommissioning project was loaded for shipment and disposal. Only standard size TRU boxes will be used for future TRU shipments. This transition to standard size boxes will minimize impacts on the project should the Waste Isolation Pilot Plant (WIPP) burial criteria come into effect; (2) Chicago - Building 350 (Plutonium Gloveboxes) Decommissioning - Disassembly efforts required for PF-10A and PF-12 gloveboxes were underestimated. Project work is now scheduled to be finished by December 31, 1982; (3) Oak Ridge - (a) BONUS Facility Surveillance - During the annual physical and radiological inspection of the BONUS facility, very low levels of removable beta-gamma material were detected. Although the levels detected were well below allowable limits, further investigation is planned to determine the source of the contamination; (b) Weldon Spring Site Surveillance - Hydrologic and soil structure analyses of the west berm of Raffinate Pit No. 4 were completed. Preliminary engineering work is underway for stabilization of the berm to prevent further deterioration; and (c) Niagara Falls Storage Site (NFSS) Remedial Action - Preparations are underway for the construction of the R-10 decontamination facility and spoils impoundment facility at NFSS. The NFSS Phase I Long Range Planning Study was submitted to DOE-OR for review. The Action Description Memorandums (ADMs) for the proposed interim remedial actions on the R-10 spoils pile and Building 413/414 were approved by DOE-RAPO; (4) Richland - (a) Remedial Actions Program Information Center (RAPIC) - RAPIC representatives provided information support at the International Symposium on Management of Waste from Uranium Mining and Milling, held May 10-14, 1982, in Albuquerque, New Mexico; (b) Shippingport Station Decommissioning Project (SSDP) - The SSDP final Environmental Impact Statement was approved and released by DOE-HQ. A Record of Decision on the SSDP is expected to be published in the Federal Register in June; and (c) Program Administration (Commercial) - OSFM completed basic planning for the 1982 International Decommissioning Symposium, scheduled for October 10-14, 1982 in Seattle, Washington. A draft report summarizing the responses to an international questionnaire concerning decommissioning activities and plans was submitted by OSFM to the Nuclear Energy Agency for review. OSFM transmitted a draft Record of Decision on the SSDP to DOE-RL for review and approval. The Record of Decision was sent to DOE-HQ for later publication in the Federal Register. OSFM completed production of a Shippingport Station Decommissioning Project (SSDP) Briefing Booklet; copies will be forwarded to DOE-RAPO. The booklet presents an overview and justification of the SSDP project and contains illustrations demonstrating the proposed one-piece reactor vessel removal technique; and (5) San Francisco - Advanced Fuels Labor Decommissioning - All but one major AFL project .

stone was completed this report period. The completed milestones included: shipment of remaining DOE equipment, shipment of chemistry gloveboxes, and assembly and shipment of DOE records. Final contamination surveys of the laboratory are still in progress. The remaining milestone, completion of the AFL project final report, is expected by July 31, 1982. (Auth)(PTO)

185

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Commercial Program

UNC/OSFM-83-1a; 78 pp. (1982, October-November)

Highlights from the progress reported by the area offices for commercial program work include: (1) Albuquerque - Mound ANSPD Areas Decommissioning - Installation of a small replacement house vacuum/corrosive vapor system in the PP Building was temporarily placed on hold in October as a result of an unexpected release of contaminated liquid during connection to existing piping. Several employees were splashed with contaminated acid; however, no significant physical or radiological injuries resulted. Mound hosted the annual SFMP Budget and Program Planning Conference in Miamisburg, Ohio on November 9-11, 1982. In addition to the presentations made at the conference, tours of the Mound decommissioning projects were provided to interested conference participants; (2) Chicago - Building 350 (Plutonium Gloveboxes) Decommissioning - Disposal efforts on the remaining PF-12A glovebox components resumed this report period. Except for the packaging of two large end supports, the decommissioning work on PF-12 is now complete. In November, removal of the 9000 pound, seven-foot long main hydraulic piston from the PF-10A glovebox was completed. The piston was initially cut in half to allow disposal of the exterior four-foot long, 4400-pound section as scrap. In November, the interior portion of the piston was removed and after decontamination, it too was disposed of as scrap. Completion of the physical decommissioning work at Building 350 is now projected to be in February 1983, two months behind schedule. Dismantling problems encountered in the PF-10A glovebox were the primary reason the delay; (3) Idaho - Monticello Site Remedial Action - Groundwater sampling of installed monitoring wells continued this report period. Results of the analyses confirm previous findings of uranium contamination in the groundwater downstream from the site. Continued monitoring of these wells is planned until an adequate definition of the problem can be found; (4) Nevada - Nuclear Rocket Development Station (NRDS) Decommissioning - The in-depth soil survey of the Radioactive Material Storage Facility (RMSF) was completed this report period. Contaminated soil removal from the RMSF is now in progress; (5) Oak Ridge - (a) Oak Ridge National Laboratory (ORNL) Surplus Facilities Surveillance (Commercial) - The fifteen surplus waste storage tanks at ORNL previously in the Commercial Program were transferred to the Defense Program this report period. Future decommissioning activities on these tanks will be reported in the Defense monthly reports; (b) CEER Mayaguez Facility Decommissioning Project - The procurement action for final decontamination of the CEER Mayaguez Facility was cancelled in October due to unavailability of sufficient FY 1983 funding. Under the current funding, FY 1983 activities at CEER will be limited to surveillance of the facility and shipment of radioactive source materials to ORNL for storage. Management responsibility for the decontamination of the CEER facility was transferred in October to the DOE-OR Assistant Manager for Construction and Engineering. Now all remedial action projects away from Oak Ridge are under the same department; (c) Weldon Spring Site (WSS) Remedial Action - Formalization of the DOE Stipulation regarding remedial action activities at WSS was completed in October. With the approval of the Stipulation, no physical movement of radioactive waste into the Weldon Spring area can occur until the appropriate NEPA actions have been completed. The repair work on Raffinate Pit No. 4 berm was completed in November. The construction of the decontamination pad and the road stabilization effort in the pit area were also completed in November. This completes the scheduled repair work on the berm; (d) Niagara Falls Storage Site (NFSS) Remedial Action - Installation of the gravel stops and gravel roofs on Buildings 413 and 414 was completed in October. This completes the sealing work on these structures. Construction of the R-10 impoundment facility was completed in November. Installation of an EPDM cover over the R-10 pile for the winter was also accomplished. Efforts are now underway to anchor the cover over the R-10 perimeter dike. Results from the sampling program on the treated water in the NFSS water treatment/retention system showed that the system significantly reduced the concentration of heavy metals in the water and reduced the radium content by a factor of 25 to 50. In view of the favorable results, the water

treatment system was purchased from the vendor for continued use in SFMP/FUSRAP activities at NFSS. Following notification of the New York Department of Environmental Conservation (NY-DEC) of pending overflow of the water retention ponds as NFSS as a result of heavy rains, approximately 770,000 gallons of water from the ponds were released to the Central Ditch. As a result of the release, and the lack of an approved New York State discharge permit, a violation notice from the NY-DEC was served against OR/BNI. Efforts to resolve this matter are currently underway. A copy of the NFSS Phase I Long Range Planning Study was obtained from an unknown source by a local newspaper in the Niagara Falls, New York area. The resulting published article raised considerable local public concern regarding the possibility of the NFSS becoming a waste disposal site. Because of the increased public interest aroused as a result of the article, and to keep the local citizenry abreast of NFSS activities, meetings were tentatively scheduled in early December by OR/BNI to brief New York State representatives, the NFSS Oversight Committee, and the Town Council of Lewiston, New York on current and future activities planned for the NFSS. Discussions are currently underway between DOE-DRAP, DOE-RL, and DOE-OR regarding possible acceleration of remedial work at NFSS during the FY 1983-84 time frame. An OR/BNI plan is now being reviewed by DOE which identified supplemental tasks in FY 1983-84 which could be accomplished should the funding be available to proceed at the accelerated rate; (6) Richland - (a) Remedial Actions Program Information Center (RAPIC) - RAPIC provided information support at two SFMP conferences this report period. In October, RAPIC representatives attended the 1982 International Decommissioning Symposium held in Seattle, Washington. In November, RAPIC representatives attended the SFMP Budget and Program Planning Conference held in Miamisburg, Ohio. At both conferences, literature searches were performed for interested participants. Volume 3 of the bibliography, ORNL/EIS-154/V3, Nuclear Facility Decommissioning and Site Remedial Actions. A Selected Bibliography was distributed in November; (b) Shippingport Station Decommissioning Project (SSDP) - A draft Statement of Work for the SSDP was prepared by OSFM and submitted to DOE-RL for initial review on November 24, 1982, as scheduled. This document describes the required services and responsibilities of the Decommissioning Operations Contractor (DOC); and (c) Program Administration (Commercial) - The 1982 International Decommissioning Symposium was held October 10-14, in Seattle, Washington. An estimated 400 attendees participated in the official program and various guest program activities. A total of 67 papers from 11 countries were presented, covering all aspects of decommissioning. Representatives of SFMPO and OSFM participated in a review of FY 1982 Commercial Program accomplishments and FY 1983 plans at the DRAP Annual Program Review Meeting held in Grand Junction, Colorado. In addition to the presentations made by the various programs in DRAP, extensive discussions took place regarding future remedial actions at the Niagara Falls Storage Site. A proposal for possible acceleration of the remedial work at NFSS in FY 1983-84 was addressed. Further discussion of this matter was planned. The SFMP Budget and Program Planning Conference was held November 9-11, 1982 in Miamisburg, Ohio. Representatives from all participating field offices and their contractors were in attendance. In addition to the technical discussions, tours of the Mound decommissioning projects were provided to all interested attendees; and (7) San Francisco - Nuclear Materials Development Facility (Building 055) Decommissioning - The draft Project Plan for Building 055 Decontamination and Deactivation was completed and distributed for review in October. Following DOE approval of the plan, deactivation activities began in November. (Auth)(PTO)

186

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Defense Program

UNC/OSFM-83-14a; 46 pp. (1982, December)

Highlights from the progress reported by the area offices for defense program work include: (1) Idaho - INEL Site Planning and Risk Assessment - Drafts of decision analysis for both the TAN/TSF-3 concrete pad and the MTR-657 Plug Storage Facility were completed and sent to DOE-ID for review. The recommendation for the concrete pad was to cut it up and ship it to the Radioactive Waste Management Complex (RWMC) for disposal. The area would then be cleaned up and released for unrestricted use. A different decommissioning mode was recommended for the Plug Storage Facility. It will be decommissioned by removing contaminated items from the storage holes, decontaminating the holes as required, and then releasing the facility for further use. The facility will not be dismantled; (2) Oak Ridge - ORNL Surplus Facilities Surveillance - Completion of

tamination of the cell access area at the Curium Facility was halted while in-cell repairs and modifications were in progress. Decontamination of the cell access area will be resumed when in-cell repairs and modifications are completed. Work is expected to be completed in March and the facility turned over to an operating program on April 1; (3) Richland - (a) Surveillance of Hanford 100 Areas - Local high winds caused damage to roofs and doors throughout the areas (100-D, H&F). Minor damage occurred on some roofs of the 185, 189 and 1713-D Buildings. These roofs were replaced in 1980 and are generally in excellent condition. With the recent addition of a carpenter to the surveillance maintenance staff, repairs are being made as weather conditions permit; (b) Surveillance of Hanford 200 Areas - The cost/benefit review of installing the 291-C Fan House HEPA filter was completed and the recommendation was made to install the HEPA filter; (c) 100-F Ancillaries and 108-F Laboratory Decontamination - All detailed work procedures for performing 108-F Laboratory decontamination were prepared and submitted to Environmental and Occupational Safety in order to complete the work package. Work is scheduled to begin in March; and (d) Program Administration - The draft FY 1985 Budget Submittal Guidance was transmitted to the Surplus Facilities Management Program Office (SFMPO) on December 21, 1982. Following SFMPO review, the guidance was transmitted to the participating DOE field offices on December 22, 1982. Responses to the FY 1985 Budget Submittal are due from the field offices by February 1, 1983. Preparation of the FY 1985 Budget Submittal for the SFMP will be the major activity during the upcoming months. (Auth)(PTO)

187

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Commercial Program

UNC/OSFM-83-2a; 71 pp. (1982, December)

Highlights from the progress reported by the area offices for commercial program work include: (1) Idaho - Idaho National Engineering Laboratory (INEL) Site Planning and Risk Assessment (Commercial) - The characterization reports for the SPERT III outside areas and the SPERT I, II, and BORAX V leach ponds were completed this month and distributed as scheduled. Work was subsequently initiated on the decision analysis effort to determine what decommissioning actions are required for each of these areas; (2) Nevada - Nuclear Rocket Development Station (NRDS) Decommissioning - The contaminated soil removal from the Radioactive Material Storage Facility (RMSF) and surrounding areas was completed this month as scheduled. Work is now underway to resurvey the RMSF and adjacent areas and remove residual contamination; (3) Oak Ridge - Niagara Falls Storage Site (NFSS) Remedial Action - Installation of the anchor blocks over the EPDM covering the R-10 pile was completed this month. Placement of a crushed stone facing on the R-10 dike was also accomplished. Following numerous discussions throughout the month between DOE and the New York State Department of Environmental Conservation (NY-DEC) regarding the unapproved release of water from the site, a water release consent order was signed and forwarded by DOE-OR to the NY-DEC for concurrence. Efforts continue to put in place an acceptable water discharge permit for NFSS. Clearing of the New Naval Waste area, in the north-central portion of the NFSS was completed this month in preparation for later characterization work. The DOE's near- and long-term plans for the NFSS were the subject of four briefings presented to New York State and local officials and members of the public December 20 and 21, 1982. The principal theme, consistently presented by the DOE/contractor briefing team, was (a) DOE has no intention of developing NFSS into a regional disposal site, (b) the current site conditions at NFSS are being upgraded, (c) the public should not feel threatened by potential health hazards resulting from residues stored there, and (d) DOE will assess very carefully the disposition alternatives: site decontamination, and stabilization of waste currently on-site and that which may have migrated on to vicinity properties. Reactions to the briefings were mixed, with negative reactions related primarily to the lack of a clear commitment by DOE to decontaminate and decommission the NFSS, which the area residents desire. Also announced at the briefings was that a scoping meeting for the NFSS Environmental Impact Statement (EIS) would tentatively be scheduled for late January 1983; and (4) Richland - Program Administration (Commercial) - The FY 1985 Budget Submittal Guidance was transmitted to the participating DOE field offices on December 22, 1982. Responses to the FY 1985 Budget Submittal are due from the field offices by February 1, 1983. The minutes from the SEMP Budget and Program Planning Conference, held in Miamisburg, Ohio, in November were completed and distributed to the conference attendees. (Auth)(PTO)

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

188

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Commercial Program

UNC/OSFM-82-9a; 60 pp. (1982, June)

Highlights from the progress reported by the area offices for commercial program work include: (1) Chicago - Building 350 (Plutonium Gloveboxes) Decommissioning - Project work in FY 1982 is being accelerated on Building 350 as a result of ten-hour workdays going in effect for the remainder of the fiscal year. Additionally, to save project labor time and cost, negotiations are underway between DOE-CH and DOE-RL regarding potential shipment and burial of four M-III bins containing the larger (6000-12,000 pound) components of the PF-10A extrusion press. These time-saving efforts for the remainder of FY 1982 are expected to minimize the work required in FY 1982 to complete the project; (2) Oak Ridge - BONUS Facility Surveillance - The investigation into the source of the low-level contamination found during the annual BONUS survey was completed. The results indicated the contamination originated on a rusty hatch door which, when opened during the survey effort, released particles of contaminated rust onto the area walkway. This contamination was then tracked over a small area of the facility. The contaminated area was subsequently cleaned up; (3) Richland - (a) Piqua Nuclear Power Facility Surveillance - The annual surveillance inspection of the Piqua Nuclear Power Facility was performed on June 18, 1982. The inspection summary report will be issued by September 1, 1982; (b) Hallam Nuclear Power Facility Surveillance - Gamma scanning of the entombed Hallam Nuclear Power Facility, originally scheduled to be performed in June, was postponed until required radiation equipment can be made available; (c) Shippingport Station Decommissioning Project (SSDP) - DOE-Naval Reactor's plan for leaving fuel element structural assemblies for disposition by the Decommissioning Operations Contractor (DOC) is a matter of major concern to the SSDP. Such activities are not included in the present project baseline. DOE-RAPO will be requested to aid in obtaining an agreement with DOE-NR regarding the status of the Shippingport Station at turnover which can be accommodated within the existing baseline; (d) Program Administration (Commercial) - Miamisburg, Ohio was selected as the site for the FY 1983 SFMP Budget and Program Planning Conference to be held November 9-11, 1982. OSFM completed a review of all SFMP Third Quarter Review inputs. Resulting adjustments to the SFMP Commercial budget will be finalized by July 6, 1982. OSFM completed and transmitted to DOE-RL a document titled "SFMP Methodology for Establishing Decommissioning Priorities." The document describes in detail the process that OSFM and SFMPO use to establish and periodically re-evaluate priorities for decommissioning project funding; and (4) San Francisco - (a) Sodium Reactor Experiment Facility Decommissioning - A ceremony commemorating completion of the SRE decommissioning was held on June 28, 1982 at the SRE facility. Representatives from DOE-SAN, SFMPO, and OSFM were in attendance; and (b) Advanced Fuels Laboratory Decommissioning - A ceremony commemorating completion of the General Electric Advanced Fuels Laboratory decommissioning was held on June 29, 1982. Representatives from DOE-SAN, SFMPO, and OSFM were in attendance. (Auth)(PTO)

189

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Defense Program

UNC/OSFM-82-24a; 34 pp. (1982, September)

Highlights from the progress reported by the area offices for defense program work include: (1) Albuquerque - Special Metallurgical (SM) Building Surveillance - Roof duct removal is approximately eighty percent complete. The remaining twenty percent is to be removed in FY 1983. Removal of the scheduled portion of the roof was completed. Roof replacement is approximately ninety percent complete. Delays were encountered due to rain; (2) Chicago - NBL Surveillance - Analysis of the sewer samples obtained in May has been completed, although all the results are still not available. The data for the on-site sewers indicates that these systems are contaminated well above background. Off-site sewers are also contaminated but not to the extent of on-site sewers; (3) Idaho - Liquid Waste Evaporator (PM-2A) - Grading, seeding and fencing of the PM-2A area was completed. This fulfills Milestone No. 4 "Backfill, Grade, Seed and Fence Area"; (4) Oak Ridge - (a) ORNL Surplus Facilities

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

veillance - Comments and suggestions have been incorporated into the comprehensive report on radiological characterization of the Metal Recovery Facility. It has also been submitted for publication; and (b) Curium Facility - Investigation of the personnel contamination incident was completed, allowing decontamination efforts to be resumed. The final report on the committee's investigation has not yet been filed; (5) Richland - (a) Hanford 100 Areas - All planned roof repairs were completed; (b) Hanford 200 Areas - Building 291-U stack exhaust was repaired, including the bearings, and the electrical damper controls were recommended; and (c) Program Administration - Preparation of the FY 1983 SFMP Program Plan was completed. The final version was transmitted to DOE-RL on September 30, 1982, as scheduled. Work planned includes: (1) Chicago - New Brunswick Laboratory - Analysis of the monitoring well samples taken in August will be completed. Compiling of the remaining sewer sample data, obtained in May, will be completed; (2) Oak Ridge - Curium Facility - Final cleanup of the cells and service area will not be completed until early in FY 1983 (November 1) because of the delay during investigation of the contamination incident. Funding for completion of this work will be furnished by the new program; and (3) Richland - (a) Hanford 100 Areas - Soil sterilization will be initiated for the 100-D perimeter area; (b) Hanford 200 Areas - Surface stabilization of the No. 35 through No. 42 "B" trenches will be completed; complete replacement of the heat tracer line from 202-S to the 291 and 292 Buildings; and (c) Program Administration - The FY 1982 SFMP Program plan will be distributed to all DOE Field Office and contractor organizations involved with the program. (Auth)(PTO)

190

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Commercial Program

UNC/OSFM-82-10a; 61 pp. (1982, July)

Highlights from the progress reported by the area offices for commercial program work include: (1) Albuquerque - Mound ANSPD Areas Decommissioning - An OSHA lost time injury occurred when a decontamination worker received an eye injury while size-reducing a concrete block wall in the PP Building. This is the third lost time accident to occur during the last 18 months on SFMP-related activities (and the second of the ANSPD areas). DOE-AL has requested DOE-DAO to audit the MRC decommissioning safety program. All accidents to date have been nonnuclear; (2) Oak Ridge - (a) ORNL Surplus Facilities Surveillance (Commercial) - Removal and replacement of the faulty ORR north beam hole (HN-1) shield plus and liner were completed during the ORR shutdown on July 26-28, 1982. This action was required to correct a previously identified water leak from the shield plus area; (b) BONUS Facility Surveillance - The inspection summary report of the annual BONUS survey was issued by DOE-OR on July 27, 1982; (c) Weldon Spring Site Surveillance - Local (Weldon Spring area) opposition to what is perceived to be DOE's intent to create an "open-ended dumping operation" of radioactive wastes at WSS from outside the Weldon Spring area is being expressed directly to DOE or through elected officials. At the request of Missouri Senator Eagleton, a public meeting was scheduled for August 10, 1982 in the Weldon Spring area to inform the local citizens and their elected officials of the nature of the current and future work at the Weldon Spring Site; and (d) Niagara Falls Storage Site (NFSS) Remedial Action - Extensive sand lenses, discovered during excavation of the sedimentation pond and R-10 dike areas, have delayed progress on the R-10 stabilization and retention pond construction efforts. Project impacts as a result of the delays have not yet been fully identified. The roof and support structure removal on Buildings 413 and 414 was completed this report period. The sealing of Building 413 was initiated; (3) Richland - (a) Shippingport Station Decommissioning Project (SSDP) - DOE-Naval Reactor's plan for leaving fuel element structural assemblies for disposition by the Decommissioning Operations Contractor (DOE) is a matter of major concern to the SSDP. Such activities are not included in the present project baseline. DOE-DRAP has been requested to aid in obtaining an agreement with DOE-NR regarding the status of the Shippingport Station at turnover which can be accommodated within the existing baseline. A meeting has been scheduled for August 5, 1982 among DOE-HQ, DOE-NR, DOE-RL, and OSFM to discuss the status of the Shippingport Station at turnover, and other items of common interest; and (b) Program Administration (Commercial) - OSFM prepared and transmitted the third quarter FY 1982 budget recommendations to SFMPO on July 8, 1982; Production of the FY 1983-87 SFMP Program Plan was initiated. The final draft plan is scheduled for submission to SFMPO on September 1, 1982; and (4) San Francisco - (a) Sodium Reactor Experiment Facility Decommissioning - A final radiological survey of the SRE

complex was initiated by the Argonne National Laboratory survey team. Completion of the survey is expected in August; and (b) Advanced Fuels Laboratory Decommissioning - The final project report on the AFL decommissioning was issued on July 30, 1982. A technology exchange effort was established between General Electric (GE) and Atomics International (AI) in support of the decommissioning of the Nuclear Materials Development Facility (Building 055) at the Santa Susana Field Laboratory. GE has just completed decommissioning the Advanced Fuels Laboratory (AFL), and AI is currently in the engineering phase of a similar decommissioning project (Building 055). Since both facilities (AFL and Building 055) are NRC licensed, utilization of GE "lessons learned" should prove to be both time and cost effective in the Building 055 decommissioning effort. (Auth)(PTO)

191

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Defense Program

UNC/OSFM-82-21a; 34 pp. (1982, June)

Highlights from the progress reported by the area offices for defense program work include: (1) Albuquerque - Special Metallurgical (SM) Building Surveillance - Duct removal is approximately thirty-five percent complete. The black (insulated) duct has been removed and size reduced. The roof duct size reduction facility in the SFMP penthouse was completed; (2) Chicago - New Brunswick Laboratory (NBL) - A total of twenty-six samples obtained from the sewers at NBL-NJ in May 1982 were prepared and sent to the Argonne Analytical Chemistry Laboratory for analysis. Some preliminary data have been received indicating that water and sludge in the storm sewer catch basins at the site boundary contain radionuclides above background level. The sludge in the on-site sanitary sewer and at one sample point in the first sanitary sewer manhole downstream from the site contains radionuclides above background levels. Principal nuclides were U-238, U-235, Pu-239 and Th-233. Analysis of the samples taken from the monitoring wells was started and the input of the data into the computer continued; (3) Idaho - (a) INEL Surveillance - A draft of the IET Characterization Report was completed and distributed for internal review and comment; and (b) Liquid Waste Evaporator (PM-2A) - The drying agent for the liquid and sludge in the underground tanks was injected into the tanks. Photographs taken after injection of portion of the drying agent indicated that absorption the liquid was occurring as expected. Additional photographs will be taken following completion of the injection operation and clearing of the tank atmosphere. The PM-2A feedline characterization and capping operation was completed; (4) Oak Ridge - (a) ORNL Defense Facilities - The comprehensive report on radiological characterization of the MRF was completed in draft form and is being prepared for distribution and comment; (b) Curium Facility - The final set of manipulators was removed for decontamination and repair; (c) ILW Transfer Line - The final detailed drawings and procedures for removal of the sections of pipe from the White Oak Creek floodplain have been certified for construction; and (5) Richland - (a) Surveillance of Hanford 100 Areas - Bids were received for roof repair at 100H and 100D/DR areas. Additional funding was authorized to allow completion in FY 1982 of all roofing planned for these areas in FY 1983; and (b) Program Administration - OSFM recommended to SFMPO that Dayton Area Office-Mound Facility/Miamisburg, Ohio be selected as the site for the FY 1983 SFMP Budget and Program Planning Conference to be held in mid-November, 1982. OSFM completed and transmitted to DOE-RL a document titled "SFMP Methodology for Establishing Decommissioning Priorities." The document described in detail the process that OSFM and SFMPO use to establish and periodically re-evaluate priorities for decommissioning project funding. The new document combined material in two earlier draft reports (SFMP Cost Efficiency Study and the SFMP Priority Listing) and includes other factors that have been used previously by OSFM but not formally described. Transmittal of the document to Headquarters satisfies a Director Level Milestone established by Headquarters for the SFMP. Work planned includes: (1) Albuquerque - Special Metallurgical (SM) Building - Roof duct removal and minor roof repair will continue and a suitable roof drying system will be installed; (2) Idaho - Liquid Waste Evaporator (PM-2A) - Soil Removal at the PM-2A site will continue as weather conditions permit; (3) Oak Ridge - (a) ORNL Defense Facilities - The MRF Characterization Report will be distributed for comment in July, 1982; (b) ILW Transfer Line Decommissioning - A cost estimate for removal of the ILW pipeline from the White Oak Creek floodplain will be prepared following approval of the Safety Assessment. Removal of the pipeline will be initiated following reconciliation of the cost estimate; ar Richland - (a) Surveillance of Hanford 100 Areas -

repair will be initiated at 100 D/DR and 100H areas. This repair will be completed in FY 1982; and (b) Program Administration - Program Planning representatives will visit the INEL site on July 15, 1982 to observe decommissioning operations at the PM-2A (Liquid Waste Evaporator) site and to discuss ongoing and planned activities. A tour of surplus facilities at INEL will be made to familiarize Program Planning personnel with the site. (Auth)(PTO)

192

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Defense Program

UNC/OSFM-82-22a; 34 pp. (1982, July)

Highlights from the progress reported by the area offices for defense program work include: (1) Albuquerque - Special Metallurgical (SM) Building Surveillance - Interior contamination control activities were completed. Preparation, including design, for roof removal was completed. Roof duct removal is approximately forty percent complete. It has been determined that the majority of the remaining ductwork to be removed will be classified as TRU waste rather than LSA waste; (2) Chicago - New Brunswick Laboratory (NBL) - Analysis of samples taken in May 1982 at the New Brunswick site continued. The only analyses completed were of samples taken from the sanitary and storm sewers immediately off-site from the NBL property and the sanitary sewer pipe section which was removed to isolate the on-site sewer system from the municipal sewer system. These analyses indicate that there is radioactive contamination in the municipal sewer system above normal background. Further analyses will be required before an evaluation can be made. (3) Idaho - (a) INEL Surveillance - A draft of the Initial Engine Test (IET) characterization report was transmitted to DOE-ID for their review. Comments on the INEL Long Range Decommissioning Plan were received from DOE-ID. Comments will be incorporated and an issue date established; and (b) Liquid Waste Evaporator (PM-2A) - Contaminated soil removal operations were completed at the PM-2A site. The area is being re-surveyed prior to backfilling with clean soil; (4) Oak Ridge - (a) ORNL Defense Facilities - The comprehensive report on radiological characterization of the Metal Recovery Facility has been distributed for review; (b) ILW Transfer Line - An acceptable cost estimate was received from the CPAF contractor for removal of the pipeline from the floodplain and work started in mid-July. The line was uncovered at each end and residual liquid was drained and disposed of; and (c) Curium Facility - Decontamination efforts scheduled for July 1982 were limited due to a personnel contamination incident which is being investigated. The air hoist in Cell 5 was removed and the cell interior was painted. Contamination levels in Cell 5 are acceptable for release to alternate use; and (5) Richland - (a) Surveillance of Hanford 100 Areas - Roof repair at 115-D building was completed; and (b) Program Administration - OSFM reviewed the FY 1983 Defense budget based on continuing resolution and provided SFMPO with a proposed funding schedule for the first quarter of FY 1983. The schedule also identified impacts to the program which would occur under continuing resolution. Work continued on the FY 1983-87 SFMP Program Plan preparation. Correction of the data base information (reflecting the FY 1982-86 Program Plan information) was completed. Preparation of the data base for producing the FY 1985-87 Program Plan is in progress. Major problems encountered include: (1) Albuquerque - Special Metallurgical (SM) Building Surveillance - The determination that a large portion of the remaining ductwork on the SM Building roof will require handling as TRU waste will impact cost of removal and will cause a delay in filtration system modification. Due to the limited resources available, the project will experience a cost underrun in FY 1983. The exact amount of the underrun has not been determined as yet but is estimated to be approximately $65K. Planned work includes: (1) Albuquerque - Special Metallurgical (SM) Building - Work planned for the remainder of the fiscal year includes installation of the roof drying system, removal of approximately eighty percent of the ductwork, removal and replacement of approximately twenty percent of the roof, and upgrading a portion of the exhaust system. The exhaust system completion will be delayed until second quarter FY 1983 due to limited manpower available for the work, however, it will not impact other project work; (2) Chicago - New Brunswick Laboratory - A site inspection is tentatively scheduled for late August or early September 1982; (3) Idaho - Liquid Waste Evaporator (PM-2A) - Following the resurvey of the PM-2A site, the area will be backfilled with clean soil and seeded to minimize erosion. A fence will be constructed around the site to prevent unauthorized entry; (4) Oak Ridge - ILW Transfer Line - The pipeline will be removed from the floodplain and associated contaminated soils will be removed. A completion date of September 15, 1982 is anticipated; and (5) Richland -

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

Surveillance of Hanford 200 Areas - Stabilization of outside contaminated areas (BC-Crib) will be initiated in August 1982. Additional funding will be authorized by DOE-RL for this work. (Auth)(PTO)

193

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Defense Program

UNC/OSFM-82-20a; 35 pp. (1982, May)

Highlights from the progress reported by the area offices for defense program work include: (1) Albuquerque - Special Metallurgical (SM) Building Surveillance - Planning for ductwork removal was completed and ductwork removal is approximately fifteen percent complete. The roof duct size reduction facility in the SMA penthouse is approximately ninety-five percent complete. Interior contamination control (painting and caulking) is seventy-five percent complete; (2) Chicago - New Brunswick Laboratory (NBL) - The third scheduled quarterly surveillance and maintenance inspection of the NBL site was conducted on May 25-27, 1982. Thorough radiological sampling of the site sanitary and storm sewers was conducted, along with sampling of the municipal sewer system at locations upstream and downstream from the property; (3) Idaho - (a) INEL Surveillance - The annual inspection of INEL surplus facilities was completed which fulfills activity Milestone 1, "Complete Facility Survey"; and (b) Liquid Waste Evaporator (PM-2A) - Comments were received and incorporated on the revised PM-2A decommissioning plan. Removal of above ground piping at PM-2A was completed. Sludge drying tests (PM-2A) were completed and diatomaceous earth was selected as the drying agent; (4) Oak Ridge - (a) ORNL Defense Facilities - All but one section of the comprehensive report on radiological characterization of Metal Recovery Facility has been drafted. The report on analysis and evaluation of subsurface soil samples from the environs of the facility has been reviewed and is expected to be issued in July. These reports along with a feasibility study will provide the basis for conceptual design work in FY 1983 on decommissioning of the facility; (b) Curium Facility - Removal of the final set of manipulators has been rescheduled to June 1982, based on the availability of manpower. To date, no official directive has been received by ORNL from DOE-OR management to release the Curium Facility to the americium separations program, as referenced in earlier reports. Remaining FY 1982 funding is less than $30,000. SFMPO has allowed work to continue to reach a point where turnover to a new program (i.e., americium separations) can be readily accomplished. Currently SFMPO does not plan to provide any Curium Facility funding in FY 1983; (c) ILW Transfer Line Decommissioning - A very preliminary cost estimate for removal of the pipe sections from the floodplain (approximately $120,000) was submitted to OSFM on May 28, 1982 to allow lead time in arranging for FY 1982 funding if the project is supported. A formal cost estimate by the CPAF contractor is planned for June 1982; and (5) Richland - (a) Surveillance of Hanford 100 Areas - Repairs to deteriorated and damaged doors were made and the change out of security locks was initiated at 100-F and 100-H areas. A second story inside access door at 105-H Building was found open by a night patrolman and a security violation was reported. The door was secured; (b) Surveillance of Hanford 200 Areas - The cover blocks over D Cell in the Redox canyon were removed to investigate the extent of leakage of waste solution into the D Cell. Indications were that most of the material which had leaked into the cell had evaporated. Photographs of the cell were obtained and ventilation air flow was verified to assure that airflow was in the proper direction and sufficient to prevent loss of containment; and (c) Program Administration - OSFM Engineering is continuing work on a new document, "Methodology for Establishing Priorities for Disposition Projects." This document describes the system used by OSFM and SFMPO to establish priorities for project funding on both the defense and commercial programs. (Auth)(PTO)

194

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Defense Program

UNC/OSFM-83-17; 70 pp. (1983, March)

Highlights from the progress reported by the area offices for defense program work include: (1) Oak Ridge - (a) ORNL Site Planning and Risk Assessment - The draft version of the ORNL Surveillance and Maintenance

was completed and submitted to DOE this month for review and comment. Final version of the plan is scheduled to be issued in June 1983; (b) Fission Products Development Laboratory (FPDL) Decommissioning - The FPDL project started this month with preparations on the FPDL Decontamination and Decommissioning Project Plan. Decommissioning work, beginning with process equipment removal from Cell 8, is expected to begin in April; (2) Richland - (a) Hanford 201 Areas Surplus Facilities Surveillance - The engineering evaluation for repair of the REDOX facility lower roof was completed this month as scheduled. Actual repair of the roof is currently expected to begin in late April or May; (b) 201-C Strontium Semiworks Decommissioning - Characterization of the 201-C Strontium Semiworks Facility was initiated this month. As a result of delays involved in initiating the task, expected completion of the characterization and issuance of a characterization report is now in May; (c) 108-F Biological Laboratory Decommissioning - All required documentation and safety reviews were satisfactorily completed this month in preparation for starting decommissioning work on the 108-F Laboratory. Actual work began on March 26, 1983, with decontamination and removal of equipment from the facility; (d) Program Administration - The Surplus Facilities Management Program's proposal to the Nuclear Energy Agency (NEA), regarding expansion of the joint DOE-NEA International Decommissioning Questionnaire Report, was approved by the NEA Radioactive Waste Management Committee at their February 23-24, 1983, meeting in Paris. Formal notification of the approval was received early in March. The report will be expanded through issuance of a supplementary questionnaire that will be issued by the NEA to the 14 countries that responded to the first questionnaire in 1982. The OSFM will prepare the questionnaire and the subsequent report, coordinating publication and distribution with the NEA. The expanded report is expected to be used by the NEA as a working document for a meeting of decommissioning experts to be convened in 1984, and subsequently used by NEA member countries interested in information exchange with other countries. A SFMPO/OSFM review of field office inputs to the Civilian and Defense Mid-Year Review was initiated this month. Final recommendations will be made in early April and subsequent funding reallocations initiated, as necessary. Preparation of presentation materials was initiated this month for a briefing on the Surplus Facilities Management Program to be given by DOE-RL to Earl Gjelde, Special Assistant to the Secretary of Energy, in mid-April. The purpose of the presentation was to familiarize Mr. Gjelde with the SFMP [and the other programs within the U.S. Department of Energy's Division of Remedial Action Projects (DOE/DRAP)]. (Auth) (PTO)

195

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Civilian Program

UNC/OSFM-83-5; 93 pp. (1983, March)

Highlights from the progress reported by the area offices for civilian program work include: (1) Albuquerque - Mound ANSPD Areas Decommissioning - The four remaining gloveboxes in the R-130 laboratory have been removed and packaged for disposal completing milestone No. 4. A review of Mound's D&D programs and a tour of R Building D&D areas was given to five members of Congressman Tony P. Hall's local Dayton area staff on March 30, 1983. (2) Chicago - (a) Building 350 (Plutonium Gloveboxes) Decommissioning - All decommissioning activities on Building 350 were completed as of March 30, 1983. Some waste shipments and preparation and issuance of the final report remain to be completed; (b) ANL-East Facilities Decommissioning - The Site Decommissioning Project Plan has been completed and is ready for issue to DOE. This satisfies this activity's milestone objective No. 1; (3) Idaho - (a) INEL Site Planning and Risk Assessment - A draft of the decision analysis for the SPERT III outside areas has been completed and issued; (b) Monticello Site Remedial Action - The state of Utah water rights permit has been obtained. The permit will allow for the drilling of water wells necessary for the hydrology study of the cullinary aquifer. This study is crucial in determining if the mill tailings pile is contaminating the source of Monticello's drinking water, and will have direct bearing on whether or not the pile will be moved. (4) Nevada - NRDS Decommissioning - The resurvey of the RMSF and adjacent areas was completed thus completing milestone No. 2 for this activity; (5) Oak Ridge - (a) ORNL Site Planning and Risk Assessment - The draft version of the Surveillance and Maintenance Plan was completed and issued completing milestone No. 1 for this activity; (b) Weldon Spring Site (WSS) Remedial Action - DOE-OR and BNI staff members met with DOA representatives at the Aberdeen Proving Grounds, MD, on March 16 for further discussions on a DOE/DOA cooperative effort at WSS.

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

The DOA indicated they may delay further action until current DOE (FUSRAP) work is completed for substantiating the suitability of the raffinate pits for a disposal site; (c) Niagara Falls Storage Site (NFSS) Remedial Action - The revised draft of the NFSS Project Management Plan (PMP) was distributed for review. The general quality of the plan has significantly improved although there are still major cost and schedule concerns. The costs particularly those associated with project support and management appear to be excessive for the scope of work involved. Adequate correlation between detailed cost data and milestone schedules has not been made available to SFMPO. The initial draft of the Referenceable Engineering Document (RED) has been completed, reviewed by DOE-OR and ANL, and is now being revised to incorporate comments. Based on the EIS scoping input, all of which has been received, a tentative decision has been made to incorporate subalternative scenarios into the EIS so as to evaluate the management of the AFRIMET residues separate from the other wastes. New York DEC has reported that the Ontario Ministry of the Environment has challenged the proposed copper limit and radiological control issues specified in the SPDES. The DEC is attempting to resolve their concerns. Further delay in issuing the permit could hamper work efforts this construction season; (6) Richland - (a) Shippingport Station Decommissioning Project (SSDP) - The SSDP Quarterly Review Meeting with DOE-RL was held on March 28, 1983. The status of engineering and management activities were presented, including a brief review on recent BRISC success in affecting substantial recovery of the unfavorable cost and schedule variance. The new TEC, $79.7M, and reasons for growth from the previous TEC, $66.2M, were presented. The general message presented was that the project is on schedule, within budget, with no identified major concerns; (b) Program Administration - The Surplus Facilities Management Program's proposal to the Nuclear Energy Agency (NEA), regarding expansion of the joint DOE-NEA International Decommissioning Questionnaire Report, was approved by the NEA Radioactive Waste Management Committee at their February 23-24, 1983 meeting in Paris. The report will be expanded through issuance of a supplementary questionnaire that will be issued by the NEA to the 14 countries that responded to the first DOE-NEA Questionnaire in 1982. The OSFM will prepare the questionnaire and the subsequent report, coordinating publication and distribution with the NEA. The expanded report is expected to be used by the NEA as a working document for meeting of decommissioning experts to be convened in 1984, and subsequently used by NEA member countries interested in information exchange with other countries. The FY 1985 Civilian Program SFMP Budget Submittal was completed and distributed satisfying milestone No. 3 for this activity. (Auth)(PTO)

196

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Defense Program

UNC/OSFM-83-18; 69 pp. (1983, April)

Highlights from the progress reported by the area offices for Defense Program work include: (1) Idaho - INEL Surplus Facilities Decommissioning - Decommissioning efforts in Chemical Processing Plant (CPP) Process Cell C were completed this month as scheduled. Preparations for decommissioning CPP Process Cell D are now in Progress; (2) Richland - (a) Hanford 100 Areas Site Planning and Risk Assessment - The Surveillance and Maintenance Plan for the Hanford 100 Areas was issued this month as scheduled; (b) Program Administration - SFMPO/OSFM review of the Field Office inputs to the Civilian and Defense Programs Mid-Year Review was completed this month. Notification letters on the mid-year requests were subsequently mailed to the Field Offices and Contractors. Required funding readjustments will be made in the May Financial Plan. A briefing on the Surplus Facilities Management Program (SFMP) was given on April 14, 1983 to Earl Gjelde, Special Assistant to the Secretary of Energy, at DOE-HQ. The purpose of the presentation was to familiarize Mr. Gjelde with the SFMP. (Auth)(EST)

197

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Civilian Program

UNC/OSFM-83-6; 92 pp. (1983, April)

Highlights from the progress reported by the area offices for Civilian Program work include: (1) Albuquer

CHAPTER 1. SURPLUS FACILITIES MANAGEMENT PROGRAM GENERAL STUDIES

Mound ANSPD Areas Decommissioning - Applicable sections of the NEW/OMA D&D Program Plan were updated and the document was issued completing milestone 2 for this activity. Addtionally, a cost analysis for constructing new laboratory space equal to that which will be provided through decommissioning operations was prepared and submitted for review; (2) Chicago - ANL-East Facilities Decommissioning - Physical decommissioning efforts on Building 37 were initiated with the dismantlement of external utilities and the removal of spare components in the vicinity of the air filtration units; (3) Idaho - (a) INEL Site Planning and Risk Assessment - The recent characterization of the SPERT II pond has disclosed that this area is uncontaminated. A draft of the SPERT II decision analysis has been prepared accordingly and is under review at ID; (b) Monticello Site Remedial Action - The atmospheric transport computer code obtained from ORNL was tested and debugged. Arrangements for acquisition of other computer programs used in support of health analysis sections of the Radioactive and Pollutant Impact Study were initiated; (4) Oak Ridge - (a) ORNL Site Planning and Risk Assessment - Survey plans for the ORR experimental facilities have been completed and corresponding survey tasks initiated. Radiological characterization surveys of the waste holding basin and the ORR heat exchanger were completed. (b) Weldon Spring Site (WSS) Remedial Action - The 1981 Environmental Monitoring Report has been completed and issued for review. The aerial survey subcontractor has completed topographical work on the Pits and Quarry and the meteorological monitoring tower has been erected. Geological drillings of the Raffinate Pits was completed and the findings were being prepared in a report; (c) Niagara Falls Storage Site (NFSS) Remedial Action - A decision has been made by HQ to adopt EPA standard 40 CFR 192 as the NFSS acceptance criteria for contaminated soils. Documentation is heing revised accordingly. DOE-RL/OSFM staff members met with DOE-OR/BNI on April 27 to 29 to discuss technical issues and corresponding costs furnished in the current draft PMP. As a result of the meeting, OR has again committed to revise the PMP to more accurately reflect the work that is planned and to furnish new cost estimates that are representative of the work. The final SPDES permit was issued on April 27. Recent analysis of impounded waters (rain water) indicate some nonradiological elements, principally iron, exceed limits specified in the SPDES. Confirmation testing is currently being performed, contingency plans are being developed and negotiations with NYDEC are taking place. There are now approximately 1.6 million gallons of water on site. The meteorological monitoring tower has been erected and data gathering has started. AFRIMET was advised of the estimated cost for remedial actions to control residues at NFSS in CY 1983. Restart of settlement talks between DOE and AFRIMET are tentatively scheduled for the end of May; and (5) Richland - (a) Shippingport Station Decommissioning Project (SSDP) - Preparation of the draft Engineering Requirements Document (Task IIIA) was completed, satisfying milestone 3 for this activity. DOE-RL has received and is currently reviewing the SSDP Updated Project Plan which will be subsequently fowarded to HQ for their review; (b) Program Administration - OSFM completed the mid-year review for the Civilian portions of the Surplus Facilities Management Program (SFMP). Notification letters of the mid-year requests were mailed out to the field offices and contractors. OSFM prepared materials for use by SFMP in a presentation to the Assistant to the DOE Secretary of Energy. The materials included photo briefing books and viewgraphs covering project activities, program schedules and costs, and public concerns over various decommissioning projects in the Civilian and Defense Programs. (Auth)(EST)

198

Ureda, B.F., C.C. Conners, and W.D. Kittinger, Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA

Practical Technological Benefits of SRE Decommissioning

ASME 82-NE-21; CONF-820705; Proceedings of an American Society of Mechanical Engineers/ American Nuclear Society Nuclear Engineering Conference, Portland, OR, July 25-28, 1982; (6 pp.) (1982, July)

The decommissioning of the Sodium Reactor Experiment is essentially complete. Contaminated materials, equipment, and soil were removed, decreasing the residual radioactivity to levels acceptable for future unrestricted use of the site. The fuel was removed and declad, tooling and techniques to support the decommissioning were developed, bulk sodium and residual sodium films were removed, coolant systems were dismantled, the reactor vessel was dissected, the interior surfaces of the facilities were decontaminated, and waste materials were packaged and shipped to burial sites. Radiation exposure to workers and the public was within the guidelines and as low as reasonably achievable. In performing the project, new decontamination techniques were tested, decontamination equipment was evaluated, and waste disposal methods were developed. (Auth)

77/78

Chapter 2

NUCLEAR FACILITIES DECOMMISSIONING

- Design, Planning, and Regulations
- Decontamination Studies
- Dismantlement and Demolition
- Land Decontamination and Reclamation
- Waste Disposal
- General Studies

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DESIGN, PLANNING, AND REGULATIONS

199

Arter, D.R., Hanford Engineering Development Laboratory, Richland, WA

Quality Assurance as a Management Tool in Decommissioning Activities

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-80 - VII-84) (1982, October)

Quality assurance practices have been applied to the peaceful use of nuclear energy for many years. These practices are just as useful to the back end of the nuclear energy cycle as they are to the front end. The Department of Energy requires the application of quality assurance to all of its projects and programs. Quality assurance as a management tool consists of three fundamental elements: planning, execution and control. These elements should be applied to decommissioning activities by all parties, such that limited funds are wisely sent and the public is adequately protected. (Auth)

200

Bankruptcy Potential Threatens Decommissioning Funds, Says NRC

Electric Light and Power 59(8):33-34 (1981, August)

Electric utilities and the Nuclear Regulatory Commission (NRC) disagreed at an American Nuclear Society seminar on how reactor decommissioning should be financed. Industry and state regulators claim it should be handled by standard depreciation methods without involving the NRC, which argues that it must guard against safety risks from industry bankruptcies and premature decommissioning. Both sides agreed that funds must be collected, but they disagreed on the best method. Their options include the deposit method, external sinking fund, internal reserve, and insurance or surety bond. The NRC feels that too many utilities face possible bankruptcy unrelated to decommissioning or accidents, and that this possibility should outweigh other considerations. (DCK)(EDB)(JMF)

201

Bennett, C.R., and M. Carney

The Canadian Approach to Decommissioning

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-99 - VII-114) (1982, October)

In addition to Canada's well known power reactors now operating, or near operation, there are several research, low power and demonstration reactors in existence. Different concepts of decommissioning are applied to these two categories depending upon their usage. So far decommissioning studies have been carried out only on reactors, though some support facilities, e.g. mines have been or are being decommissioned to various levels. The planning and execution of the "lay-up" exercise which has been done at the 250 MWe demonstration reactor, Gentilly-1, has demonstrated the type of consideration required to take a CANDU reactor to the Stage 1 option. The current low-level studies of the decommissioning of the 600 MWe CANDU reactors have partially resolved some of the relevant problems of waste management, particularly waste quantities and characterization. These results are applicable to the design concepts of future waste disposal facilities in Canada. (Auth)(RAF)

202

Brosche, D., and J. Essmann

Investigation of Reactor Decommissioning as a Precaution by Electric Utilities

Energiewirtschaftliche Tagesfragen 31(10):780-786 (1981, October)

This article discusses the use of decommissioning data in the planning of new nuclear facilities such as research reactors, nuclear power plants, and reprocessing plants. Nuclear facilities that are being built in the Federal Republic of Germany are cited as examples of the use of D&D investigations in all planning and licensing stages. (EDB)(PTO)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DESIGN, PLANNING, AND REGULATIONS

203

Chapman, D., Cornell University, Ithaca, NY

Nuclear Economics: Taxation, Fuel Cost, and Decommissioning

Report; 113 pp. (1980, November)

This report investigates selected factors which may affect the potential future cost of electricity generated by nuclear energy. An economic simulation model is developed to examine the annual cash flows to various accounts associated with the construction, operation, and decommissioning of a hypothetical commercial nuclear power plant that begins operation in 1990. The reference case, which uses conventional assumptions about cost components, inflation rates, tax provisions and accounting practices, gives a nuclear generated electricity cost of 7.6 cents per kilowatt-hour in 1990 dollars; however, the tax subsidy is 3.4 cents per kilowatt-hour, or 30% of the generation cost. Furthermore, the present value of the tax liability is negative; that is, the plant owner receives a subsidy when all tax deductions and payments are converted to 1990 dollars. For funding decommissioning costs, the establishment of a special fund, with contributions from customers and its earnings exempt from taxation, provides the best assurance of fund availability when needed. (Auth)(PTO)

204

Commission of the European Communities, Luxembourg

Communities' Research and Development Program on Decommissioning of Nuclear Power Plants

EUR-7440-EN; 53 pp. (1981)

All of the decommissioning projects were at an early stage or had not yet began at the time of the writing of this report. Seven major topics are covered: long-term integrity of buildings and systems; decontamination for decommissioning purposes; dismantling techniques; treatment of specific waste materials, i.e. steel, concrete, graphite; large transport containers; estimation of the quantities of radioactive waste; and influence of nuclear power plant design on decommissioning. The results from this program will appear in subsequent reports. It is recommended that design concepts should be devised which would prevent the activation of shield concrete around the reactor; that ways of reducing the amount of cobalt in construction materials should be studied so that cobalt-60 formation is inhibited; and that guidelines for the design, operation and decommissioning of nuclear power plants should be established. (EDB)(JMF)

205

Cregut, A., Commissariat a l'Energie Atomique, Centre d'Etudes Nucleaires de Bagnols-sur-Ceze, France

French R and D Program on Decommissioning Tooling and Techniques

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. V-1 - V-12) (1982, October)

Experience has been or is being gained in France due to the decommissioning of various types of nuclear facilities such as (if mines and mill tailings are excluded), hot cells used in nuclear fuel reprocessing or high-level waste treatment research and development (R&D), nonnuclear fuel facilities, nuclear fuel facilities, material testing reactors, gas-cooled graphite-moderated reactors. Decommissioning studies have also been done on a reference fast breeder reactor. Specific technical problems gave rise to R&D work, in the frame work of the French Decommissioning Program, pertaining to nuclear safety, tooling and remote handling, waste management and decontamination. This paper summarizes the present status, as of mid-1982, of the tooling and techniques R&D (except decontamination) in relation to safety. (Auth)(JMF)(RAF)

206

Cregut, A., Commissariat a l'Energie Atomique, Centre de Marcoule, Bagnols-sur-Ceze, France

Decommissioning of Nuclear Installations

Revue Generale Nucleaire 3:166-172 (1978)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DESIGN, PLANNING, AND REGULATIONS

The statutory aspects of the final shutdown and decommissioning of nuclear plants regarding safety and protection are described. The decommissioning problems are analyzed from the point of view of the nuclear operator. The main technical aspects of the problems are presented. (EDB)(PTO)

207

Essmann, J., and D. Brosche, Preussische Elektrizitats AG, Hannover, Federal Republic of Germany; Bayernwerk AG, Muenchen, Federal Republic of Germany

Plans and Activities for Decommissioning of LWR Power Plants by the German Utilities

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-13 - VII-23) (1982, October)

In the Federal Republic of Germany a prerequisite for a license for erection or operation of a nuclear power plant is a detailed demonstration that the plant can be decommissioned in compliance with demands for radiation protection. To fulfill this demand, the German utilities who plan and operate LWR power plants have been studying extensively the decommissioning situation since 1975. The German approach to decommissioning, the regulatory framework and the progress to date are discussed. To show that the German concept is really practicable, the achievements and future plans for the decommissioning of the plants KKN, KRB-A and KWL which are shut down, are described briefly. (Auth)(RAF)

208

GKSS-Forschungszentrum Geesthact GmbH, Geesthact-Terperhude, Federal Republic of Germany

NS Otto Hahn - Test Report No. 29 for the Period Between April 13, 1978, and February 17, 1979: Fuel Element Removal and Transport Between February 17, 1979 and November 22, 1979

GKSS-81/E/21; 86 pp. (1981)

The last 10 voyages of the nuclear ship are reported along with information on special events which occurred and the research programs which were carried out. The removal of the fuel elements of the second core and their transport for final storage and reprocessing are described. Important operating data for the more than 10 years of operation of the NS Otto Hahn are presented in a table. Various intended decommissioning measures are discussed. (EDB)(JMF)

209

Goddard, A.H.J.

Decommissioning of Nuclear Generating Stations

International Power Generation 5(5):46-47 (1982, June)

Taking out of service and shutting down a nuclear power station is carried out in the reverse order of commissioning. After fuel is removed and preliminary decontamination and housekeeping is accomplished, the plant will be in a generally safe state until the various stages of dismantling and waste disposal are carried out. The presence of residual radioactivity gives a nuclear station special features compared with the dismantling of a fossil fuelled station. (INSPEC)(JMF)

210

Hess, E., and R. Veya, Nordostschweizerische Kraftwerke AG, Baden, Switzerland

Decommissioning Study for the Beznau Nuclear Power Plant (2 X 350 MW) - the Swiss Approach

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-153 - VII-168) (1982, October)

On request of the Swiss Nuclear Regulatory Authority a

comprehensive decommissioning study for the Beznau nuclear power plant was worked out in 1980. The purpose of the study was to demonstrate the feasibility of decommissioning and dismantling and to give sound estimates for the amount and type of nuclear waste, the total collective dose, the cost and dismantling schedule. Two alternatives were studied, one starting the dismantling work two years after the final plant shutdown, the other starting the dismantling activities after a "mothballing" period of 30 years. The results confirmed, that present technology offers adequate dismantling techniques and that the work can be performed in accordance with the Swiss atomic law and regulations. Furthermore, it can be concluded that neither the collective dose nor the cost of decommissioning are such as to jeopardize the over-all benefit of commercial nuclear power in Switzerland. The conclusions are confirmed by the Swiss Nuclear Regulatory Authority's assessment of the decommissioning study, issued in spring 1982. The study contributed to establish a clear position of the authority and the operators on the so far controversial issues of decommissioning in the nuclear debate. The study also helped to convince the authority that there is no incentive today to advocate one or the other decommissioning alternative. The choice has to be made for each specific case weighing all aspects involved at the time of final shutdown. (Auth)(JMF)

211

Hoyt, R.C., L.F. Grantham, R.L. Gay, and L.J. Jones, Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA

Engineering Analysis and Costs of Product Conversion, Refabrication, Waste Treatment, and Plant Decommissioning of an Exportable Pyrochemical Process

ESG-DOE-13286; 134 pp. (1979, September 30)

Engineering evaluations have been performed for portions of a fast breeder reactor (FBR) fuel cycle utilizing pyrochemical processing. Results of engineering studies for (1) conversion of the metallic uranium-plutonium alloy reprocessing product to the oxide, (2) refabrication of the oxide product, and (3) waste management for the pyrochemical reprocessing plant are summarized. In addition, a preliminary economic evaluation for uranium-plutonium alloy conversion to an oxide, fabrication of the mixed oxide (MOX) fuel, reprocessing waste management, and decontamination and decommissioning of the Exportable Pyrochemical Process (EPP) facility is included. As part of the evaluation of the fuel cycle costs of the EPP fuel cycle, the preliminary estimate of the D&D cost of an EPP reprocessing plant was based on the following assumptions: all reprocessing waste is shipped off-site at the end of reprocessing; no wastes are stored on-site; all reprocessing spills are cleaned up when they occur; all reprocessing is discontinued at least 3 months prior to the start of D&D; all facility functions are operational at start of D&D; an Environmental Impact Statement (if necessary) is completed 3 months prior to D&D; the D&D plan is approved at least 1 month prior to the start of D&D; a radiological survey is completed 3 months prior to the start of D&D; all D&D support structures-facilities are in-place and operational before the start of D&D; the facility radioactive exhaust and waste management systems are used for D&D; the facility restrooms, office areas, docks are used; work proceeds from low-contamination to high-contamination areas; decontaminate reprocessing areas in the order: U-Pu-Zn casting line, U-Pu casting line, U casting line, feed line, reprocessing center, waste management, facility support systems; after D&D, the building is reduced to rubble and the rubble is covered with earth; the site is released for unrestricted use. The total equipment cost for the operation is estimated to be 0.4 million dollars, and the total waste disposal cost 1.6 million dollars. Total D&D costs are estimated to be 5.2 million dollars. (RAF)

212

Koch, D.A., and M.J. Akins, Gilbert Associates, Inc., Reading, PA

Preparing a Decommissioning Cost and Technology Study

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-51 - VII-79) (1982, October)

Decommissioning planning requires a systematic approach to determine costs, radiation exposure, waste disposal, manpower requirements, dismantling and decontamination procedures, personnel protection, and schedules. The basic document of decommissioning planning is the cost and technology study prepared fo

specific site. It is important that this study yields results that are complete and comprehensive. This is accomplished by utilizing a methodology known as the Work Package Concept which accounts for all significant cost factors and technical activities. The Work Package Concept divides all labor and materials into specific increments which are basically suitable for all power plants and produces summaries of the major results. This paper describes the major study outputs, the work package format and function, and the type of input criteria which must be collected prior to the commencement of the study. It is concluded that correct formating is essential to the complete and consistent processing of large and varied amounts of data and that details and input criteria are crucial to assure adequate sensitivity and reliable results. (Auth)

213

Kumakura, O., Central Research Institute of Electric Power Industry, Tokyo, Japan

Regulations and Financing for Decommissioning of Nuclear Facilities, France

Denryoku Chuo Kenkyusho Hokoku 581002:1-27 (1981, April)

This report surveys the French legislation concerning the decommissioning of nuclear facilities and the method of financing it. There is no clause in French regulations, which gives specific criteria or licensing procedures for proper decommissioning. The legal problems in this domain are treated within the general regulation system on atomic energy. The decommissioning of nuclear facilities is carried out in accordance with the licensing procedure for constructing them, as outlined in the "Decree on Nuclear Installations, 1963." Work for the final shut-down and decommissioning is treated as modifications in the safety report or the general operation instructions, and a new permit is required. In the case that the radioactive levels after decommissioning are above the criteria of the 1963 decree, a license is required. If the levels are below the criteria, the facilities are governed by the "Act on Installations Classified for Environmental Protection, 1976." The "Decree on General Radiation Protection, 1966," the "Decree on Radiation Protection of Workers in Nuclear Installations, 1975," the "Ministerial Order on Transport of Dangerous Materials, 1945," and two ministerial orders on radioactive effluent discharge, 1974, are applied to the commissioning procedures. (EDB)(JMF)(RAF)

214

Levy, L.H., Northeast Utilities Services, Hartford, CT

Utility Perspective of Nuclear Facility Decommissioning

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. II-44 - II-50) (1982, October)

This paper provides a utility viewpoint of current federal decommissioning policies and a discussion of the potential impact of proposed policy revisions. It also discusses some of the decommissioning financial aspects, but it is primarily concerned with the technical areas of decommissioning. (Auth)(RAF)

215

Ludwick, J.D., and E.B. Moore, Pacific Northwest Laboratory, Richland, WA

Decommissioning of Independent Spent Fuel Storage Installations

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-170 - VII-184) (1982, October)

Safety and cost information is developed for the conceptual decommissioning of five different types of independent spent fuel storage installations (ISFSIs), each of which is being given consideration for long-term storage of spent nuclear fuel in the United States. These include one water basin-type ISFSI (wet) and four dry ISFSIs (dry well, silo, vault, and cask). Three decommissioning alternatives are studied to obtain comparisons between costs (in 1981 dollars), occupational radiation doses, and potential radiation doses to the public. The alternatives considered are: DECON (immediate decontamination), SAFSTOR (safe storage followed by deferred decontamination), and ENTOMB (entomb-

ment). The effects of storage size, colocation at a reactor site, and elimination of fuel encapsulation upon decontamination are examined to provide potential owners with information applicable to most proposed ISFSIs. (Auth)

216

Maxey, M.N., University of Texas at Austin, College of Engineering, Austin, TX

Decommissioning: Moral Dilemmas Revisited

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp.; (pp. XV - XXV) (Addendum) (1982, October)

The decommissioning of reactors that have functioned in the early stages of the federal program of nuclear technology development are an emerging focus of attention for at least two reasons: (1) the management and ultimate disposal of all waste by-products is mandated by the law incorporated in the Atomic Energy Act of 1954; and (2) the very necessity of "decommissioning" reactors lends credence to a popular perception that nuclear technologies are utterly unique in the risks and uncertainties imposed on present and future generations. The effectiveness with which strategies of fear have been successful in mobilizing public antipathy and opposition to nuclear technology, even opposition to resolving the problem of managing waste by-products, reflects a new and ethically questionable doctrine of risk-aversion. There can be no learning without trial. But "the new doctrine" demands that there be no trial without prior guarantee of zero-risk. No technology, old or new, can meet that guarantee. It is intellectually and morally a fraudulent expectation. Radioactive wastes exist; they are not going to decay away, and they cannot be left lying around. We will need waste management, no matter what the future of nuclear energy. To hold up disposal facilities for radioactive wastes as hostages to extort a nonnuclear future from policy-makers approaches the nadir of social responsibility. In conclusion it should be underscored that the decommissioning demonstrations carried out on federal facilities hardly typify procedures that are projected by the nuclear utility industry. Denigrating expectations of a costly early dismantlement and transport of unneeded commercial facilities completely ignores two distinctive factors: (1) reactor sites have been carefully selected for the emplacement over the years of multiple reactors; and (2) decommissioned structures on a given site will likely be used as on-site repositories for low-level wastes which a replacement reactor may produce during operations. The option of "safe storage and surveillance" of decommissioned reactors is certainly preferable, both economically and ethically, to an unnecessary dismantlement. (Auth)(PTO)

217

Moore, E.B., R.I. Smit, and N.G. Wittenbrock, Pacific Northwest Laboratory, Richland, WA

Decommissioning of Multiple-Reactor Stations: Facilitation by Sequential Decommissioning

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-192 - VII-197) (1982, October)

Reductions in cost and radiation dose can be achieved for decommissionings at multiple reactor stations because of factors not necessarily present at a single reactor station: reactors of similar design; the opportunity for sequential decommissioning; a site dedicated to nuclear power generation; and the option of either interim or permanent low-level radioactive waste storage facilities on-site. The cost and radiation dose reductions occur because comprehensive decommissioning planning needs only be done once; the labor force is stable and need only be trained once; there is less handling of radioactive wastes; and central stores, equipment, and facilities may be used. The cost and radiation dose reductions are sensitive to the number and types of reactors on the site, and to the alternatives selected for decommissioning. (Auth)(RAF)

218

Musser, S.S., E.E. Gutwein, and M.J. Akins, Gilbert/Commonwealth, Reading, PA

Estimating Radiological Conditions for Decommissioning Studies

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DESIGN, PLANNING, AND REGULATIONS

Power Engineering 86(6):66-69 (1982, June)

A utility which operates a nuclear power plant should perform decommissioning studies at various stages of the plant's life. From such studies, the utility can estimate what the radiological conditions of the plant will be at the time of final shutdown, what the best method of decommissioning will be, what advance preparations have to be made, and what the costs will be. (INSPEC)(PTO)

219
Nuclear Energy: The Real Costs

Energy Digest (London, United Kingdom) 11(2) :33-34 (1982, April)

This paper presents the recommendations and a summary of a report on nuclear energy costs. The United Kingdom proposals for nuclear power, and the CEGB and South of Scotland Electricity Board generating program are discussed. Accounting techniques, generating surpluses, relative costs of electricity from AGR plants and coal-fired plants, fuel reprocessing, decommissioning, insurance, safety of PWR's, national economy and energy needs are given. (EDB)(JMF)

220
Osanai, M., Hitachi Limited, Energy Research Laboratory, Ibaraki, Japan

JPDR Decommissioning Program

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp.; (pp. 146-156) (Addendum) (1982, October)

National policy regarding the decommissioning of nuclear reactors was established in Japan recently, including basic considerations and technology development. A technology development program to implement this policy has been started at the Japan Atomic Energy Research Institute utilizing a 90 MWt power demonstration reactor, JPDR. The program consists of two phases: Phase 1 is aimed at development of individual techniques that will be required for the dismantlement of a nuclear power plant. In this program, the demonstration, adaptation, improvement or development of techniques will be conducted in the fields of systems engineering, radionuclide inventory estimation, decontamination, disassembly, remote handling, waste management, and radiation control. Phase 2 involves the complete dismantlement of the JPDR. These programs will be a demonstration of dismantling technology and acquisition of actual experience. It is expected that these programs will provide useful information on the development of technical guidelines for the decommissioning of nuclear power plants. (Auth)(PTO)

221
Outline of Survey Concerning Decommissioning of Nuclear Facilities, (2)

Genshiryoku Iinkai Geppo 25(10):32-38 (1981, January)

This survey compares European and American efforts in nuclear facility decontamination with efforts made in Japan. Design and construction of nuclear facilities are also compared. The Decommissioning Research Committee was organized in the Japan Atomic Energy Research Institute, and the following areas were studied: (1) case studies on the decommissioning of nuclear facilities; (2) surveys on laws and regulations concerning decommissioning in foreign countries; and (3) surveys on the status of decommissioning in Europe and America. Four special sub-committees of planning and general matters, dismantling techniques, decontamination and abandonment, and reprocessing and hot laboratories were established. There were 486 unused facilities in the U.S. as of 1976, and 87 decommissioning projects are expected in 20 years. The OECD forecasts that 45 nuclear power stations to be decommissioned in the next 25 years in the U.S. The situations in Great Britain, West Germany, France and others are briefly outlined. The definition and features of recent decommissioning methods, and the amount of radioactive wastes produced by decommissioning are also presented. (EDB)(JMF)(RAF)

222
Publication of the Safety Regulation KTA 1401 by Kerntechnischer Ausschuss - Dated April 13, 1981

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DESIGN, PLANNING, AND REGULATIONS

Bundesanzeiger Beilage 33(106a):3-9 (1981, June 11)

Safety Regulation KTA-1401 applies to quality assurance in the planning, design, acquisition, construction, start-up, operation, shut-down, and decommissioning of nuclear power plants. The quality requirements for all safety components, systems, and structural elements for nuclear power plants are specified. (Auth)(PTO)

223

Rodrigues, S., Technicatome, Saclay, France

Decommissioning Engineering Within the Framework of the French Nuclear Structure

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-214 - VII-222) (1982, October)

The French nuclear organization consists of state owned nuclear facilities through various companies and agencies, private agencies being allowed to own only sources for industrial processing of various types. The authorizations for the construction and operation of nuclear plants are granted through a ministerial decree following a procedure covering the decree from all the ministries involved. The Interministerial Commission for the Basic Nuclear Facilities (CIINE) then gives advice relevant to the presentation of the authorization decree for signature by the Prime Minister. Also, the modification or decommissioning of a nuclear plant is covered by the framework of this procedure, resulting either in issuing a new decree or cancelling the previous decree with the nuclear operator managing the decommissioning procedure in accordance with his own time schedules and deadlines. Such agreement is obtained for each successive project phase with prior preparation of the following dockets: basic docket taking stock of the status or the facility prior to starting-up the decommissioning procedure; selection docket; safety docket; technical construction docket; construction completion docket or final status report covering the work completed. (JMF)(RAF)

224

Schaller, K.H., Commission of the European Communities, Brussels, Belgium

Decommissioning Research in the Commission of European Communities' Program on Decommissioning of Nuclear Power Plants

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-227 - VII-235) (1982, October)

An important part of the European Commission's indirect research program (1979-1983) on Decommissioning of Nuclear Power Plants is concerned with research and development of procedures and methods in the field of decontamination. Research work in progress, with Commission funding up to 50%, is performed actually by eight organizations on subjects chosen from a number of proposals. As a preparation for the initial invitations to submit research proposals, information on decontamination work done in the various types of reactors in operation in the Community had been gathered, and a careful analysis of information defined areas where further research was needed. A description of the main results of this analysis is given. Based on this work, the following five subjects were specified for proposals: estimation of contamination, decontamination of systems, vigorous decontamination of metallic objects, decontamination of building surfaces, and overall studies in order to assess reasonable decontamination in decommissioning. (Auth)(JMF)(RAF)

225

Shinohara, Y.

Decommissioning of Nuclear Reactors

Journal of the Society of Instrument and Control Engineers 20(1):157-160 (1981, January)

This document discusses the following concerns in decommissioning: rate of radiation abatement, radioactive waste disposal procedures, sealing off of the plant, air conditioning use, and maintenance of the sealed plant which depends on whether reuse of the site is planned

the short- or the long-term. Technical problems treated in the document include planning radioactive waste disposal procedures according to the amount of radioactive materials involved, personnel exposure rates and environmental effects, contamination prevention, special techniques for dismantling highly irradiated plants, and feedback to reactor designers of decommissioning problems. (INSPEC)(JMF)

226

Sissingh, R.A.P., Ontario Hydro, Toronto, Ontario, Canada

Preliminary Nuclear Decommissioning Cost Study

CONF-8106200; Proceedings of the Second Annual Canadian Nuclear Society Conference, Ottawa, Ontario, Canada, June 8-10, 1981; (pp. 245-252) (1981, June 10)

This preliminary study concentrates on the logistical, technical, and cost aspects of decommissioning a multi-unit CANDU generating station using the Pickering Generating Station as the reference design. The Pickering Generating Station-A is located on the shore of Lake Ontario, 32 km northeast of downtown Toronto. The station consists of four reactors, each reactor having a gross thermal power of 1744 MW. The reactors are heavy water moderated and cooled. It has been found that with the exception of reactor core dismantlement, which will be done remotely, the dismantlement of all other systems and buildings can be accomplished using Ontario Hydro's current operating, maintenance, and construction procedures and practices. (INSPEC)(PTO)

227

Strasma, J.D., University of Wisconsin, Department of Agricultural Economics, Madison, WI

Costs of Decommissioning Nuclear Power Plants as Reported to the Public to Date

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp.; (pp. 157-166) (Addendum) (1982, October)

This paper attempts to determine what information has been available to the U.S. public concerning the cost of decommissioning nuclear power plants. A number of abstract journals, indexes, and computerized retrieval systems of magazines, newspapers, and television news broadcasts were searched including: Television News Index and Abstracts, The Reader's Digest, New York Times Information Bank, and Magazine Index. Fewer than ten articles appeared in widely read publications, and no coverage was given on national news broadcasts. The cost of decommissioning nuclear power plants was reported in various ways, with a wide range of estimates and relatively little actual experience. Costs were given in dollars of different years, in percentages of construction costs, in cost per kWh to the consumer, etc., making the range of reported costs seem even wider than it really was. It is not surprising that the public fears that decommissioning costs will be alarmingly high. The public debate on energy policy might be more rational with better information on decommissioning costs. (Auth)(PTO) (RAF)

228

Valentine, A.M., Los Alamos National Laboratory, Los Alamos, NM

Radiological Planning and Implementation for Nuclear Facility Decommissioning

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VI-1 - VI-9) (1982, October)

Radiation protection issues associated with nuclear facility decommissioning are described. Most of the discussion focuses on radiological issues that pertain to worker protection; however, issues concerning project support, environmental protection, and site release are also addressed. Issues are described in generic terms with full realization that the importance of the specific issues varies markedly depending on how the operation is performed and on the type of facility being decommissioned. General planning, preoperational planning, project implementation, and project closeout phases of decommissioning projects are addressed. Recent nuclear facility decommissioning experience at the Los Alamos National Laboratory, a Department of Energy research and development laboratory serves as the primary basis for the ideas and issues presented. (Auth)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DESIGN, PLANNING, AND REGULATIONS

229
Watzel, G.V.P.

Closing-Down of Nuclear Power Stations in the Federal Republic of Germany

Brennstoff-Waerme-Kraft (Federal Republic of Germany) 33(10):395-399 (1981, October)

The most important results regarding technical operation and expected costs are presented. The conclusions are based on an investigation dealing with the closing-down and complete removal of nuclear power stations with light water reactors [e.g. Biblis A (1204 MW, PWR) and Brunsbuettel (805 MW, BWR)]. Two variants are considered: immediate complete removal of the plant, and delayed removal after an assured enclosure of about 30 years. After a rough survey of possible working methods which are available to-day, hints are given for the overall work with a general description of the procedure, including a flow chart. (EDB)(JMF)

230
Watzel, G.V.P., H. Gallenberger, and K. Grabenstatter, Rheinisch-Westfaelisches Elektrizitaetswerk AG, Essen, Federal Republic of Germany

Progress Report on Germany - Plans for Decommissioning

Nuclear Engineering International 26(313):36-40 (1981, May)

There are now seven nuclear reactors in the Federal Republic of Germany, in addition to the NS Otto Hahn, which are either already shut down and awaiting decommissioning or are to be shut down by the mid-1980s. Decommissioning is still largely at the planning stage, except at the 100 MWe Niederaichbach GCHWR, which has been entombed. The German approach to date is outlined, and the achievements and future plans at Niederaichbach are reported in detail. (EDB)(JMF)

231
Watzel, G.V.P., and G. Stang, Rheinisch-Westfaelisches Elektrizitaetswerk AG, Essen, Federal Republic of Germany; Kernkraftwerk RWE-Bayernwerk GmbH, Gundremmingen, Federal Republic of Germany

Decommissioning of Unit A of the Nuclear Power Plant Gundremmingen and its Conversion to a Condition of Protective Storage

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-237 - VII-249) (1982, October)

The first German nuclear demonstration power plant, KRB-I in Gundremmingen, with a boiling water reactor and an electric capacity of 250 MW has completed 11 years of very successful commercial operation. In 1980 the decision was made to decommission the plant and the necessary planning work was initiated. The present concept provides to transfer the reactor and auxiliary building into a protective storage and, independently of this, to further use the turbine building for other purposes, such as for storing low-level waste. In order to save space the plant components contained in the turbine building should be dismantled and decontaminated to a large extent. (Auth)(RAF)

232
Williams, D.H., Arkansas Power and Light Company, Little Rock, AR

Utility Planning for Decommissioning

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-129 - VII-138) (1982, October)

Though the biggest impact on a utility of nuclear power plant decommissioning may occur many years from now, procrastination of efforts to be prepared for that time is unwarranted. Foresight put into action through planning can significantly affect that impact. Financial plan

can assure the recovery of decommissioning costs in a manner equitable to customers. Decision-making planning can minimize adverse affects of current decisions on later decommissioning impacts and prepare a utility to be equipped to make later decommissioning decisions. Technological knowledge base planning can support all other planning aspects for decommissioning and prepare a utility for decommissioning decisions. Informed project planning can ward off potentially significant pitfalls during decommissioning and optimize the effectiveness of the actual decommissioning efforts. (Auth)

233

Williams, D.H., Arkansas Power and Light Company, Little Rock, AR

Decommissioning of Nuclear Power Plants - How to Handle the Costs

Report; 23 pp. (1980, December)

The costs of decommissioning a nuclear powered generating plant can be reasonably estimated. The availability of funds to accomplish the decommissioning can be reasonably assured by the establishment of an unsegregated sinking fund reserve at a minimized cost. For certain institutionally unique situations, a segregated sinking fund reserve may be preferred even though it is more expensive. Flexibility for inflation and technological changes and equity of collection over time can be accomplished by frequent adjustments to annual (or periodic) charge determinations to maintain fully inflation-adjusted accumulated reserves and factor-in progress in decommissioning technology. Nuclear Regulatory Commission jurisdiction over assurance issues can be accomplished without encroaching on rate making body jurisdiction of rate structures. (Auth)(PTO)

234

Wood, R.S., U.S. Nuclear Regulatory Commission, Office of State Programs, Washington, DC

Assuring the Availability of Funds for Decommissioning Nuclear Facilities

NUREG-0584 (Rev.3) (1983, March)

This report discusses methods that can be used to assure the availability of funds for decommissioning nuclear facilities. Although the report focuses on commercial reactors, other NRC-licensed facilities and activities are considered. Six basic funding alternatives are analyzed by using five evaluation criteria. The author has drawn conclusions that will form the basis of the NRC staff's recommendations on decommissioning funding to the commission. Of all the options, the best overall appears to be premature decommissioning insurance coupled with one of the plant-specific funding methods. In the absence of insurance, the deposit-at-start-up method appears to be the next best option. The sinking fund should also be acceptable in those cases with little likelihood of premature shutdown. For smaller facilities at least, surety bonding may be an available option and may be acceptable if the bond is cannot be terminated by the surety company prior to other arrangements being made. (Auth)(PTO)

235

Woollam, P.B., Central Electricity Generating Board, Berkeley Nuclear Laboratories, Berkeley, United Kingdom

An Assessment of the Data for Decommissioning Calculations on Ag-108 Metastable

CEGB-RD/B/N-4373; 7 pp. (1978, September)

An assessment of the data required for decommissioning calculations relating to Ag-108m has been performed. Significant errors have been found in the generally accepted data. These errors are sufficiently large as to affect the potential decommissioning policy decisions. The conclusions of this study are as follows: The thermal cross-section for the reaction Ag-107(n, gamma) Ag-108m is 0.37 + or - 0.07b. The generally accepted value in the literature, 3 + or - 1.5b, is incorrect. Although the half-life of Ag-108m quoted in the literature was measured in the presence of low levels of contaminating Ag-110m, no allowance was made for this short lived isotope in calculating the accepted value of 127 + or - 7 yr. Reanalysis of the original data indicates that a half-life of 145 yr would be more accurate. The generally accepted data for gamma-ray emissions from the decay of Ag-108m are correct. No significant lines have been observed other than those from the 90% abundant triple cascade at 434, 615 and 723 keV. The predicted dose equivalent rate to personnel working inside the steel pressure vessel of a Magnox reactor 100 yr after shutdown is a factor of

four lower than that previously accepted. However, this reduction is not sufficient to predict that unrestricted access will be permitted to this area at this time. (Auth) (RAF)

236

Yajima, M., Central Research Institute of Electric Power Industry, Tokyo, Japan

Regulations and Financing for Decommissioning of Nuclear Facilities: The Federal Republic of Germany

Denryoku Chuo Kenkyusho Hokoku 581001:1-47 (1981, April)

In the Federal Republic of Germany, specific regulations governing the decommissioning of nuclear facilities have been instituted. In the revised edition of the Atomic Energy Act dated October 31, 1976, the new subsection 3 was added to Section 7. As a result, license is required for the final shutdown of plants as well as the protective storage and dismantling of plants and components. The submission of corresponding documents is required for decommissioning. Another specific provision regarding the decommissioning of nuclear facilities is in Section 9(a) of the Act. Any person, who shuts down or dismantles plants in which nuclear fuel has been handled, must ensure that the residual radioactive substances as well as the radioactive parts of the plants and equipment which were removed or dismantled are utilized safely or disposed of adequately as radioactive wastes. Criterion 2.10 of safety criteria promulgated by the Federal Ministry of Interior stipulates that nuclear power plants must be designed so as to be able to shut down in accordance with the radiation protection regulations. The "Ordinance concerning financial security pursuant to the Atomic Energy Act" contains a specific provision for the decommissioning of nuclear facilities. (EDB)(JMF)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DECONTAMINATION STUDIES

237

Barnes, M.G., Pacific Northwest Laboratory, Richland, WA

Statistics and the Statistician in Nuclear Site Decontamination and Decommissioning: Lecture Notes for a Four-Day Short Course

PNL-SA-9486; 96 pp. (1981, April)

This course provides information on statistical aspects of radiological surveys and the remedial action (RA) process to enable statisticians to serve effectively in Decommissioning and Decontamination (D&D) projects. The material covered is pertinent both to a statistician working on-site and handling day-to-day data analysis and to a statistical member of project planning and management teams. Participants will learn the types of statistical problems that can arise and the kinds of questions that must be answered to enable efficient statistical designs and analyses to be developed. The ultimate goal is to help extract the maximum benefit from statistical contributions to D&D projects. Among the topics covered are: nature of the D&D problem; measuring devices and sampling methods; estimating activity in or on soil, buildings, equipment and other materials; estimating isotope ratios and error variances; acceptance sampling as a general method; special estimation problems; non-statistical considerations; and challenge problems. (EDB)(JMF)(RAF)

238

Bergemann, L., W. Stang, I. Auler, and G. Lorcher, Kernkraftwerk Gundremmingen Betriebsgesellschaft GmbH, Gundremmingen, Federal Republic of Germany; NIS Nuklear-Ingenieur-Service GmbH, Frankfurt, Federal Republic of Germany

Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VI-59 - VI-73) (1982, October)

For planning the decommissioning of the nuclear power plant Gundremmingen, Block A, an overall balance of the current activity inventory was determined by measurements as well as by calculations. The results showed satisfactory agreement. A total activity of 5 X 10(E+16) Bq was found in the RPV plus its inner parts. Only the inner part of the biological shield - specially separated - was activated. (Auth)(RAF)

239

Denham, D.H., Pacific Northwest Laboratory, Richland, WA

Plea for Realistic Environmental Surveillance/Decommissioning Criteria Based on Radiation Dose

PNL-SA-9726; CONF-820613; Proceedings of the Third International Society for Radiological Protection Symposium, Inverness, United Kingdom, June 6, 1982; (7 pp.) (1982, June)

This paper focuses on the need for consistent and realistic dose criteria for environmental surveillance and decommissioning programs. Of particular interest is the relationship between environmental detection levels and potential annual doses. There is also a need for establishing "de minimis" dose criteria. (Auth)(PTO)

240

Neri, C., and D. Lattanzi, Comitato Nazionale per l'Energia Nucleare, Rome, Italy

Radiological Aspects of Decommissioning Nuclear Power Plants

CNEN-RT/PROT-(80)31; 59 pp. (1980, December)

The problem of nuclear power plants decommissioning is examined from a radiological point of view. In addition, some estimates of the collective dose absorbed by workers during the decommissioning are reported and compared with the collective dose absorbed during operation and maintenance of the plant. The requirements to be taken into account into the design stage of nuclear plants in view of their decommissioning and the areas which need further improvements are briefly discussed. (EDB)(JMF)(RAF)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DECONTAMINATION STUDIES

241

Woollam, P.B., Central Electricity Generating Board, Berkeley Nuclear Laboratories, Berkeley, United Kingdom

Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island

CEGB-RD/B/N-4231; 51 pp. (1978, September)

This report is the first of a series which, together, aim to produce an accurate assessment of neutron induced activation levels in the fixed structural components of a Magnox type steel pressure reactor vessel. It describes the measurements made of induced activation, necessary in order to establish credibility in the complex calculations given in the subsequent reports. The report also attempts to systematically assess the potential contributions to the dose and disposal problem from all isotopes with a half-life in excess of 5 years. This is necessary in order to ensure that no isotope has been overlooked which could limit any part of the plan for the decommissioning of a Magnox reactor. In addition the report aims to determine the concentrations of trace elements in each major material type which lead to the isotopes limiting the decommissioning process. (EDB)(JMF)

242

Agostinelli, A., F. Bregani, R. Pascali, and C. Ronchetti, ENEL/DPT, Settore Nucleare, Roma, Italy; ENEL/DSR CRTN, Milan, Italy; CISE, Milan, Italy

Vigorous Decontamination Tests of Steel Samples

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. V-36 - V-49) (1982, October)

The chemical decontamination of metallic surfaces of the LWR, mainly with the use of highly effective reagents, is being studied as part of operative decommissioning problems. ENEL research activities, partially financed by the European Community Commission, began at the end of 1980, and are being developed by the Centro di Ricerca Termica e Nucleare, in close connection with ENEL-DPT and CISE. The main goal is the identification, development and assessment of vigorous decontamination techniques, taking into account the amount and disposal cost of liquid radwaste. The test materials come from the primary loop of the BWR-Garigliano plant. At first static tests screen for optimal etching parameters (time, temperature, reagent concentrations, etc.). The effectiveness of reagents is then tested in a special experimental loop (DECO), in dynamic conditions simulating in situ real procedures of decontamination. Hydrofluoric, nitric and hydrochloric acids and mixtures thereof have been used for the first tests. Sometimes total oxide removal is possible, and when this is the case, the final contamination levels are within the limits indicated for unrestricted release of materials in some countries. (Auth)(JMF)(RAF)

243

Allen, R.P., Pacific Northwest Laboratory, Richland, WA

Development of Improved Technology for Decommissioning Operations

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. V-18 - V-34) (1982, October)

This paper describes the technology development activities conducted at Pacific Northwest Laboratory under U.S. Department of Energy sponsorship to help ensure the availability of safe, cost-effective and environmentally sound decommissioning technology for radioactively-contaminated facilities. These improved decommissioning technologies include techniques for the removal of contaminated concrete surfaces and coatings, adaption of electropolishing and vibratory finishing decontamination techniques for field decommissioning applications, development of sensitive field instrumentation and methods for the monitoring of large surface areas, techniques for the field sectioning of contaminated components, improved contamination-stabilizing

ing and application methods, and development of a small solidification system for the field solidification of liquid waste. The results of cost/benefit studies for the vibratory finishing and sectioning technologies are also reported. (Auth)(JMF)

244

Ampelogova, N.I., R.V. Balukov, G.A. Zakharchuk, V.M. Orekhov, V.E. Olanov, Y.A. Khitrov, and L.M. Voronin

Electrochemical Decontamination of Metallic Surfaces

Nuclear Power Plants. Ehnergiya, Moscow, Vol. 3; (pp. 199-201) (1980)

A new type of device for electro-chemical decontamination consisting of operation electrode head, supply channels, and water-ring vacuum pump (mounted in the tank with the electrolyte) is developed. Laboratory and bench-scale tests of the method and mock-up of the device for electro-chemical decontamination are conducted. The device is applicable to decontamination of horizontal, vertical and complex-profile surfaces. The developed method and the device decrease the amounts of radioactive wastes and reduce labor costs. (EDB) (JMF)

245

Arrowsmith, H.W., D.G. Rencken, and H.R. Gardner, Quadrex Corporation, Richland, WA

Electrolytic Decontamination of Torus Steel for Release as Salvage

Transactions of the American Nuclear Society 41:100-102; CONF-820609; American Nuclear Society 1982 Annual Meeting, Proceedings of a Conference, Los Angeles, CA, June 6-10, 1982; (pp. 100-102) (1982, June)

A variety of carbon steel structural items removed from a boiling water reactor torus were electrolytically decontaminated and released for sale as salvage. The initial contamination level was 100,000 dpm/100 sq cm. After a 'e decontamination processing, greater than 90% of the items met the release criteria of less than 100 dpm/100 sq cm smearable and less than 0.05 mR/hr direct survey. The decontamination processing procedures consisted of sawing torch cut ends, paint stripping, water rinsing, electropolishing, water rinsing, and radiation survey for release. The approximately 70 tons of contaminated material which was decontaminated included 6-inch angle iron, 8-inch I-beams, 10-inch piping, and other miscellaneous iron sections. The successful decontamination of this quantity of torus steel for sale as salvage is a significant contribution to waste management technology. It permits a substantial reduction in volume of material shipped for burial, conserves burial space, and returns a large amount of carbon steel for industrial use. (Auth)(PTO)

246

Ayres, J.A., Battelle Pacific Northwest Laboratories, Richland, WA

Equipment Decontamination with Special Attention to Solid Waste Treatment: Survey Report

BNWL-B-90; 91 pp. (1971, June)

Methods for the decontamination of equipment that has been used at nuclear installations and has been contaminated with radionuclides are reviewed. A discussion of the different decontamination processes and an evaluation of each method from the standpoint of radioactive wastes generated during the decontamination and the net reduction in volume of solid wastes is presented. (DHM)

247

Balaban-Irmenin, Y.V., and A.L. Teplitskii

Decontamination of Equipment in Nuclear Power Plants With WWER-440 Reactors

Elektricheskie Stantsii (USSR) 81(4):6-8 (1981)

Schematic diagrams are shown of the systems for decontaminating the main circulation pump and steam generators of the WWER-440. Alkaline, acid, and rinse stages are tabulated with results (total activity in the dry residue) and treatment parameters (temperature, pH,

concentration of alkali and oxalic acid and iron). The concentration of KMnO4 in the alkali was 3 g/l and the concentration of HNO3 in the etching step was 0.3 to 1 g/l. (CAS)(JMF)

248
Balukov, R.V., and N.I. Ampelogova

Behaviour of Polonium During Electrochemical Steel Polishing Process

Radiokhimiya (USSR) 22(6):893-897 (1980)

The electrochemical behavior of microquantities of polonium on the surface of carbon and stainless steels in anodic solution in an electrolyte composed of 68% H3PO4, 15% H2O4, 4% CO3, and 13% H2O at a 1.5-2.25 volt potential interval, is investigated. Polonium transition into the solution at the initial stage of solution coincides with destruction and reconstruction of oxide film formed in the air; a desorption mechanism is more probable in the stationary regime. A higher rate of polonium removal is achieved during electropolation with stabilization of polonium and steel solution rates under conditions whereby structural etching is suppressed. (EDB)(RAF)

249
Card, C.J., G.R. Hoenes, L.F. Munson, and G.A. Halseth, Pacific Northwest Laboratory, Richland, WA

Health Physics and Industrial Hygiene Aspects of Decontamination as a Precursor to Decommissioning

CONF-820973; Decontamination of Nuclear Facilities, Proceedings of an International Conference, Niagara Falls, Ontario, Canada, September 19-23, 1982; (14 pp.) (1982, June)

The Pacific Northwest Laboratory is conducting a comprehensive study of the impacts, benefits, and effects of decontamination as a precursor to decommissioning for the U.S. Nuclear Regulatory Commission. The program deals primarily with chemical cleaning of light-water reactor (LWR) systems that will not be returned to operation. A major section of this study defines the health physics and industrial hygiene and safety concerns during decontamination operations. The primary health physics concerns include providing adequate protection for workers from radiation sources which are transported by the decontamination processes, estimating and limiting radioactive effluents to the environment, and maintaining operations in accordance with the ALARA philosophy. Locating and identifying the areas of contamination and measuring the radiation exposure rates through the reactor primary system are fundamental to implementing these health physics goals. The principal industrial hygiene and safety concerns stem from the fact that a nuclear power plant is being converted for a time to a chemical plant which will contain large volumes of chemical solutions. (Auth)

250
Faust, C.L.

Stainless Steel

Metal Finishing 80(9):89-93 (1982, September)

Information is presented for establishing procedures of electropolishing stainless steel. The advantages of the procedures are discussed. (EIX)(JMF)

251
Fetrow, L.K., and R.P. Allen, Pacific Northwest Laboratory, Richland, WA

Sectioning of Contaminated Components for Decontamination by Vibratory Finishing and Electropolishing

PNL-3943 (1981, September)

This report summarizes work conducted to develop, adapt, and evaluate a variety of techniques for sectioning glove boxes, chemical processing equipment, pipes, ducts, and other contaminated components in preparation for decontamination by vibratory finishing and electropolishing. These sectioning studies were conducted with a special 10-ft by 20-ft by 10-ft stainless steel, walk-in glove box equipped for either hands-on operation via gloves and personnel entry, or by remote operation using master slave manipulators and a bridge crane. Several sectioning techniques have been eva'

with respect to effectiveness, versatility, secondary waste generation, and capability for remote operation. The methods include wet and dry plasma arc torch cutting, mechanical sawing and nibbling, abrasive cutting, and hydraulic shearing and punching. (EDB)(PTO)

252

Groessler, P., Messerschmitt-Boelkow-Blohm GmbH, Muenchen, Federal Republic of Germany

Process for Decontaminating Objects Having Radioactive Layers

West German Patent DE2,745,458/B; 2 pp. (1980, November 6)

In decontaminating structural parts of a facility such as walls, a process has been developed to peel off layers by use of plate or liquid explosives. The use of this process greatly reduces the quantity of waste generated from decommissioning operations. (EDB)(PTO)

253

Hagan, P.G., Rockwell International, Energy Systems Group, Rocky Flats Plant, Golden, CO

Review of Processes for the Decontamination of Transuranic Wastes

RFP-3225; 60 pp. (1981, May 14)

Decontamination processing is being considered as an alternative to placing TRU waste in permanent repositories. The advantages would be to reduce the high cost of emplacement in a permanent repository, reduce transportation and handling of TRU waste, and possibly allow for recovery of transuranics and scarce metals. To define the cost savings and other potentials, several processes for decontamination are being evaluated. These processes utilize various modes of operation. The first mode includes processes that remove the TRU element but leave the surface unchanged. The second mode includes processes that remove thin layers of the base metal carrying the contamination with them. (Auth)(PTO)

254

Halter, J.M., R.G. Sullivan, and A.J. Currier, Battelle Pacific Northwest Laboratories, Richland,

Concrete Decontamination

PNL-SA-8855; CONF-800542; Proceedings of a Workshop, Seattle, WA, May 28-29, 1980, 206 pp. (1980)

Fourteen papers were presented which describe concrete surface removal methods and equipment, as well as experiences in decontaminating and removing both power and experimental nuclear reactors. (EDB)(JMF)

255

Hitachi Metals, Limited, Tokyo, Japan

Electropolishing of Nickel-Containing Austenitic Stainless Steel and Nickel-Base Alloys

Japanese Patent 81/38499; 2 pp. (1979, September)

Electroplating of nickel containing austenitic stainless steel and nickel-base alloys is effected in a neutral electrolyte obtained by adding to 30-85% aqueous glycerin 10-100 g/l salts of H2S04 or HN03 (Na, NH4, K, etc.) and 5 g/l NaCl and/or KCl up to the amount of the above neutral salts. (CA)(JMF)(RAF)

256

Huang, F.H., Union Industrial Research Institute, Hsinchu, Taiwan

Electropolishing of Carbon Steel and Stainless Steel and Its Industrial Application

Kung Yeh Chi Shu 85:16-23 (1981)

Carbon steel and stainless steel were electropolished using a bath containing H3PO4, H2SO4, and H2CrO3. The steel samples were degreased with CHClCCl2; then degreased in a hot alkaline bath containing NaOH, Na2CO3, and Na3PO4; washed in HCl; electropolished in an acid bath composed of 55-60% H3PO4, 15-20% H2SO4, 5-10% H2CrO4, 10-15% H2O and 0.05-0.1% additive at 60 to 75 deg C, an anodic c.d. 30 to 60 A/d sq m, and a voltage 8 to 12 V for 5 to 15 min; washed; neutralized with NaOH or NH4OH solution; washed; and dried. The brightness of the polished steel sample surfaces was considerably better than that obtained with a polishing bath using only H2SO4 and H3PO4. (CA)(JMF)(RAF)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DECONTAMINATION STUDIES

257

Kuriyama, O., and T. Koyama, Hitachi Limited, Energy Research Laboratory, Ibaraki, Japan

Application of a Plasma Arc in Decontamination of Radioactive Metallic Wastes

Transactions of the American Nuclear Society 38:195-196 (1981)

Metallic wastes such as stainless steel pipes and reactor components are contaminated by surface deposition of radioactive corrosion products in the coolant. Most of the radioactivity is localized in a region 10 mum in depth from the surface. Fundamental experiments carried out to develop a new decontamination method that applies a plasma arc for removing a thin surface layer from the contaminated metallic waste is described. (INSPEC) (JMF)

258

Lacy, C.S., W.B. Stewart, and A.B. Mitchell, Ontario Hydro, Toronto, Ontario, Canada

Decontamination Experience at CANDU-PHW Reactors

CONF-7710187; Water Chemistry of Nuclear Reactor Systems, Proceedings of an International Conference, Bournemout, United Kingdom, October 24-28, 1977; (pp. 385-391) (1978)

Several years experience in operating and maintaining nuclear generating stations has demonstrated the usefulness of chemical and mechanical decontaminations. Examples of techniques developed for the CANDU-PHW reactors are described in the belief that Ontario Hydro experience may be of use to other utilities. These examples include the decontamination of the external surfaces of a fuelling machine, the decontamination of internal surfaces of a fuelling machine and of pumps, and the CAN-DECON decontamination of the whole heat transport system of Douglas Point NGS. (EDB)(JMF)

259

McVey, J.T., C. Campuzano, and D.E. Fowler, Health Physics Systems, Inc., Gainesville, FL

Tools and Equipment: From Nuclear Waste to Reuseable Items

Nuclear and Chemical Waste Management 2(3) :197-200 (1981)

High pressure Freon cleaning and and electropolishing techniques were employed to clean radioactively contaminated metallic items, including pumps, cables, electric motors, hand tools, and assorted porous items. The techniques produced minimal waste in the decontamination processes due to advances in distillation and filtration of the cleaning fluids to permit their reuse. The volume of waste for burial was reduced by a factor of 40. About 95% of the radioactive contaminants were removed and condensed to a minimal volume for disposal, thereby permitting the return of approximately 6,000 articles, worth approximately $1.5 million, to active reuse. (EIX) (PTO)

260

Nippon Soda Company, Limited, Tokyo, Japan

Electropolishing of Stainless Steel

Japanese Patent 81/09400 (1981, January)

Stainless steel is electropolished by using a solution containing 40-70 parts water, 54-110 parts H2S04; 0.01-0.1 parts of a cationic surfactant, and/or 0.01-0.1 parts of an aromatic amino compound, and a c.d. of 15-30 A/d sq m with the outside to be polished as the anode. (CA)(JMF) (RAF)

261

Nuclear Energy Agency, Paris, France

Decontamination Methods as Related to Decommissioning of Nuclear Facilities

Report; 48 pp. (1981, March)

Decontamination will, most likely, be an activity of a decommissioning program for any nuclear facility. The type and magnitude of the decontamination campaign will be determined by many factors including the ultimate intended use of the residual equipment and facility and the nature of the contamination. Decontamir

processes can be applied to internal and external surfaces of components and systems, structural surfaces and to the tools employed in decommissioning. The type of facility will strongly influence the feasibility of an in situ decontamination process. For example, water reactors and reprocessing plants are quite compatible with wet chemical processes for decontamination of the internal surfaces of contaminated piping systems. But such is not the case for a gas-cooled reactor. The radioactive contamination of the latter consists essentially of dry particulates which are transported in the coolant gas and deposited on exposed internal surfaces. In this case vacuum cleaning is the most logical method for removal of loose contamination. It is the purpose of this report to present information in the following categories: (1) objectives of a decontamination program relative to decommissioning; (2) factors and logic influencing program selection; (3) current chemical, mechanical and electromechanical decontamination processes including their applicability to materials, decontamination effectiveness and waste generation impact; (4) current development activities; and (5) conclusions and recommendations for any indicated additional development work. (Auth)

262
Pokvitis, D.Z.

Electropolishing Goes Functional

Machine Design 53(22):56-60 (1981, September 24)

In the electropolishing process, also called reverse plating, the item to be cleaned is placed in a chemical bath between cathodes and is then anodically charged. Metal ions are dissolved from the surface and collect in the electrolyte. As little as 0.0001 in. of metal can be removed in a carefully controlled process. Since current densities are most concentrated on sharp edges or burrs, these can be dissolved away without greatly affecting the rest of the metal structure. Besides deburring, the process removes imbedded impurities. The process is used most on 300 series stainless steels, but all stainless steels, aluminum alloys, wrought, free-machining and cartridge brass, most copper alloys, Monel, Inconel, nickel, nickel-silver, molybdenum-chromium steels, and pure molybdenum can be electropolished. (MAY, PTO)

263
Riess, R.

Decontamination in Nuclear Power Stations

VGB Kraftwerkstechnik 61(2):124-130 (1981, February)

Before decontamination is carried out in a nuclear power station a cost-benefit analysis must be conducted. When the analysis shows a benefit from decontamination, objectives of the operation must be carefully reviewed. A review of the chemical and mechanical procedures which are applicable during the decontamination procedure is presented. A study of decontamination operations in recent years indicates that chemical procedures have become more efficient than mechanical procedures. (EDB)(PTO)

264
Rottger, A.F., Consolidated Edison of New York, Inc., New York, NY

Develop Decontamination Techniques for Pressurized Water Reactors

CONED-92413; CONED-92414 (1982)

The purpose of this project is to develop decontamination technology for PWRs. Phase I, development of strong chemical decontamination techniques, was accomplished. The U.S. Department of Energy contributed $180,000 to this project during Phase I. Remaining Phases II through V, which involved decontamination of an operating plant, were cancelled. This project has been redirected to develop dilute chemical treatment techniques to prevent build-up of radioactivity in the primary coolant system. (Auth)(PTO)

265
Schenk-Filterbau GmbH, Federal Republic of Germany

Electrolyte Solution for Electropolishing

German Patent DE-2949807; 3 pp. (1981)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DECONTAMINATION STUDIES

The composition of baths for electropolishing metals such as copper and stainless steel is given. Thus, a bath for polishing stainless steel contains commercial phosphoric acid (800 ml/l), 96% sulfuric acid (100 ml/l), water (100 ml/l), sodium polyphosphate (n - 16) (4-5 g/l), and a wetting agent (2.5-3 mg/l). A fluorinated wetting agent with a polymepization number of 36 can be used with good results. The bath temperature was 45-55 deg C, the c.d. 8-20 A/sq dm, and the polishing time was 5-10 minutes. (CA)(JMF)(RAF)

266

Schneider, F., and H. Rabold, Staatliches Amt fuer Atomsicherheit und Strahlenschutz, Berlin, German Democratic Republic

Investigation of Highly Efficient Decontamination Solutions for Decommissioning of Pressurized Water Reactor Power Plants

Kernenergie 25(3):115-120 (1982)

In the decommissioning of nuclear power plants highly efficient decontamination procedures are advantageous. Therefore, the decontamination efficiency of aggressive inorganic acid solutions has been studied under laboratory conditions with various materials at different bath temperatures. Using oxidizing and chelating agents, higher decontamination factors could be achieved than with the material-preserving decontamination solutions applied in operating nuclear power plants. The results obtained are discussed, and the problem of processing the resulting aggressive liquid radioactive wastes is outlined. (EDB)(JMF)

267

Testemale, G., F. Andreucci, and C. Bozec, Commissariat a l'Energie Atomique, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, France

Intervention Device for Use in a Hostile Environment

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. V-72 - V-79) (1982, October)

This report describes the technique used by the Fontenay-aux-Roses Research Centre to solve problems of intervention in an environment strongly contaminated with high-activity alpha emitters. The center used a cell specially fitted for work in ventilated clothing called the "Scalhene" intervention device, a special application of the DPTE system (double door for hermetic transfer - CEA License) normally used to take materials into and out of a tight cell without breaking the confinement. The problem was to decontaminate and dismantle large low-level glove-box type equipment contaminated by transuranic elements. (JMF)

268

Uda, T., H. Tsuchiya, and H. Iba, Hitachi Limited, Energy Research Laboratory, Ibaraki, Japan

Decontamination of Uranium-Contaminated Iron by Smelting

Transactions of the American Nuclear Society 41:102-103; CONF-820609; American Nuclear Society 1982 Annual Meeting, Proceedings of a Conference, Los Angeles, CA, June 6-10, 1982; (pp. 102-103) (1982, June)

Large quantities of alpha-contaminated metal scrap are produced by operating nuclear industry facilities. A major problem is to develop effective decontamination and volume reduction techniques for even extremely low-level contaminated materials. Smelting is one of the most effective decontamination methods because it offers the possibility of decontamination by concentrating radionuclides in slag, as well as volume reduction. It also has the advantage of cleaning the metals for reuse. It is very important to understand the transfer mechanism for the movement of radionuclides from metal to slag, in order to increase the decontamination efficiency. Several smelting experiments were carried out with uranium-contaminated iron varying by several parameters, such as slag composition and melting temperature. (Auth)(PTO)

269

Utroska, D.

Three Mile Island: Searching for Pennsylvania Initiatives (Alternatives for Funding Cleanup)

Electric Light and Power 59(4):12-13 (1981, A

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DECONTAMINATION STUDIES

As Pennsylvania legislators consider ways to fund the Three Mile Island cleanup, critics watch to see if they will also rescind the portion of the gross receipts tax bonus that amounts to a windfall and whether they will review the recent refusal to defer Metropolitan Edison Company's tax payment. No plan to aid the utility has come from the governor in spite of his announced intention of avoiding bankruptcy if it is legally possible. The legislature is expected to ask for federal assistance. The Pennsylvania Public Utility commission could take several actions to mitigate the financial problem, but there is disagreement over the extent of federal and state responsibility in setting rates for public utilities. (DCK)(EDB)(JMF)

270

Woollam, P.B., Central Electricity Generating Board, Berkeley Nuclear Laboratories, Berkeley, United Kingdom

Perspective on Potential Contributions to Reactor Decommissioning Problems Caused by Nickel-59

CEGB-RD/B/N-4232; 8 pp. (1978)

A recent, widely publicized report by the New York Public Interest Research Group concluded that dose equivalent rates in boiling water reactors due to nickel-59, were 150 Sv/hr at the end of reactor life. Consequently a decay period of 1.5 million years was required for the radioactivity to reduce to a "safe level". This note shows that these results are entirely fallacious and that the maximum dose equivalent rate due to nickel-59 in a decommissioned Magnox reactor will be less than 10 Sv/hr. In addition, nickel-59 is not a major isotope to be considered in calculations for ingestion via drinking water 1000 years after reactor shutdown. (EDB)(JMF)

271

Younger, A.F., and J.L. Briggs, Rockwell International, Energy Systems Group, Rocky Flats Plant, Golden, CO

Literature Survey of Interior-Surface Materials for the Advanced Size Reduction Facility

RFP-3091; 13 pp. (1981, October)

A literature survey was conducted to characterize optimum interior surface coatings for an advanced size reduction facility. The size reduction facility will process decommissioned stainless steel apparatus used for the chemical recovery of plutonium. The literature survey includes topics pertinent to the selection of suitable interior surface coatings for the proposed facility, e.g., decontaminability, chemical resistance, radiation stability, flammability, and application and identifies generic coatings and liners that are acceptable candidate materials for use in the size reduction facility. (EDB)(JMF)(RAF)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DISMANTLEMENT AND DEMOLITION

272

Armstrong, P.J., and R.C. Macphee, Ontario Hydro, Toronto, Ontario, Canada; Macphee Nuclear, Toronto, Ontario, Canada

Evaluation of Immediate Dismantlement of CANDU Reactors at the End of Service Life

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-66 - VII-79) (1982, October)

There are several approaches to the decommissioning of large multi- unit nuclear generating stations. For the purpose of estimating costs, Ontario Hydro has chosen storage with surveillance for thirty years followed by dismantlement. The thirty-year storage period allows radiation in the reactors to decay to more manageable levels. After the dismantling process, the site is restored to a condition suitable for unrestricted use. Ontario Hydro chose this decommissioning method after considering the entire range of methods of decommissioning. The range lies between two extremes. One extreme is immediate dismantlement; this is dismantlement performed as soon as reasonably possible after the station ends its normal service life. The other extreme is indefinite storage; this entails sealing the nuclear portion of the station to prevent escape of radioactive material, and then maintaining it in a safe state for hundreds of years. This paper discusses the option of immediate dismantlement and compares it with the above reference method. The studies were based on Pickering Nuclear Generating Station A. (Auth)

273

Bahmann, H., E. Brandenberger, and K. Schober

Underwater Oxygen Lance - Cutting of Metals, Concrete and Stone

Mitteilungen der BEFA 32(1); (4 pp.) (1981)

Although the use of oxygen lances for underwater cutting of metal and concrete was initially fraught with problems, it is now considered to be a highly efficient, reliable and economic cutting process. The difficulties experienced previously with the lance design, particularly regarding the interrelationship between the core wires and the outer tube, and in the perforation of thick concrete and minerals have been overcome. Cutting operations using oxygen lances of this type are possible up to depths of 70 m; the technique is quick, requires little preparation, and offers flexibility as a result of the lightweight and easily transportable lance. (Auth)(JMF)

274

Bartley, D.L., W.N. McKinnery, Jr., and K.R. Wiegand, National Institute for Occupational Safety and Health, Cincinnati, OH

Control of Physical Agent Hazards of Arc Welding and Cutting

PB-80-164866; 50 pp. (1979, September)

Measurements of the ultraviolet radiation from gas tungsten arc welding (GTAW), gas metal (spray arc) welding (GMAW), and plasma arc cutting (PAC) were made using a micro-computer controlled rapid scan spectroradiometer. Welding of aluminum alloys containing low concentrations of magnesium were found to yield radiation of considerably greater biological activity than nonmagnesium alloys and, at a distance of one meter from the arc, up to a thousand times that of sunlight at the earth's surface. "Biological activity" in this regard refers to the effectiveness in producing skin-shielded DNA response, and as such may be related to the potential for carcinogenicity. The use of GMAW consumable electrode wire containing 5 percent magnesium led to an order of magnitude greater biological activity than nonmagnesium wire. Magnesium in small concentrations was found to be important to radiation emission due to the ease of vaporization into the arc and to the existence of magnesium emissions in the ultraviolet region. The emission dependencies of GTAW on process, shielding gas, gap, and magnesium concentration in the base metal and consumable electrode wire were determined. Ultraviolet radiation and third-octave band noise analyses of PAC were also carried out. Preliminary measurements of welders' clothing transmittance were made. (GRA) (RAF)

275

Braun, W.

Present Position of Plasma-Torch Cuttin

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DISMANTLEMENT AND DEMOLITION

Blech, Rohre, Profile 27(4):226-228 (1980, April)

Plasma-torch cutting is used for highly alloyed steels (1. 4301) and light metals (aluminum) which cannot be cut with oxygen torches. The advantages and limitations of various gases used for the plasmas are discussed: argon-hydrogen, compressed air, and water injection, the most recently developed variant. The last process may be conducted with the workpiece in contact with a water bath or even totally submerged, achieving in the latter case very high cutting speeds. (Auth)(JMF)

276

Campbell, R.L., U.S. Army Engineers Waterways Experiment Station, Vicksburg, MS

Review of Methods for Concrete Removal

WES-TR; 65 pp.; SL-82-3, 63 pp. (1982, April)

The purpose of this report is to aid in the selection of equipment and processes for the removal of concrete. The report presents the advantages and disadvantages of each of the following means of concrete removal: explosive blasting; hand-held breaker; high-pressure carbon dioxide blaster; hydraulic rock-breaker; powder lance; powder torch; thermal lance; vehicle-mounted breaker; water cannon; and water jet. (Auth)(PTO)

277

Caruolo, A.B., and A.P. Walch

Laser Cutting Apparatus for Nuclear Core Fuel Subassembly

U.S. Patent 123,861 (1980. February)

The object of this invention is to provide a system and apparatus which employs laser cutting to disassemble a nuclear core fuel subassembly. The apparatus includes a gantry frame which straddles the core fuel subassembly; an x-carriage travelling longitudinally above the frame which carries a focus head assembly having a vertically moving carriage and a laterally moving carriage; a system of laser beams transferring and focusing mirrors carried by the x-carriage and focusing head assembly; and a shroud follower and longitudinal follower for following the shape of the shroud to maintain a beam focal point fixed upon the shroud surface for accurate cutting. (DB)(JMF)(RAF)

278

Christen, W.

Thermal Cutting: What To Do About High Alloy Steels

Schweisstechnik 34(1):8-10 (1980, January)

Methods of thermal cutting difficult materials such as austenitic steels and non-ferrous metals are considered. Metal powder cutting processes in which metal powder is introduced into the flame gives good cutting properties, but has the disadvantage of forming metal dust around the work area, thus preventing it from being widely adopted. Alternative methods using mineral powder instead of metal powder injection have not found much application either. Cutting by plasma arc is the most promising method and an outline of its use is given. Suitable eye shields are essential; local fume extraction equipment is advisable. Noise may present a hazard. (DB)(RAF)

279

Controlled Dismantling

Wirtschaftswoche 33(40):20 (1979)

In 1963, the first German nuclear power plant began operation at Kahl in Bavaria; it signalled a new technical age in West Germany. With the nuclear power plant at Niederaichbach, the first plant of this type is torn down in Western Europe. The fate of Unit I of Gundremmingen nuclear power plant is still unsettled. (EDB)(JMF)

280

Corica, S., American Welding Society, New York, NY

Recommended Practices for Plasma Arc Welding (Welding Workbook Data Sheets 31a, 31b)

Welding Journal 61(9):59-60 (1982, September)

Typical parameters are tabulated for the plasma welding of butt and joints in titanium, stainless steel, carbon steel, low alloy steel; of fillet welded lap and T-joints in stainless steel; and for the plasma cutting of aluminum alloys, stainless steel and carbon steel. (Auth)(JMF)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DISMANTLEMENT AND DEMOLITION

281

Cregut, A., Commissariat a l'Energie Atomique, Centre de Marcoule, Bagnols-sur-Ceze, France

Decommissioning of Nuclear Facilities

CONF-770409; Proceedings of the International Radiation Protection Association Fourth International Congress, April 24-30, 1977, Vol. 3; (pp. 779-782) (1977)

The International Atomic Energy Agency recommendations concerning the possible stages of decommissioning facilities are recalled. Each of the three selected stages (the physical state of the plant and its equipment, the survey, and the inspections and testing required by this state) are described. The specific characteristics of decommissioning with regard to intervention and maintenance operations in an ionizing atmosphere are emphasized. A list of known methods and techniques and special equipment necessary to carry out the dismantling of large nuclear facilities is given. The state of large nuclear facilities which were permanently withdrawn from service in France, and the interventions which have been executed are described. (EDB)(JMF)

282

Deichelbonrer, P.R., Rockwell Hanford Operations, Richland, WA

The Arc Saw and Its Application to Decommissioning

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. V-50 - V-65) (1982, October)

The arc saw is a toothless, circular saw that cuts by arc erosion. A model was built to study the arc saw's usefulness in cutting radioactively contaminated metal scrap. The arc saw was selected because it cuts with very little contact to the work piece and because cutting is not affected by material hardness. After several improvements were made, the arc saw could cut almost any metal alloy with minimal manipulation required. (Auth)(PTO)

283

Deichelbohrer, P.R.

Vacuum Furnace for Radioactive Waste Volume Reduction

CONF-810217; Waste Management '81, The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs, and Public Communications, R.G. Post (Ed.), Proceedings of an American Nuclear Society Topical Meeting, Tuscon, AZ, February 23-26, 1981, Vol. 2, 1210 pp.; (pp. 309-320) (1981)

In handling radioactive materials and chemicals like those found in processing spent nuclear fuel or the production of plutonium, the process equipment becomes contaminated. After the equipment has become obsolete or worn out, the equipment itself is a form of radioactive waste, requiring the development of a suitable disposal method. Volume reduction by melting has been considered to be a suitable preparation for these wastes before burial. This paper discusses the Contaminated Equipment Reduction Program, a pilot program instituted by Rockwell Hanford Operations in Richland, Washington. The goal of the program is to develop a remote-controlled process that can cut up the scrap and melt it into ingots. Only wastes in the form of contaminated equipment are considered. The paper discusses typical work pieces, pilot plant, arc saw employed, and function of the vacuum furnace. (EIX)(JMF)(RAF)

284

Deichelbohrer, P.R., and G.A. Beitel, Rockwell Hanford Operations, Richland, WA

Arc Saw Development Report

DOE/RL/01030-T1; 90 pp. (1981, September)

The arc saw is a key component of the Contaminated Equipment Volume Reduction (CEVR) Program. This report describes the progress of the arc saw from its inception to its current developmental status. The history of the arc saw and its early contributors, special features and its advantages for CEVR are discussed. The theory of operation, pertinent experimental results, plans for the large area saw and advanced control systems are covered. Associated topics such as pot

applications for the arc saw and other arc saw installations in the world are also touched upon. (EDB)(JMF)(RAF)

285
Detilleux, E., L. Geens, W. Hild, and W. Klonk, European Company for the Chemical Processing of Irradiated Fuels, Mol, Belgium

Decontamination and Partial Dismantling of the Eurochemic Plant: Part 1 - Decontamination of the Head-End Cells and Partial Dismantling of Two Dissolvers

ETR-303; 25 pp. (1980, September)

A description is given of the partial dismantling of the dissolver used for fuel elements of up to 1.6 weight%/uranium-235 enrichment, and of the total dismantling of the dissolver. The corresponding head-end cells have been decontaminated, allowing prolonged interventions, either in view of refurbishing or complete dismantling. An assessment of required manpower, dose commitments, material consumption, and waste production for all operations is given. (EDB)(JMF)

286
Esibjan, E.M.

Present State of Development of Plasma-Compressed Air Cutting of Metals

Zentralinstitut fuer Schweisstechnik Mitteilungen (East Germany) 20(9):928-939 (1978, September)

The state of development of plasma-compressed air cutting in the USSR is reviewed, with specific reference to research programs under way at the Paton Institute. In particular, trends in plasma cutting equipment such as VPR-9 and VPR-10 torches and electrodes containing zirconium or hafnium; operating parameter selection; economic considerations; and future research objectives, including water-air stabilization of the cutting arc column and more sophisticated equipment design are discussed. (Auth)(JMF)

287
Flow Industries, Inc., Kent, WA

Abrasive-Jet Cutting Examples and Concepts

RTD Communication No. 145; 15 pp. (1982, June)

This report details the abrasive-jet cutting and drilling system developed by Flow Industries. The system replaces diamond tools and offers omni-directional features and narrow kerf capabilities of high energy laser-cutting. The system has been designed to cut through composite armor, oil well casing, laminated safety glass, advanced composite structures such as rocket motors and structural aerospace parts. A small light-weight particle accelerator creates the jet at 40,000 to 60,000 psi and a stream of solid abrasives is introduced into the accelerator at separate feed ports. A coherent, high velocity (up to 3000 ft/s)water jet, 0.010 to 0.025 inches in diameter, with limited dynamic stability is discharged into an entrainment chamber. The internal geometry of the cutting head is designed to transfer droplet momentum to the solid particles, streamline the resulting particle jet, and minimize particle interaction and wall effects. A focused, high velocity particle stream exits the accelerator. For underwater cutting, the particle stream can be discharged through an air shroud. In hazardous areas quench water is added to suppress spark generation. The cutting rates for steel and concrete are given: 1/8 in. steel sheet ASTM A36 - 16 in./min; 3/4 in. steel plate ASTM A36 - 4 in./min; and 8 in. concrete - 1.5 in./min. The operating conditions for the system are: engine rpm - 2400; hydraulic horsepower - 21 hp; water-jet pressure - 30,000 psi; nozzle diameter - 0.018 in.; and abrasive flow rate - 4 lb/min. (PTO)

288
Flow Industries, Inc., Kent, WA

High Pressure Water-Jet Scarification of High Density Concrete

RTD Report No. 256; 23 pp. (1983, February)

This report details the use of ultra-high pressure and low-volume water for the removal of contaminated concrete surfaces. Scarification tests were carried out on a high density (220 to 320 lb/cu ft) concrete sample. The

equipment used to perform the concrete scarification test was a standard Flow Industries 40ED JetPac and Jet-Lance. The system operates at a maximum of 35,000 psi water pressure and delivers a maximum of 2.5 gal/min. The Jet Lance is a hand-held tool with two jets which rotate at 500 to 700 rpm. All tests were performed under the following conditions: jet pressure - 30,000 psi; jet flow rate - 1.3 gal/min; traverse speed - 36 in./min; and jet standoff distance from workpiece - varied from 1/4 in. to 2 in. Operating costs of the standard 40ED Flow JetPac and Jet-Lance including maintenance range from $3.00 to $4.00/hr. The capital costs for the JetPac and Jet-Lance are $70,000 and $4500 respectively. (PTO)

289

Flow Industries, Inc., Kent, WA

System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design

Flow Technology Report No. 205; 70 pp. (1981, August)

This report documents the Task 1 effort of a project for the development of a system capable of demonstrating the feasibility of using water jets to remove contaminated concrete surfaces. The Task 1 goal was to conceive and prepare preliminary designs for a concrete surface removal system. The goals of Tasks 2 and 3 are to accomplish the detailed system design and fabrication and field testing, respectively. A concrete surface removal system designed for use on contaminated surfaces must: (1) be capable of completely removing contaminated material from the surface; (2) not generate respirable airborne dust; and (3) capture and contain all of the contaminated material. Water jet scarifiers have already been used to remove surface concrete from bridge decks. This surface was scarified by a single pass to an average depth of 0.5 in. The average area removal rate that can be achieved using a single-pass system is approximately 215 sq ft/hr for a 250-horsepower pump. The objective of task 1 was to conceive and design such a system with the following capabilities: (a) contained cutting whereby concrete particles and water are collected by a vacuum system; (b) closed-loop operation; (c) complete concrete cuttings containment; (d) complete containment, filtering, and reuse of water; (e) air filtering; and (f) removal from 1/16 to 1/8 in. of concrete from floor surface exclusive of concrete in corners. (PTO)

290

Francioni, W.M., Eidgenoessisches Institut fuer Reaktorforschung, Wuerenlingen, Switzerland

Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw

EIR-448; 32 pp. (1981, October)

Studies are being conducted concerning the breakdown of the biological shield of light water reactors and particularly the breakdown of the reactor island of the former research reactor, Diorit. The wire saw was selected as a possible method for disassembling the concrete structures. Cutting trials were conducted on two sample pieces, representative of the concrete and reinforcement of the Diorit and Beznau reactor shields. The test results indicated that the wire saw can be economically feasible in disassembly operations. (PTO)

291

Freund, H.U., B. Bohm, and S. Schumann, Battelle Institute, Frankfurt, Federal Republic of Germany

Dismantling Techniques for Reactor Components Using Explosives

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp.; (pp. 10-20) (Addendum) (1982, October)

Both the pressure vessel and the biological shield represent components which contribute substantially to the radioactive inventory of a decommissioned reactor. In order to minimize radiation exposure of personnel it is desirable to reduce the time for the dismantling operation. Dismantling procedures should therefore be simple, yielding fragments of suitable size and shape to facilitate easy conditioning. Methods utilizing explosives seem to meet these requirements. These methods are described in this paper. (Auth)(PTO)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DISMANTLEMENT AND DEMOLITION

292

Freund, H.U., and R. Synofzik, Battelle Institute, Frankfurt, Federal Republic of Germany

Method for Explosive Demolition of Reactor Pressure Vessel

CONF-810326; Jahrestagung Kerntechnik '81 (Nuclear Technology '81), Proceedings of the Annual Meeting, Dusseldorf, Federal Republic of Germany, March 24-26, 1981; (pp. 525-528) (1981)

This paper describes a method of dismantling steel pressure vessels using explosives. The vessels to be dismantled are filled with liquid nitrogen which increases the brittleness of the steel. Desired lines of fracture can be scribed (scarred) on the exterior surface of the vessel. Coaxial linear explosive charges are detonated and the pressure wave is absorbed by the liquid nitrogen. The pressure wave causes a fracture through any planes of weakness in the vessel. The experimental procedures are outlined and interior pressure measurements are plotted. It is believed that the amount of explosive required to dismantle a reactor pressure vessel can be reduced to 25 kg (about 10% of the mass needed to dismantle a vessel in the ductile state). (INSPEC)(PTO)

293

Goldberg, F.

Survey of Underwater Cutting of Metals

Indian Welding Journal 13(3):67-82 (1981, July)

A summary of the present underwater cutting methods for metals is given. The methods discussed include oxy-fuel gas cutting; oxy-arc underwater cutting; metal-arc cutting; metal-arc cutting with consumable electrode and water jet; plasma-arc cutting; explosive cutting; thermic lance; and mechanical cutting. The effects of depth on the feasibility of underwater cutting processes are also considered. (Auth)(JMF)

294

Hamasaki, M., Y. Murao, and F. Tateiwa, Government Industrial Research Institute, Shikoku, Japan

Gouging the Answer to Nuclear Dismantling Problems

Welding and Metal Fabrication 49(10):585-587 (1981)

Nuclear pressure vessels are dismantled under water to protect against radiation. A new gouging/cutting technique has been tested on mild steel pressure vessel sections, 150-mm thick, clad with 6 to 12 mm stainless steel. The results are discussed. (EDB)(JMF)

295

Hamasaki, M., J. Sakakibara, and F. Tateiwa

Dismantling Commercial Atomic Reactor Pressure Vessels - Combined Gouging and Gas Cutting Process Used Underwater

Welding Review 1(3):52-54 (1982, August)

A brief description is given of experiments conducted to examine the feasibility of a combined metal arc gouging and gas cutting process for dismantling atomic reactor pressure vessels, of mild steel clad with 6 mm to 12 mm of 18/8 stainless steel, underwater. It was shown that satisfactory results could be obtained using the two processes separately, and it is expected that the use of compound torches could be adopted in practice. (WELD)(PTO)

296

Hamasaki, M., F. Tateiwa, F. Kanatani, and S. Yamashita

Underwater Cutting of Stainless Steel Plate and Pipe for Dismantling Reactor Pressure Vessels

Metal Construction 14(8):446-447 (1982, August)

A comparison is made between consumable electrode water jet cutting of stainless steel plate up to a thickness of 120 mm and plasma arc cutting for dismantling reactor pressure vessels and other components. Results are discussed for the cutting of plate 40-mm, 55-mm, 70-mm, and 80-mm thick and of pipe, including pipe of small diameter. Gas and dross generation are also described. (WELD)(PTO)(RAF)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DISMANTLEMENT AND DEMOLITION

297

Hayashi, K., S. Takahashi, Y. Ichihashi, S. Suzuki, T. Yada, U. Nakamura, S. Tomidokoro, and M. Fukuzawa

Study on Underwater Plasma Arc Cutting for Stainless Steel

Ishikawajima-Harima Engineering Review 22(1) :35-39 (1982, January)

A study is presented on the underwater plasma arc cutting of SUS 316 stainless steel tubing in the Japan Material Testing Reactor (JMTR), to establish a dismantlement technology for the radioactive in-pile creep test facility. Optimum cutting conditions were studied. Assessments were made of the relationships between cutting conditions and cutting width, cutting conditions and cutting slags, and heat input and cutting slags. These conditions were evaluated for the development of a remote control system. Quantitative analysis was made of the amount of particles suspended in water as well as those contained in bubbled gas, in order to develop a safe removal system for contaminants produced by cutting radioactive material. The quantity of particles in water and air was slight. The plasma cutting process was effective in materials dismantlement. (Auth)(PTO)

298

Higginson, P.R., and D.A. Campbell, United Kingdom Atomic Energy Authority, Dounreay Nuclear Power Development Authority, Dounreay, United Kingdom

Laser Cutting Equipment for Dismantling Irradiated PFR Fuel Sub-Assemblies

CONF-8005182; Proceedings of the British Nuclear Energy Society Conference, Grange-over-Sands, United Kingdom, May 13-16, 1980; (pp. 135-141) (1980)

Laser cutting was named as a possible technique for dismantling irradiated Prototype Fast Reactor (P.F.R.) fuel sub-assemblies. Initial trials showed that it could be used to make essentially swarf free cuts in P.F.R. wrapper material provided sufficient laser power was available to allow use of an inert cutting gas. A technique for inert gas cutting with the reliable, commercially available Ferranti MF 400 laser and equipment has been established for laser cutting of subassemblies. The equipment has been installed in the Irradiated Fuel Cave at P.F.R Test cuts carried out with this equipment on non-radioactive wrapper sections have shown it to be easy to operate remotely, optically stable, and reliable in operation. (EDB)(JMF)

299

Hoover, M.D., G.J. Newton, E.B. Barr, and B.A. Wong, Lovelace Biomedical and Environmental Research Institute, Inhalation Toxicology Research Institute, Albuquerque, NM

Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Inhalation Hazards and Worker Protection

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp.; (pp. 131-145) (Addendum) (1982, October)

This study was undertaken to enable improved human inhalation risk assessments for industrial workers and to guide in the selection of appropriate control technologies for airborne materials released during metal cutting activities associated with decommissioning nuclear facilities. Mechanical cutting tools evaluated included a multi-wheel pipe cutter, reciprocating saw, band saw, chop saw, and large and small grinding wheels. Melting-vaporization cutting techniques included an oxy-acetylene torch, electric arc cut rod, and plasma torch. With the exception of the multi-wheel pipe cutter, all devices created aerosols in the respirable size range (less than 10 um aerodynamic diameter). Time required to cut 2-inch schedule 40 type 304L stainless steel ranged from about 0.6 min for the plasma torch to about 3.0 min for the reciprocating saw. Aerosol production rate ranged from less than 10 mg/min for the reciprocating saw to more than 3000 mg/min for the electric arc cut rod. Particles from mechanical tools were irregular in shape while particles from vaporization tools were spheres and ultrafine branched chain aggregates. (Auth)(PTO)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DISMANTLEMENT AND DEMOLITION

300
Hosoda, N., and T. Hosoda

A Plasma-Arc Cutting Machine

British Patent 1-598-574; Japanese Patent 52/034731; Japanese Patent 53/015104 (1981, September 23)

The new instrument developed is a small pencil-sized plasma cutting torch which can be held in one hand and has a number of other advantages over conventional machines. The low end of the nozzle is placed in contact with the workpiece, thus eliminating the difficulty in positioning the torch at a correct distance. The electrode is mounted within the body in such a way as to be axially movable. The torch gives a small diameter heated spot, enabling small workpieces to be handled. The operator is protected from the intense light generated by the arc. (WELD)(PTO)(RAF)

301
Hosoda, N., and T. Hosoda

Plasma-Arc Cutting Methods and Plasma-Arc Cutting Machines

British Patent 1-594-058; Japanese Patent 52/034732 (1981, July 30)

The design of the new torch allows the nozzle to be in contact with the workpiece, which permits the electrode to be positioned inside the nozzle at a desirable distance from the workpiece. Because the nozzle is in contact with the workpiece, the electrode is kept a fixed distance from the workpiece and the operator is protected from the brightness of the plasma arc. Grooves are provided for venting the gas from the nozzle. (WELD)(PTO)

302
Inoue, N., Toshiba Corporation, Kawasaki, Kanagawa, Japan

Biological Shields

Japanese Patent 56/57989/A; 2 pp. (1981, May 20)

A method is described to facilitate the dismantlement of biological shields used in nuclear reactors. The method involves injection of water into the cavity surrounding the pressure vessel. (PTO)

303
Japanese Standards Association, Tokyo, Japan

Gas Welding and Cutting Torches

JIS Handbook; (pp. 943-970) (1981)

This chapter covers low pressure type gas welding torches, manual gas cutting torches and pressure regulators for gas welding and cutting torches. (WELD)(PTO)

304
Jayakumar, T.K., and A.S. Paithankar, Bhabha Atomic Research Centre, Bombay, India

DC Plasma Torch for Metal Cutting

BARC-645; 34 pp. (1972)

A plasma process is described in detail for cutting metals like stainless steel, mild steel, and other alloy steels. The design, construction, and performance of the 100 kW direct current plasma metal cutting torch are described. The merit of the direct current plasma process over conventional methods is discussed. Operational data and safety measures are also described. (Auth)(PTO)

305
Jeantet, E., P. Miquel, J.C. Baudoin, and A. Moutonnet, Commissariat a l'Energie Atomique, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, France

Dismantling of a Hot Cell of High Level Activity: Method and Tools Used

CEA-CONF-5765; CONF-8105128; Hot Laboratories and Remote Handling, Proceedings of a Workshop, Karlsruhe, Federal Republic of Germany, May 21-22, 1981; (13 pp.) (1981, May)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DISMANTLEMENT AND DEMOLITION

The purpose of this activity is to remove all of the equipment and materials in the "Attila" hot cell and to decontaminate to radiation levels as low as possible (ALARA). The Attila facilities were built during the period 1964 to 1966 to study dry processing of irradiated fuels by the halogenide volatility process. Dismantlement of the hot cell and associated laboratory by the use of remote control equipment is described. (AIX)(PTO)

306

Karker, S., and P. Holmgren, Studsvik Energiteknik AB, Nykoping, Sweden; Rivteknik i Skelleftea AB, Skelleftea, Sweden

Dismantling of the R1 Reactor, Stockholm

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-150 - IV-161) (1982, October)

This report describes briefly the dismantling of the Swedish research reactor R1, which is located underground in a cavern in central Stockholm. The report deals mainly with the demolition of the reactor's iron-ore concrete biological shielding, which surrounds the reactor vessel and graphite reflector. R1 was Sweden's first nuclear reactor. It was taken into service during the summer of 1954 and shut down in 1970. The R1 was a research reactor of the natural uranium/heavy water type and had a nominal thermal power of 1 MW. After its final shutdown, the reactor fuel, the heavy water and the ion exchangers were removed from the station. Due to the fact that safety problems on site would generally become more acute with time and for a number of other reasons as well, a complete dismantling of the reactor was proposed by Studsvik Energiteknik AB, the owner of the station. (Auth)(JMF)(RAF)

307

Kharitonov, E.P., G.I. Chepurkov, A.I. Kurnosov, L.B. Sabun, and A.N. Zhmotov, Proektno-Tekhnologicheskii Institute, Ehnergomontazhproekt, USSR

Surface Plasma-Arc Cutting of Steels 10KHSND and 10KHN1M

Svarochnoe Proizvodstvo (USSR) 1980(11):33-34 (1980, November)

Estimation of technological effectiveness of surface plasma-arc cutting (SPAC) and its effect on properties of joints are presented for 10KhSND and 10khN1M steels. It is shown that application of SPAC for preparing 10KhSND and 10KhN1M steels for welding and burning of defect areas in the joint weld does not hinder structural and mechanical properties of the welded joints. SPAC provides stable parameters for grooves both at cutting in argon and in nitrogen. (EDB)(JMF)

308

Lunn, D.J.

Nibbling, Laser Cutting and Plasma-Arc Cutting

Tooling and Production 46(12):66-69 (1981, March)

This article considers the advantages and versatility of CNC punch press systems in sheet metal and plate working. Processes discussed included: plasma-arc cutting using water injection; laser cutting; and punch press nibbling. (Auth)

309

Mayer, C.A.

Fabricating Centers Cut with Numerical Control Accuracy

Welding Design and Fabrication 55(7):68-70 (1982, July)

The use of NC turret punch presses combined with plasma or laser cutting equipment is discussed. A basic turret punch press is described. Several examples of complex parts produced with turret punch presses and plasma arc cutting are presented. The capacities of the combined fabricating centers are tabulated. (WLD)(PTO)

310

Miwa, S., S. Tomidokoro, and U. Nakamura, Ishikawajima Plant Construction Company, Limited, Tokyo, Japan

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DISMANTLEMENT AND DEMOLITION

Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor

Doryuokuro Giho (1980)35:46-47 (1980)

The core of the heavy water reactor "Fugen" is composed of 224 pressure tubes made of zirconium alloy, and fuel is charged in these pressure tubes. In the design of pressure tubes, creep strain of the material which is accelerated by neutron irradiation has to be considered. The material is heat-treated zirconium (2.5%) niobium alloy. The plan for the creep test in the JMTR of the Japan Atomic Energy Research Institute was developed by the Power Reactor and Nuclear Fuel Development Corporation. An under-water plasma cutting method was used to make the test pieces from specimens subjected to the irradiation internal pressure creep test. It was confirmed that disassembling radioactive cylindrical structures by the under-water plasma cutting method could be done safely. The apparatus "SUPA-Cut" for the irradiation internal pressure creep-testing equipment was designed by taking the environment of the cutting operation at the pool side of the JMTR into consideration. The actual cutting operation is scheduled in 1981. In this paper, the basic experiment and the outline of the design of the plasma cutting apparatus are reported. (EDB)(JMF)(RAF)

311
National Research Development Corporation, United Kingdom

Improvements in Methods and Apparatus for Cutting, Welding and Surface Treating Using a Laser Beam in Conjunction with an Arc

British Patent 1-600-796 (1978, February)

Improvements are claimed to the methods and apparatus for laser cutting, welding, surface hardening, alloying, and coating disclosed in British Patent 1 547 172, Weldasearch 70594. A laser beam is projected onto a substrate and an arc is struck between an electrode and the point of incidence of the laser beam. As the laser beam moves across the substrate, the arc is made to remain in the heat affected zone (HAZ) created by the laser beam, e.g. by a gas jet or a magnetic field. The advantage of the invention is that the arc roots in the HAZ and not on any other hot material which may be present after the beam and arc have passed by. The gas jet may be an inert gas or may react with the substrate, but it must be below 1230 deg C. When used for welding, a flux may be present and an electrode system similar to that in MIG or TIG welding may be provided. The arc is struck on the same side as the laser, except in thin material when it may be on the opposite side, or two arcs may be used. (Auth)(JMF)

312
National Technical Information Service, Springfield, VA

Plasma Welding: 1972 - June, 1982 (Citations from the International Aerospace Abstracts Data Base)

PB-81-854721; 86 pp. (1982, June)

This bibliography contains citations about operational envelopes for plasma welding, cooling of underwater plasma welds, gas dynamics of plasma flow in welding arcs, plasma arc surface cutting, characteristics of plasma arc welding, pulsed plasma arc welding influence on arc dimensions of plasma nozzle design, and advanced plasma welding technology. The bibliography is updated with 81 citations, 11 of which are new entries to the previous edition. (GRA)(JMF)

313
National Technical Information Service, Springfield, VA

Plasma Welding: 1970 - May 1982 (Citations from the Engineering Index Data Base)

PB-81-854713; 142 pp. (1982)

This bibliography contains citations concerning operational envelopes for plasma welding, cooling of underwater plasma welds, gas dynamics of plasma flow in welding arcs, plasma arc surface cutting, characteristics of plasma arc welding, welding influence on arc dimensions of plasma nozzle design, and advanced

plasma welding technology. (This updated bibliography contains 160 citations, 13 of which are new entries to the previous edition.) (GRA)(JMF)

314
National Technical Information Service, Springfield, VA

Plasma Cutting: June 1970 - June 1982 (Citations from the Engineering Index Data Base)

PB-80-855737; 133 pp. (1982)

This bibliography contains citations concerning plasma-arc cutting of such materials as nonferrous metals, mild steel alloys, tool steels, cast steel, exotic alloys, and stainless steels. Computerized numerical control of plasma cutting is discussed relative to the economics, reliability and the scope of the process. Underwater and high pressure plasma-arc cutting are also included, as well as equipment design innovations. (This updated bibliography contains 156 citations, 17 of which are new entries to the previous edition.) (GRA)(JMF)

315
National Technical Information Service, Springfield, VA

Laser Metal Cutting: 1966 - July 1982 (Citations from the Metals Abstracts Data Base)

PB-81-868796; 122 pp. (1982)

This bibliography contains citations on laser metal cutting. High precision and carbon dioxide laser cutting methods are presented. Three-dimensional cutting process and the cutting of thin metal sheets without edge deformation are included. (This updated bibliography contains 224 citations, 12 of which are new entries to the previous edition.) (GRA)(JMF)

316
Newton, G.J., M.D. Hoover, E.B. Barr, B.A. Wong, and P.D. Ritter, Lovelace Biomedical and Environmental Research Institute, Inhalation Toxicology Research Institute, Albuquerque, NM

Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Experimental System for Collection and Characterization

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp.; (pp. 116-130) (Addendum) (1982, October)

Decommissioning of radioactively contaminated sites has the potential for creating radioactive and other potentially toxic aerosols. An experimental system is described to collect and characterize aerosols from metal cutting activities typical of those used in decommissioning nuclear facilities. A special enclosure was designed for the experiment and consisted of a 2-inch by 4-inch stud frame with double walls of flame retardant polyethylene film. Large plexiglass windows allowed the cutting operations to be directed and filmed. Ventilation was 8500 l/min (350 cu ft/min) exhausted through HEPA filters. Seven cutting techniques were evaluated: pipecutter; reciprocating saw; band saw; chop saw; oxy-acetylene torch; electric arc cut rod; and plasma torch. Two grinding tools were also evaluated. Materials cut were 2-inch, 3-inch, and 4-inch diameter schedule 40, 80, and 180 type 304L stainless steel pipe. Basic studies were done on uncontaminated pipe. Four-inch diameter sections of schedule 180 type 304L stainless steel pipe with radioactively contaminated internal surfaces were also cut. Controlled important variables included tools, cutting technique, and type and thickness of material. (Auth) (PTO)

317
Ozawa, T., K. Yamada, and T. Abe, Kawasaki Heavy Industries Limited, Kobe, Japan

Development and Verification Test on Remote Plasma Cutting of Large Metallic Waste

FAPIG (Tokyo, Japan) 92:37-40 (1979, July)

Plasma cutting is used to melt and scatter cut objects by generating an arc between an electrode in a nozzle and the cut object, and by making the working ga d

around it into a high temperature, high-speed plasma jet. In case of remote plasma cutting, the torch is operated remotely with a manipulator from the outside of a cell. During this study the breaking up of solid wastes, the type of cutting machines and the method of remote operation of the cutting machines were examined. It was decided to adopt plasma cutting machines, because their cutting capabilities are excellent, and their construction and handling are simple. Because the form of solid wastes to be cut is not uniform, the manipulator operation was made to respond in a flexible manner. Cut objects are placed on a turntable to change the position successively. In case of remote plasma cutting, the torch speed and gap must be made with a manipulator. The use of light-shielding glasses reduces the ability to watch cut objects and becomes a hindrance in the operation. For safety, a suitable gas for cutting which does not contain hydrogen, must be selected. Two years of tests since November, 1977 are reported in this paper. Most of the problems have been solved during this time. (EDB)(JMF)(RAF)

318

Shapiro, I.S., V.V. Kuibyshev Politekhnicheskij Institut, Kuibyshev, USSR

An Evaluation of the Performance of a Plasma Torch for the Cutting of Metal

Welding Production 28(4):37-40 (1981, April 4)

It has been established that the variations of all the process parameters that determine arc formation in the nozzle duct of the plasma arc torch are caused by a self-regulating process which characterizes the response of the flow velocity of the gas that forms the arc on the variation of these parameters. It has been shown that the gradient of the the pressure variation in the arc-formation cavity is an external indicator of the occurrence of the self-regulation process. The results show that the maximum permissible operating conditions of the plasma torch are exceeded if the self-regulation process is disrupted. (EIX)(PTO)

319

Shapiro, I.S., and M.V. Tkachev

Processes Taking Place in Arc Plasmatron Chamber in Cutting of Metals

Savrochnoe Proizvodstvo (USSR) 1976(12):12-15 (1976, December)

Pressure variation has been studied in the chamber of an arc plasmatron during cutting. Investigations were carried out with the aid of an RPM-6 plasmatron, using commercial nitrogen as plasma-forming medium. It has been established that in plasma-arc cutting the pressure in the plasmatron chamber increases appreciably. The factors responsible for the pressure variation are the internal geometry of the plasmatron (the nozzle channel diameter, the electrode immersion depth, and the nozzle channel height) and the cutting process parameters. Using an arc model in the form of a solid makes it is possible to explain the previously established regularities of the cutting process, as well as the processes occurring in the chamber of the arc plasmatron. (EDB)(JMF)(RAF)

320

Svejsecentralen, Glostrup, Denmark

Air Pollution in the Plasma Cutting of Steel, Stainless Steel and Aluminum

PB-82-156506; 124 pp. (1978)

This report presents several projects undertaken at the Danish Welding Institute to evaluate economic aspects, quality and industrial hygiene in respect of a number of plasma cutting units on the market. The purpose of these projects was to examine whether the development of nozzles and burners in recent years had resulted in such an improvement in the quality of cut in plasma cutting, that the requirements could be satisfied for square cutting in mild steel, for the subsequent welding of fillet welds. This would provide great opportunities for the working of mild steel and HT (high tensile) steel. It is essential for the industrial use of plasma cutting in the cutting of unalloyed steel and stainless steel, that the industrial hygiene arrangements are satisfactory and, in particular, that efficient extraction systems have been established. Economic and hygiene factors are therefore closely connected. (GRA)

321

Tikhomirov, A.V., N.V. Evdokushkin, A.Y. Mikheev, E.A Semkin, Y.V. Kurlovich, A.S. Shesternin, I.N. Ostroumov, E.K. Makhnach, and N.G. Gerasimov

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING DISMANTLEMENT AND DEMOLITION

Technology and Equipment for Gas-Laser Cutting of Sheet Steels

Svarochnoe Proizvodstvo (USSR) 1979(11):11-13 (1979, November)

The technology and machinery for gas-laser cutting of 0.5- to 5 mm-thick metal sheets have been developed, and experiments have been carried out using Kh18N10T and VNS2 steels. Metallographical and X-ray analysis methods, and mechanical, fatigue, and corrosion tests have been applied to determine the material properties of slit edge and welded joints made along the slit edges. A conclusion of the effectiveness of gas-laser cutting for high-tensile steels is made. Also schematics and specifications for the laser cutting machine are presented. (EDB)(JMF)

322
Two Views of Underwater Cutting and Welding

Offshore Engineer 1982:66, 68 (1982, March)

This document discusses different methods of underwater cutting and welding. There are three main types of underwater practical welding, in a wet, in a dry one-atmosphere and in a dry hyperbaric chamber. Most users favor the last method. Underwater habitats are used for fusion welding, but because of delays in mobilizing equipment, explosive welding or resin pressure-fit joints have been considered as alternatives for urgent pipe repairs. Pre-programmed welding systems with minimum direct diver-welder participation are mentioned as a possible future development. (Auth)(JMF)(RAF)

323
Watzel, G.V.P., Rheinisch-Westfaelisches Elektrizitaetswerk AG, Biblis, Federal Republic of Germany

Dismantlement of Nuclear Power Stations in Germany

Ingenieur (The Hague, Netherlands) 93(50):16-19 (1981, December)

In Germany, the safety criteria for nuclear power stations with light water reactors demand that the plants be designed in such a way that they can later be dismantled. In fact, the request for a license to build a nuclear power station must include a plan to establish the feasibility of dismantlement. The German electric companies have instigated a number of detailed studies concerning dismantlement, the results of which are presented here. Three variants are considered: shutdown and confinement; part dismantlement and part shutdown; and total dismantlement. Two stations which have been used as references are Biblis A with a pressure water reactor, and Brunsbuettel with a boiling water reactor. The reasons for shutdown, the technical aspects of dismantling, and the associated costs are considered. (EDB)(JMF)

324
Welding and Cutting Under Water

Offshore Research Focus 30:7 (1982, April)

A brief summary is given of two presentations from a seminar on welding and cutting under water dealing with the effects of pressure on arc stability and weld pool phenomena for various welding and cutting processes, particularly plasma arc cutting. (Auth)(PTO)(RAF)

325
Wong, B.A., G.J. Newton, G.E. Obarski, M.D. Hoover, D.E. Bice, M.B. Snipes, and B.S. Martinez, Lovelace Biomedical and Environmental Research Institute, Inhalation and Toxicology Research Institute, Albuquerque, NM

Aerosols from Oxy-acetylene Gas Cutting Operations on Metal Plates: A Laboratory Study

LMF-91; Inhalation Toxicology Research Institute Annual Report, October 1, 1980-September 30, 1981 (1981, December)

The decommissioning of radioactively contaminated sites has the potential for creating radioactive and other toxic aerosols. Laboratory studies characterized aerosols from oxy-acetylene cutting of carbon steel and stainless steel, and steel coated with stable cesium, cadmium, and strontium to simulate fission product contamination. Aerosol characteristics were studied with an elect

aerosol analyzer, a scanning electron microscope, filters, cascade impactors and an HCL impinger trap. Quantification of aerosolized products was by atomic absorption spectroscopy. In general, gas cutting operations produced a multicomponent, multimodal, respirable-sized aerosol. (EDB)(JMF)

326

Yie, G.G., Fluidyne Corporation, Auburn, WA

Cutting Concrete with Abrasion Jet

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp.; (pp. 21-30) (Addendum) (1982, October)

Fluidyne Corporation has developed a process and apparatus that allow selected abrasives to be introduced into a high-speed waterjet to produce an abrasive-entrained waterjet that has high material-cutting capabilities. This process, called abrasion jet, has demonstrated the ability to cut hard rock and concrete at a pressure of less than 1,360 bars (20,000 psi) with a power input of less than 45 kW (60 horsepower). Abrasion-jet cutting of concrete is characterized by its high rate of cutting, flexible operation, good cut-surface quality, and relatively low cost. This paper presents a general description of this technology and includes a discussion of recent test results as well as applications to nuclear decontamination and decommissioning work. (Auth)(PTO)

327

Yu, S., H. Jiang, and H. Yu

A Study of Underwater Thick Plate Cutting Technology

Journal of the Shanghai Chiao-Tung University 1981(4):43-52 (1981 April)

Analyses of experiments in underwater thick plate cutting and oscillograms of cutting arc voltage and current experiments were used to assess the characteristics of the metal arc cutting process. Two patterns of action of consumable electrodes emerged - sawing and digging electrodes. The theoretical analysis of the melting speeds of the cutting wire in relation to parent metal and saw cutting parameters is presented. Increase in plate thickness and its limitations was also studied. Experiments are described using water ejection and water pressure. Improvements in cutting quality were made so that carbon steel plates of 30-45 mm thickness can be cut with a consumable electrode water jet system. (Auth)(JMF)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING LAND DECONTAMINATION AND RECLAMATION

328

Cline, J.F., and V.A. Uresk, Battelle Pacific Northwest Laboratories, Richland, WA

Revegetation of Disturbed Grounds in the Semi-Arid Climate of Southcentral Washington

Health Physics 36(3):289-294 (1979, March)

A mechanically disturbed area containing trace quantities of radionuclides was successfully revegetated in one year. Using treatments of straw, clay, and a straw/clay mixture, the soil was sufficiently stabilized to resist wind erosion. The shallow-rooted vegetation (cheatgrass), planted to impede the growth of deep-rooted radionuclide carriers, maintained itself through three growing seasons and will probably persist in the study area for several decades. (Auth)(PTO)

329

Cook, A., United Kingdom Atomic Energy Authority, Authority Health and Safety Branch, Risley, Warrington, Lancashire, United Kingdom

Principles and Recommended Practice for Decontamination of Radioactive Areas and Equipment

AHSB(S)R32; 33 pp. (1962, December 12)

Principles are presented of design and operation aimed at reducing radioactive decontamination and raising the efficiency of decontamination procedures. The procedures are mainly for routine work and accidental spills. Personnel decontamination is not considered. Decontamination of large areas is touched upon briefly. General considerations are given on incidents leading to contamination of outdoor areas, such as roadways, grass, agricultural lands, or the exterior of buildings and similar unprepared surfaces. The immediate action will depend upon local conditions. Barriers should be set up immediately to control entry to the area. In the case of a wet spill from a tanker on a road, an attempt should be made to absorb the solution in vermiculite, sawdust, or earth. Care should be taken to avoid drainage into domestic drains, ditches etc. Vermiculite, sawdust, or earth may be swept up if damp, or removed by vacuum cleaners. Contaminated grass or soil should be skimmed off by hand tools or a suitable machine. Dry contamination on hard surfaces may be cleaned with mechanical decontaminants or a suitable vacuum cleaner. (RAF)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING WASTE DISPOSAL

330

Alder, J.C., and K. Tunaboylu, Nagra, Baden, Switzerland; Motor-Columbus AG, Baden, Switzerland

Classifying Decommissioning Wastes for Allocation to Appropriate Final Repositories

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp.; (pp. 102-115) (Addendum) (1982, October)

For the safe disposal of radioactive wastes in different repositories, it is advantageous to classify them in well-defined categories, appropriate for final disposal. These categories, the so-called "waste sorts" are characterized by similar radionuclide distribution, similar nuclide specific activity concentrations and similar waste matrix. A methodology is presented for classifying decommissioning wastes and is applied to the decommissioning wastes arising from a Swiss program of 6 GWe. The amounts and nuclide specific activity inventories of the decommissioning waste sorts have been estimated. An allocation into two different repository types has been performed. Such a classification enables one to define the source parameters for repository safety analysis and permits the allocation of different waste categories into appropriate final repositories. This work presents a first attempt to determine which waste sorts have to be better defined and whether the effectiveness of the repository barriers has to be optimized. (Auth)(PTO)(RAF)

331

Blaylock, B.G., and H.J. Alexander, Oak Ridge National Laboratory, Oak Ridge, TN

Radioactive Wastes

Journal of Water Pollution Control Federation 54(6):1002-1023 (1982)

Included in this radioactive waste literature review for 1981 were three symposia summarized in four tables. The remaining literature has been divided into ten categories: general programs, isolation, waste treatment, waste management, storage, environmental transport, monitoring, transportation, risk assessment, remedial action, and socioeconomics. Included are 193 references. (JMT)(JMF)

332

Buclin, J.P., Swiss Association for Atomic Energy Lausanne, Switzerland

Waste Management Experience from the Lucens Plant Incident and Decommissioning

Swiss Association for Atomic Energy Bulletin No. 9 (Annex); 4 pp. (1975, May)

The Lucens experimental reactor, which was a pressure tube, carbon dioxide cooled, high pressure (60 bar) reactor, experienced a fuel element fire during start-up on January 21, 1969. Each of the reactor's 73 fuel elements consisted of 28 metallic fuel segments arranged in an array of seven rods; each rod consisted of four segments. The structure separating the cooling path along the zircaloy pressure tube inner wall from the fuel segments consisted of three blocks of machined graphite kept together by three zircaloy tie rods. The fuel segments were canned in finned magnesium structures. The mass of the active part of each fuel element was about 100 kg. Of this mass, 77 kg was 0.96% enriched uranium metal; 17 kg was graphite; and 7 kg was magnesium. Cold D2O (heavy water) was used as a moderator. The dismantlement of the Lucens facility took four years and required a staff of approximately 30 persons. The total dose received was about 100 mrem. All main activated or contaminated components have been dismantled, and are now stored in conditioned or transportable form. The total volume of solid waste produced was about 120 cu m. (Auth)(PTO)

333

Christ, B., K.A. Schneider, P. Vygen, and G.V.P. Watzel, Transnuklear GmbH, Hanau, Federal Republic of Germany; Rheinisch-Westfaelisches Elektrizitaetswerk AG, Biblis, Federal Republic of Germany

Experience in Treatment of Components, Waste Treatment, Packaging and Shipping Related to Decommissioning

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING WASTE DISPOSAL

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. III-37 - III-49) (1982, October)

Common practice of the treatment of large amounts of activated core components, contaminated components and waste treatment is described. Single tasks of actual repair and backfitting work comprised up to 800 tons of material to be removed, packed, shipped and decontaminated. Decontamination for unrestricted release has already been successfully performed. Special container systems for shipment and storage of every kind of radioactive waste are presented. Containers resulting in maximum shipping, storage and disposal capacity as well as shipping and storage casks for canned and uncanned fuel are described. The experience gained with nuclear facilities in Europe is correlated to the decommissioning tasks to be performed in the near future. (Auth)

334

Clancy, J.J., D.F. Gray, and O.I. Oztunali, Dames and Moore, Inc., White Plains, NY

Data Base for Radioactive Waste Management - Review of Low-Level Radioactive Waste Disposal History

NUREG/CR-1759 (1981, November)

This report is a review of previously employed technologies for low-level radioactive waste (LLW) disposal. This review includes an interpretive overview of the history of this technology from its inception during the World War II Manhattan Project to the present. Summaries are provided of the geology, hydrology, meteorology, climate, and operations of six commercial disposal sites as well as five major and several other smaller government disposal sites. This document was prepared in three volumes and provides part of the technical support to the draft environmental impact statement (NUREG-0782) on a proposed regulation, 10 CFR Part 61, setting forth licensing requirements for land disposal of low-level radioactive waste. Volume 1 is a summary and analysis of the history of low-level waste disposal at both commercial and government disposal facilities. Volume 2 provides a summary of low-level waste volumes and characteristics as projected to the year 2000, in addition to characterizing treatment options for this waste. Volume 3 provides a methodology for analyzing the impacts of handling and disposing of low-level waste based upon consideration of alternative waste forms, disposal facility design and operating practices, disposal facility environmental characteristics, and institutional control considerations. (Auth)(PTO)

335

Devell, L., Studsvik Energiteknik AB, Nykoping, Sweden

Exemption of Low-Level Decommissioning Waste from Controlled Handling and Disposal

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VI-28 - VI-38) (1982, October)

The decommissioning of a nuclear facility involves the management of a wide spectrum of materials with different levels of radioactivity. Some will be classified as different types of radioactive waste. Some materials with low activity could be released for reuse or upgrading. Low-level materials could also be disposed of according to common waste techniques without having to utilize qualified disposal methods for waste containing higher levels of activity. Criteria for exemption of low-level material from controlled handling and disposal are discussed based on ICRP principles and examples are given from the decommissioning of the R1 research reactor in Stockholm and the unrestricted release of materials from LWR under operation. Permission for exemption has to be based on a stringent source control, an optimization assessment and a radiological impact calculation. These topics are discussed in the report together with comparisons of radioactivity in commonly used material. (Auth) (RAF)

336

Elder, H.K., and E.S. Murphy, Pacific Northwest Laboratory, Richland, WA

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING WASTE DISPOSAL

Waste Management Considerations in Nuclear Facility Decommissioning

CONF-810217; Waste Management '81, The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs, and Public Communications, R.G. Post (Ed.), Proceedings of an American Nuclear Society Topical Meeting, Tuscon, AZ, February 23-26, 1981, 1210 pp.; (pp. 1035-1047) (1981)

The decommissioning of nuclear facilities involves the management of significant quantities of radioactive waste. This paper summarizes information on volumes of waste requiring disposal, and waste management costs developed in a series of decommissioning studies performed for the U.S. Nuclear Regulatory Commission by the Pacific Northwest Laboratory. These studies indicate that waste management is an important cost factor in the decommissioning of nuclear facilities. Alternatives for managing decommissioning wastes are defined and recommendations are made for improvements in waste management practices. (EDB)

337

Forsstrom, H., Swedish Nuclear Fuel Supply Company, Stockholm, Sweden

Management of Decommissioning Waste from the Swedish Nuclear Program

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. III-10 - III-20) (1982, October)

The Swedish nuclear power program includes nuclear power reactors, which will be in operation up to the year 2010. By law, the responsibility for the waste management and decommissioning is given to the utilities. A charge is put on the electricity production to finance the necessary work. In order to establish this charge a decommissioning study has been performed. The results of this study also give the basis for planning the management of the decommissioning waste. The volumes and activities of the waste are described as well as how the waste is classified according to its final disposal. Most of the radioactive decommissioning waste will be similar to the operational waste from a radioactivity point of view. The planned disposal for this waste is described and some safety considerations are given. Transports of radioactive waste from the reactors to the disposal facilities will be made by ship. (Auth)

338

Francioni, W.M.

Proposal for Decommissioning of Contaminated Steel Parts from Shut Down Nuclear Power Plants

Atomkernenergie Kerntechnik 41(4):279-280 (1982)

During the dismantlement of a shut down nuclear power plant, a number of relatively highly radioactive reactor components have to be removed from the reactor core region. These components require heavy shielding for transport and disposal. A large quantity of contaminated steel parts will also require disposal. One suggested method of dealing with the disposal of these materials is to melt the contaminated steel and use it as shielding material for the disposal of the highly radioactive reactor internals. An estimate of the dose rates resulting from the use of the contaminated steel is presented. Problems encountered in the melting of the contaminated steel are also given. (Auth)(PTO)

339

Francioni, W.M., G. Megaritis, and P. Koehler, Eidgenoessisches Institut fuer Reaktorforschung, Wuerenlingen, Switzerland

Shutdown of Nuclear Power Plants - Production of Activated Material from the Region of the Reactor Core by the Example of a Shutdown Pressurized Water Reactor

EIR-368; 96 pp. (1979, May)

Using a pressurized water reactor as an example and assuming an allowable level for activated structural material, the production of waste from the region of the reactor core is determined. The influence of the cooling time (time from the reactor-shutdown to the start of dismantling) and the resulting amount of waste material is

presented. An attempt is made to give a sound basis for evaluating and understanding the assumed allowable limits by comparison with conventional regulations. Based on the study's findings on the chemical composition of the materials in the core region and the layout of the biological shield, some recommendations are made concerning the construction of future nuclear power plants. (EDB)(JMF)(RAF)

340

Gano, K.A., and J.B. States, Pacific Northwest Laboratory, Richland, WA

Habitat Requirements and Burrowing Depths of Rodents in Relation to Shallow Waste Burial Sites

PNL-4140; 27 pp. (1982, May)

This paper provides a review of the literature and summarizes information on factors affecting habitat selection and maximum recorded burrowing depths for representative small mammals that we consider most likely to inhabit waste burial sites in arid and semi-arid regions of the West. The information is intended for waste management designers who need to know what to expect from small mammals that may be present at a particular site. Waste repositories could be designed to exclude the deep burrowing rodents of a region by creating an unattractive habitat over the waste. Summaries are given for habitat requirements for each group along with generalized modifications that could be employed to deter habitation. Representatives from the major groups considered to be deep burrowers are discussed. Further, detailed information about a particular species can be obtained from the references cited. (EDB)(JMF)

341

Kajiyoshi, M., H. Kuroda, S. Mori, K. Sakoda, and S. Ito, Power Reactor and Nuclear Fuel Development Corporation, Ibaraki, Japan

The Construction of the Waste Dismantling Facility

IAEA/WMRA/13-81/11 (1982)

The Waste Dismantling Facility (WDF) is under construction and is expected to be in operation by early 1983. The solidified radioactive wastes are decontaminated, broken into smaller pieces and compacted if necessary. The WDF consists of a ferroconcrete building (three stories and a basement) containing 5400 sq m of floor space, the building occupying 1700 sq m. The high-level wastes are dismantled in the alpha scrapping cell, the low-level wastes in the scrapping hall, and the beta-gamma wastes in the beta-gamma scrapping cell, respectively. A plasma cutter is installed as the principal cutting machine each in the scrapping hall and cells. It is operated by workers wearing airline suits in the former case and remotely from outside the cells in the latter case. A hacksaw and compacting press are equipped in the scrapping cell, and a press cutter in the scrapping hall, respectively. (Auth) (PTO)

342

Kirk, J., United Kingdom Atomic Energy Authority, Dounreay Nuclear Power Development Authority, Dounreay, United Kingdom

DFR Decommissioning: Operating Instructions for NaK Disposal by Burning in Atomized Jet

DFR/OIN-1; 4 pp. (1979)

The complete operation consists of the following four distinct phases: initial plant checks; starting and maintaining good burning conditions; operational monitoring; shutdown, including emergency shutdown; and residue disposal. (EDB)(JMF)

343

Lawton, H., Windscale Nuclear Laboratories, Sellafield, Seascale, Cumbria, United Kingdom

Decommissioning of the Windscale Advanced Gas-Cooled Reactor

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-40 - VII-50) (1982, October)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING WASTE DISPOSAL

Now that the Windscale Advanced Gas-Cooled Reactor has fulfilled its development role and has been closed down, it is planned to decommission it. While ancillary buildings will be put to new use, the reactor itself and its four heat exchangers will be demolished in a project extending into the early 1990's. A special remotely-operated machine will be developed to undertake the demolition. The radioactive waste material (steel, graphite, concrete) will be handled through a special building to be built adjacent to the reactor, where it will be boxed up for disposal into monolithic concrete blocks suitable for sea disposal or land storage. It is hoped to deal with the mildly active heat exchangers as integral units. The aim of the project is to develop demolition techniques and expertise which will be of value generally to the nuclear industry. Because of this, special emphasis will be given to data recording and dissemination of results during the course of the project. (Auth)

344
Osterberg, C.L.

Why Not in the Ocean?

IAEA Bulletin 24(2):30-34 (1982, June)

This article describes the difficulty in safely disposing of radioactive as well as toxic wastes. Various possibilities of disposal are explored with the ocean becoming the most likely to be the least affected. Reasons for the ocean's relative immunity to pollution centers around its huge carrying capacity for toxic and radioactive wastes as compared to fresh water or land. (JMF)

345
Post, R.G., University of Arizona, Tucson, AZ

Waste Management '81 - The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs and Public Communications

CONF-810217; Proceedings of an American Nuclear Society Topical Meeting, Tucson, AZ, February 23-26, 1981, Vol. 1 and 2, 1736 pp. (1981)

This symposium consists of two volumes which contain papers presented at the meeting, 61 of which are indexed separately. The papers are grouped under the following general topics: programmatic and regulatory issues; international approaches to waste management; alternate waste forms; transportation of radioactive wastes; waste isolation; low-level waste; volume reduction and solidification; mill tailings and decommissioning of nuclear facilities, and others. (EDB)(JMF)

346
Post, R.G.

Waste Management '80 - The State of Waste Disposal Technology, Mill Tailings, and Risk Analysis Models

CONF-800313; Proceedings of a Conference, Tucson, AZ, March 10, 1980, 754 pp. (1980)

The two volumes of the symposium contain 39 invited papers and 10 papers from four workshops, 39 of which are indexed separately. Subjects covered include: U.S. low-level waste policies and methodologies; high-level waste technology; geologic storage; volume reduction; off-gas treatment; waste packaging criteria; and vitrification of commercial high-level waste. (EDB)(JMF)

347
Price, M.S.T., United Kingdom Atomic Energy Authority, Authority Field Processing Directorate, Didcot, Oxfordshire, United Kingdom

Transportation and Packaging

IAEA/WMRA/13-81/11 (1982)

The objectives of the research project are to: develope new radioactive waste package configurations for operation wastes; initiate prototype manufacture and testing of package configurations; and define large transport container sizes for decommissioning wastes. (Auth) (PTO)

348
Price, M.S.T., I. Lafontaine, L. Dierckx, P. Deramaix, J. Demeester, K. Pflugrad, and B. Wright, United Kingdom Atomic Energy Authority, Win-

frith, Dorset, United Kingdom; Transnubel SA, Dessel, Belgium; Belgonucleaire SA, Brussels, Belgium; Commission of the European Communities, Brussels, Belgium; Pollution Prevention, Limited, Crawley, Sussex, United Kingdom

Large Transport Containers for Nuclear Reactor Decommissioning Waste

CONF-830528; PATRAM '83, Packaging and Transportation of Radioactive Materials, Proceedings of the Seventh International Symposium, New Orleans, LA, May 15-20, 1983; (p. XV-10) (1983, May)

In 1979 the Council of the European Communities adopted a 5 year research program on the decommissioning of nuclear power plants. Project 5 under this program is a system study to define the major types of standard large transport containers which are needed in the decommissioning of nuclear power plants. For Project 5, joint contracts were placed by the Commission of the European Communities with Transnubel SA (TNB) and the United Kingdom Atomic Energy Authority. Prior to beginning the conceptual design of containers for the transport of decommissioning waste, a survey was conducted to determine the range of packages already in use in Europe and the USA. The transport of decommissioning waste must be cost effective and thus the size and weight of the transport units need to take full advantage of normal transport facilities. Study of the waste streams for reference reactors indicates that wastes that need to be transported as Type B packages have specific activities in the range of 3 X 10(E+11) to 4 X 10(E+15) Bq/Mg after 10 years decay. For non-Type B packages, the range of specific activities is 1 X 10(E+4) to 3 X 10(E+11) Bq/Mg. (Auth)(PTO)

349
Richter, D., and S. Fareeduddin

Developing Guidelines on Managing Radioactive Waste

IAEA Bulletin 24(2):6-12 (1982, June)

The safe use of nuclear power in any country rests also on the possibility of safely managing and disposing of all kinds of radioactive wastes and effluents that are generated during the operations of nuclear facilities. These problems have been recognized and studied since the early days of nuclear technology and considerable experience has been gained. However, issues of waste management have come to the fore in recent years with the increasing role of nuclear power. Obviously, industrial development of nuclear power cannot proceed successfully without the assurance that safety requirements can be met today and in the future, and that waste disposal will not place an undue burden on future generations. There is, therefore, an interest among nations using nuclear power to reach a common understanding of what safety requirements are to be applied, what techniques of management and disposal are appropriate and by which means compliance with these requirements can be shown. Internationally developed guidelines can be of considerable assistance for national authorities and the nuclear community in ensuring that the basic requirements are understood by all the parties involved. Such guidelines can be used by planning authorities, regulatory bodies, utilities, designers, constructors, and research workers, and are also helpful for the Agency's safety and technical assistance missions. They are of particular importance for countries that embark on nuclear power programs, establish long-term waste management systems and set up their related regulatory procedures. It is quite obvious that such guidelines will mostly be qualitative as they have to reflect the fact that a variety of solutions and techniques are available and can be adopted by the competent national authorities, depending on conditions which may be specific for a given plant design, site, and the legal and administrative structure of the country. (Auth)(JMF)

350
Takeda, K.

Applications of Plasma to the Refining and Melting of Metals

Bulletin of the Japan Institute of Metals 17(9):764-765 (1978, September)

The three important characteristics of plasma equipment are: (1) as plasma is a high temperature, high energy density heat source, equipment can be small; (2) diverse reaction atmospheres are possible; inert gases can reproduce vacuum conditions, and unusual reactions can be facilitated; (3) the output is stable and easily controlled. Problems are high energy consumption

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING WASTE DISPOSAL

(approximately 1000 k/mol to make plasma) and high costs of typical plasma gases (argon, hydrogen). Losses through melting shorten the lifetime of parts. Three improved plasma torches are examined. These are: (1) A.C. torch with additional D.C. source to stabilize arc; (2) plasmatron with hollow electrode of the metal to be remelted and refined, into which plasma gases flow (high thermal efficiency); and (3) combination heat source and reactor. Ore and other reactants are fed into the plasma torch, pushed against the inner wall of the torch by a revolving current of gases, and made into a film which is melted. The formation of a film extends the exposure time of the reactants to the high temperature region, resulting in a high reaction efficiency. The maximum output for the plasma arc torch is 6 MW(9000 A, 660 V). Research into plasma melting and refining is described. Air-plasma melting achieves the same degree of exclusion of impurities (H2, O2, Zn, Pb) as vacuum melting. Possible applications of plasma melting are the production of heat-resistant alloys, stainless steel, high-N and low-N steel by N- and H-plasma respectively, and high-alloy steels. The East German plasma furnace is possibly the largest - 30 t, 500 kWh/t melted steel. Plasma reduction of iron ore uses 1:2 natural gas/H2 mixture blown into a torch reactor of 1 MW output, and about 1 cu m reducing gases, requiring 2.6 kWh for melting 1 kg steel. Calculations based on full use of exhaust gases that show 0.35 cu m and 0.8 kWh may be obtained. The high temperature of plasma dissociates and ionizes H2, thus increasing its reducing power. Phosphorus in ore is removed by vaporization. The iron produced is nearly pure, but energy costs and productivity are inferior to blast furnace and converter methods. (MAL)(MEX)(NPK)(RAF)

351

Trigilio, G., Teknekron, Inc., Berkeley, CA

Volume Reduction Techniques in Low-Level Radioactive Waste Management

NUREG/CR-2206 (1981, September)

This report presents a comprehensive compilation and data base of volume reduction techniques for low-level radioactive wastes generated in fuel cycle and non-fuel cycle facilities. Discussions of the volume reduction techniques are provided to include system descriptions, system performance data, volume reduction capabilities, process parameters, system limitations, and operating experience. An economic analysis is presented for shredding and compaction, incineration, calcination, evaporation/crystallization, and bituminization. Pressurized water reactors, boiling water reactors, and non-fuel cycle scenarios are evaluated for volume reduction techniques used at a waste generator's facility and on a regional basis. The economic analyses estimate cost of capital equipment, construction, operation, processing, transportation, and disposal at the Barnwell, South Carolina and Hanford, Washington disposal sites. (Auth)(PTO)

352

U.S. Department of Energy, Technical Information Center, Oak Ridge, TN

Radioactive Waste Inventories and Projections

DOE/TIC-3394 (1982, November)

This bibliography contains 25 references on radioactive waste inventories and projections from the Department of Energy's Energy Data Base from January 1981 through October 1982. (PTO)

353

U.S. Department of Energy, Technical Information Center, Oak Ridge, TN

Low-Level Radioactive Waste

DOE/TIC-3387 (Suppl. 1); 136 pp. (1983, March)

This bibliography contains information on low-level radioactive waste included in the Department of Energy's Energy Data Base for January through December 1982. The abstracts are grouped by the following subject categories: Feed Processing; Spent Fuels Reprocessing; Transport and Storage; Marketing and Economics; Waste Management; Environmental Aspects; Health and Safety; Regulations; Nuclear Power Plants; Nuclear Reactor Technology; Environmental Sciences, Atmospheric; Environmental Sciences, Terrestrial; Environmental, Sciences, Aquatic; and General. Within each category the arrangement is by report number for reports, followed by nonreports in reverse chronological order. The citations cover research reports, journal arti-

cles, books, patents, theses, and conference papers from worldwide sources. Five indexes, each preceded by a brief description, are provided: Corporate Author; Personal Author; Subject; Contract Number; and Report Number. (Auth)(PTO)

354

Viecenz, H.J., J. Obst, F. Krieger, and H.K.J. Lettnin, Noell (G.G.) GmbH, Wuertzburg, Federal Republic of Germany; GKSS-Forschungszentrum Geesthact GmbH, Geesthact Terperhude, Federal Republic of Germany

Packaging, Transportation and Disposal of Nuclear Parts from Decommissioning of "N.S. Otto Hahn"

CONF-830528; PATRAM '83, Packaging and Transportation of Radioactive Materials, Proceedings of the Seventh International Symposium, New Orleans, LA, May 15-20, 1983; (pp. XXIV-3 - XXIV-4) (1983, May)

After more than 10 years of operation, the nuclear ship N.S. Otto Hahn was taken out of service in February 1979. A decision was made to dismantle and decommission all nuclear components in order to make the ship available for other use after its release from the atomic regulations. Components from the three nuclear areas had to be dismantled, measured for radiation levels, packed into especially constructed containers or drums, and transported to GKSS owned land to be stored for a post investigation on material behavior and decontamination testing. For shielding reasons the RPV was left within its own shieldtank and prepared for transportation by removing all pipes from the RPV, closing all openings with blindflanges and encasing them in lead. To avoid spread of contamination, the RPV was coated with a special paint. The total weight of the unit as prepared for barge transport was approximately 480 tons. (Auth) (PTO)

355

Weeren, H.O., and T.S. Mackey, Oak Ridge National Laboratory, Oak Ridge, TN

Waste Sludge Resuspension and Transfer: Development Program

ORNL/TM-7125; 95 pp.

The six gunite waste tanks at Oak Ridge National Laboratory (ORNL) contain about 400,000 gallons of sludge that has precipitated from solution and settled during the 35 years these tanks have been in service. Eventual decommissioning of the tanks has been proposed. The first part of this program is to resuspend the accumulated sludge, to transfer it to new storage tanks in Melton Valley, and to dispose of it by the shale-fracturing process. On the basis of preliminary information, a tentative operational concept was adopted. The sludge in each tank would be resuspended by hydraulic sluicing and pumped from the tank. This resuspended sludge would be treated to keep the particles in suspension and would be pumped to the new waste-storage tanks. Subsequently, the sludge would be pumped from the tanks, combined with a cement-base mix, and disposed of at the shale-fracturing facility. Verification of the feasibility of this concept required development efforts on characterization of the sludge and development of techniques for resuspending the sludge and for keeping it in suspension. These development efforts are described in this report. Sections of the report describe known properties of the sludge; tests for grinding methods investigated; tests of various suspenders; tests with cement-base mixes; summarize hot-cell tests on actual sludge samples; and tests that were made at a mockup of a gunite tank installation. On the basis of the tests made, it was concluded that reslurrying and resuspension of the sludge is quite feasible and that the suspensions can be made compatible with cement mixes. (EDB)(JMF)

356

White, I.F., G.M. Smith, L.J. Saunders, C.J. Kaye, G.H. Clarke, and M.W. Wakerley, National Radiological Protection Board, Chilton, Didcot, Oxon, United Kingdom;

Assessment of Management Modes for Graphite Wastes from Reactor Decommissioning

IAEA/WMRA/13-81/11 (1982)

The aims of this research project are to provide data on the radionuclide compositions of the graphite wastes arising from future United Kingdom reactor decommissioning programs, and on the total quantities arising; to provide new information on a variety of disposal or

and their relative technological merits; to assess the radiological impacts of the respective options; and to provide guidance on the selection of the most appropriate management strategy for these wastes. The theoretical study is supported by a small experimental program on the leaching of irradiated graphite under simulated conditions of disposal. (Auth)(PTO)

357

Zwickler, S., Burns and Roe Industrial Services Corporation, Paramus, NJ

Decommissioning a Spent Fuel Processing Facility - Low Level Waste Management

CONF-810217; Waste Management '81, The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs, and Public Communications, R.G. Post (Ed.), Proceedings of an American Nuclear Society Topical Meeting, Tuscon, AZ, February 23-26, 1981, 1210 pp.; (pp. 1049-1056) (1981)

A number of options are available to decommission a spent fuel reprocessing facility. It can be dismantled and demolished, entombed, or left in protective storage for later dismantlement and demolition. In all cases, the facility should be decontaminated to minimize inadvertent radiation exposure to custodians or the general public after plant operation is halted. Decontamination of the facility generates radioactive wastes that are classified as low-level wastes (LLW). This paper examines means to manage the LLW generated from decommissioning. (EIX)(PTO)

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING GENERAL STUDIES

358
Abandonment of Nuclear Power Stations at the End of Their Working Life

Bulletin de l' Association Suisse des Electriciens 70(22):1200-1204 (1979, November 17)

A panel of experts has reported on the problems likely to be encountered in abandoning and demolishing nuclear power stations whose working life has ended. No major technical difficulties are foreseen, although authorities must take into account the use to which the site and the salvaged materials will be put. Experience gained from dismantling experimental installations will help, as will improved techniques, particularly in the disposal of radioactive material. Demolition costs are difficult to assess, but are likely to be small in relation to building costs and the value of the electricity generated during the operating life of the power plant. (Auth)(PTO)

359
Anderson, J., D. Aquilina, and D. Rodbourne, University of Minnesota, Minneapolis, MN

Decommissioning Commercial Nuclear Power Plants

NP-2902586; Monograph; 108 pp. (1980)

The decommissioning of nuclear power plants is an exceedingly complex subject. One can quickly become immersed (and lost) in the myriad technical details. In this paper, decommissioning is approached, not as a strictly technological problem but as a policy issue. Technical aspects of decommissioning are dealt with to the extent necessary to present the basic technological options and to highlight important policy questions. The goal is to provide a useful orientation to decommissioning for those who wish to understand and deal with these questions. (EDB)

360
Auxier, J.A., and H.W. Dickson, Oak Ridge National Laboratory, Oak Ridge, TN

What is ALARA

CONF-8109868; Proceedings of the Edison Electric Institute's Health Physics Committee Meeting, Hartford, CT, September 10, 1981; 12 pp. (1981)

The as-low-as-reasonably-achievable (ALARA) philosophy as it applies to personnel radiation exposure has been in existence for a long time. The essential tenets of this philosophy surfaced quite early in the history of the Manhattan Project. Although the terminology has suffered through various translations and the application has seen many organizations and agencies come and go, the principles remain valid today. It is regretable that some regulatory agencies claim ALARA as their newfound miracle drug and that application according to their prescriptions will result in endless rounds of cyclical improvement in radiation protection practices. Others have taken advantage of the popularity of ALARA and have explained the philosophy to mean whatever is expedient for their purposes. This paper reviews briefly the history of ALARA and what it seemingly means to different interest groups and offers a balanced viewpoint that health physicists should adopt. (EDB)(JMF)(NPK)

361
Bernhardt, D.E., A.A. Sutherland, M.W. Grant, and D.C. Rich, Rogers and Associates Engineering Corporation, Salt Lake City, UT

Characterization of Nuclear Fuel Cycle Facilities Requiring Decommissioning and Decontamination

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-139 - VII-152) (1982, October)

The Environmental Protection Agency (EPA) is developing environmental protection standards for the disposal of radioactive waste and federal radiation protection guidance on residual activity for planning and implementing decommissioning and decontamination (D&D) of nuclear facilities. In developing the guidance, technical assessments are being conducted to identify problems and risks, assess D&D methods, and identify and characterize contaminated facilities which will require D&D. This paper, based on a contract report (Be82) prepared for EPA, summarizes the information on nuclear fuel cycle facilities, other than reactors. Government related facilities have been covered in Be82a. The categories of fuel cycle facilities assessed are: uranium mines, uranium mills (active), uranium hexafluoride conversion, uranium enrichment, fuel fabrication, and fuel reprocessing. (Auth)(JMF)(RAF)

.IAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING GENERAL STUDIES

362
Bjoergerd, A.

Comments on the Study of the Consequences of Nuclear Plant Closures

Foerening Foer Elektricitetens Rationella Anvaendning 53(1):14-20 (1981)

After a brief history of nuclear energy in Sweden, the commentary considers the various parts of the study in question. The closing of nuclear plants in relation to the government proposition in 1979 of twelve reactors is discussed. The study bases part of its argument on the assumption that the loss of nuclear power in Sweden need not be disastrous on a forecast electricity consumption up to the year 1990. The commentator criticizes this forecast, stating that the proposed available power levels are not acceptable for a stable community. Similarly, it is suggested that electricity prices will rise drastically, and that coal and water power resources will not suffice if there is to be reduced dependence on imported oil, particularly in a country where heating expenditure is high. Comments are made on the study's statements on the effects on the environment, particularly where coal production is concerned. The origins of the extra cost to the community are also looked at. (EDB)(RAF)

363
Cregut, A., Commissariat a l'Energie Atomique, Centre de Marcoule, Bagnols-sur-Ceze, France

Decommissioning of Nuclear Fuel Facilities

Transactions of the American Nuclear Society 40:99; CONF-820420; New Directions in Nuclear Energy with Emphasis on Fuel Cycles, Proceedings of the Third International European Nuclear Society/American Nuclear Society Conference, Brussels, Belgium, April 26-30, 1982; (p. 99) (1982, April)

The first section of this paper is devoted to the discussion of the general purposes of decommissioning nuclear facilities after the end of their operational life. The second section identifies peculiarities of nuclear fuel cycle facilities with regard to decommissioning. The third section gives a general overview on decommissioning experience of ·lear facilities other than reactors. The fourth section outlines the main objectives for improving D&D operational methodologies. The R&D programs need to include: (1) the study of aging of shutdown facilities; (2) the necessary knowledge leading to disposal, conditioning, and storage of wastes; (3) decontamination methods, liquid effluents treatment; (4) remote handling and remote operation; (5) cutting devices; and (6) design of new facilities to facilitate their future dismantlement. (Auth)(PTO)

364
Cupo, J.V., Westinghouse Electric Corporation, Nuclear Fuels Division, Pittsburgh, PA

Decommissioning of Nuclear Fuel Facilities

Transactions of the American Nuclear Society 40:97-98; CONF-820420; New Directions in Nuclear Energy with Emphasis on Fuel Cycles, Proceedings of the Third International European Nuclear Society/American Nuclear Society Conference, Brussels, Belgium, April 26-30, 1982; (pp. 97-98) (1982, April)

The limited market for plutonium and uranium fuel has resulted in the need to shut down commercial fabrication facilities dedicated to this work. The preferred method, taking into account economic and licensing considerations, is to decontaminate and decommission such facilities for unrestricted use. The Westinghouse facility (PFDL) in Cheswick, Pennsylvania is one of these facilities. It consists of about 14,000 sq ft of space used to manufacture light water reactor and fast breeder reactor oxide and carbide fuels. The D&D of this facility presents some unique challenges and problems. The approach used to decontaminate, dismantle, and package process equipment and facilities systems contaminated with plutonium and enriched uranium, as well as the health, safety, and safeguards procedures, nondestructive assay methods, techniques used to control airborne contamination, and development of effective decontamination methods are discussed. (Auth)(PTO)

365
Dabrowski, T.E., UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING GENERAL STUDIES

Recent National and International Decommissioning Experience

CONF-821103; American Nuclear Society 1982 Winter Meeting, Proceedings of a Conference, Washington, DC, November 14-18, 1982, 813 pp.; (pp. 60-61); Transactions of the American Nuclear Society 43:60-61 (1982, November)

As the backlog of shutdown nuclear facilities increases throughout the world, the decommissioning of such facilities will become more important to the nuclear industry. The purpose of this paper is to provide an overview of some recent decommissioning experience in the United States and abroad in the hope that this information will help reduce future costs and adverse impacts of decommissioning. Exchange of decommissioning information as a result of the DOE International Decommissioning Symposium, held October 10-14, 1982, and the DOE/NEA International Decommissioning Technology Questionnaire are discussed. New decommissioning techniques discussed include: (1) use of oxyacetylene torches to cut reactor vessels; (2) improved decontamination methods, particularly with concrete; and (3) wider use of explosive cutting. (Auth)(PTO)

366
Decommissioning of Nuclear Power Plants

Ingenioer-nytt 16(24):18-19 (1980, May 21)

The general aspects of the decommissioning of power reactors and the three modes of decommissioning are discussed as well as practical experience of each mode. The three stages of decommissioning are: (1) protective storage or mothballing; (2) entombment; (3) complete dismantling or green-field. The quantities and types of wastes produced and various disposal aspects are also presented. It is estimated that decommissioning costs will be about 10% of the original construction costs. (Auth)(PTO)(RAF)

367
Detilleux, E., and W. Hild, European Company for the Chemical Processing of Irradiated Fuels, Mol, Belgium

Decommissioning of Nuclear Fuel Facilities

Transactions of the American Nuclear Society 40:98; CONF-820420; New Directions in Nuclear Energy with Emphasis on Fuel Cycles, Proceedings of the Third International European Nuclear Society/American Nuclear Society Conference, Brussels, Belgium, April 26-30, 1982; (p. 98) (1982, April)

Decommissioning of surplus nuclear fuel cycle facilities is a technical task that gains increasing importance in all countries with nuclear power programs. The ultimate disposition of a nuclear facility at the end of its operational life is to insure the health and safety of the public and environment. Experience gained in various practical D&D operations has been and continues to be disseminated on an international basis. This presentation is an attempt to assess the actual state-of-the-art, by giving a functional description of the various phases of a D&D operation. Emphasis is given to detailed planning of all operations, as well as to the role of waste management in all D&D operations. An exemplary description is given of the decontamination and partial decommissioning operation carried out in the shutdown reprocessing facilities of Eurochemic. From the experience gained in these operations, conclusions are drawn for the performance of similar D&D ventures. Recommendations are given for plant designers and operators that would improve both plant maintenance in the operations phase and decommissioning of the facility after shutdown. (Auth)(PTO)

368
Detilleux, E.J., U.S. Energy Research and Development Administration, Washington, DC

Status of the Decommissioning Program of the Eurochemic Reprocessing Plant

CONF-760701; Management of Waste from the LWR Fuel Cycle, Proceedings of an International Symposium, Denver, CO, July 11-16, 1976; (pp. 413-425) (1976)

Reprocessing operations at the Eurochemic demonstration plant stopped in December, 1974, after eight years of operation. Immediately thereafter, cleaning and decontamination were begun as the first phase of the decommissioning program. The facility and reprocessing program are described to indicate the magnitude of the problem, and the requirements of the local authorities

are reviewed. The technical decommissioning program consists of several phases: (1) plant cleaning and rinsing, (2) establishment of the final fissile-material balance, (3) plant decontamination for access to process equipment, (4) equipment dismantling, and (5) conditioning and storage of newly generated wastes. The two first phases have been completed, and the third one is near completion. Some dismantling has been performed, including the plutonium dioxide production unit. Waste-conditioning and surface-storage facilities have been built to meet the dismantling requirements. Since reprocessing may be resumed in the future, decontamination has been performed with "smooth" reagents to limit corrosion. Also dismantling has been limited to subfacilities. (EDB)(JMF)

369

GKSS-Forschungszentrum Geesthact GmbH, Geesthact-Terperhude, Federal Republic of Germany

NS Otto Hahn - The Firs. German Nuclear Ship

GKSS-81/E/20; 329 pp. (1981)

The NS Otto Hahn is the first and only European nuclear propelled cargo and research vessel. She entered service in 1968 and was operated for 11 years without any technical failure. The essential experience and know-how for decommissioning the nuclear propulsion unit became available, and the ship was decommissioned in 1979. The activated and contaminated components will continue to be removed and decontaminated until the end of 1981. The ship can then be released for conventional utilization. In this book the NS Otto Hahn is described in detail and the experiences of operation as well as research and development activities are reported. All earlier publications of GKSS on the same subject are listed. (EDB) (JMF)

370

Huber, B., Commission of the European Communities, Brussels, Belgium

Overview of Decommissioning Research and Development Activities in the European Community

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. V-13 - V-17) (1982, October)

The European Community's research program on the decommissioning of nuclear power plants is managed by the Commission of the European Communities and carried out by national laboratories and private firms under cost-sharing contracts. Starting in 1980, about fifty research contracts covering a large variety of topics have been assigned so far. The paper outlines the content, progress and selected results of the seven projects composing the program. These projects concern the following subjects: maintaining disused plants in a safe condition; decontamination for decommissioning purposes; dismantling techniques; treatment of waste materials; use of large waste containers; estimation of wastes arising; and plant design features facilitating decommissioning. (Auth)(JMF)

371

Kirk, J., and J.M. Dahlke, United Kingdom Atomic Energy Authority, Dounreay Nuclear Power Development Authority, Dounreay, United Kingdom

Decommissioning of the Dounreay Fast Reactor

CONF-800401; Liquid Metal Technology for Energy Systems, Proceedings of the Second International Conference, Richland, WA, April 20-24, 1980; (pp. 8.1 - 8.5) (1980)

The Dounreay Fast Reactor liquid metal cooled experimental facility ceased operation in 1977. To date, disposal of the sodium potassium (NaK) alloy coolant has dominated the work. Progress has been made mostly by controlled burning of the coolant in an atomized spray. (EDB)(JMF)

372

Lettnin, H.K.J., and H.J. Viecenz, GKSS-Forschungszentrum Geesthact GmbH, Geesthact-Terperhude, Federal Republic of Germany; Noell (G.G.) GmbH, Wuertzburg, Federal Republic of Germany

CHAPTER 2. NUCLEAR FACILITIES DECOMMISSIONING GENERAL STUDIES

Decommissioning of NS Otto Hahn

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. IV-39 - IV-51) (1982, October)

The nuclear ship "Otto Hahn", a nuclear propelled merchant vessel, has been decommissioned after more than 10 years of successful operation. Approximately 1100 tons of contaminated and decontaminated components have been dismantled and removed from the ship. About 260 tons of contaminated components which are packed in 10-ft containers and 400-l drums and the 480-tons RPV unit have been stored at the SKSS site for later investigations. Approximately 370 tons of waste have been decontaminated by mechanical and chemical procedures. The vessel is now offered for sale for conventional operations. (Auth)(PTO)

373

Mukai, S., International Atomic Energy Agency, Division of Nuclear Fuel Cycle, Waste Management Section, Vienna, Austria

IAEA's Activities on Decommissioning and Decontamination

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. II-9 - II-20) (1982, October)

The International Atomic Energy Agency has included decommissioning of nuclear facilities in its program since 1973. The Agency has since then convened four expert meetings and one symposium and issued related documents, with one more in preparation now. A Technical Committee Meeting on "Decommissioning of Nuclear Facilities: Decontamination, Disassembly and Waste Management", was held at the Agency's Headquarters in Vienna April 19-23, 1982. In the meeting, 25 experts from 13 member states and two organizations participated and discussed considerations important to decommissioning, reasonably well-developed techniques of decontamination, disassembly, and waste management in connection with decommissioning, and areas worthy of further study. Another Technical Committee Meeting on Decontamination of Nuclear Facilities to permit plant decommissioning, modification of maintenance, will be held in late 1983. The subject of decommissioning and decontamination of nuclear facilities is one of the Agency's programs on radioactive waste management which is aimed at assisting national programs and the international community to protect man and his environment adequately from radioactive wastes and effluents. The five primary objectives of radioective waste management activities in the Agency are to: (a) keep current with and disseminate information on technology and safe methods of radioactive waste management; (b) coordinate/promote development of technology on safe methods of radioactive waste management; (c) keep current with and disseminate information on technology for maintaining acceptable radioactivity levels in effluents from radioactivity handling systems; (d) issue safety guidance on all aspects of radioactive waste management; and (e) assess the consequences of releases of radionuclides into the environment from nuclear activities. (Auth)(JMF)

29/130

Chapter 3

FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM

CHAPTER 3. FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM

374
Bechtel National, Inc., Oak Ridge, TN

Conceptual Design Report: Below-Grade Bulk Waste Disposal Facility - Formerly Utilized Sites Remedial Action Program

DOE/OR/20722-2; 75 pp. (1982, May)

This report presents two conceptual designs for below-grade land disposal facilities in the northeastern United States for wastes managed under the Formerly Utilized Sites Remedial Action Program (FUSRAP). The wastes are low specific activity radioactive wastes generated by programs of the Manhattan Engineer District/Atomic Energy Commission (MED/AEC). One design presented is for a hypothetical disposal facility for the state of New York and one for the state of New Jersey. Each design is based on the estimated volume of FUSRAP waste in each state. Since no specific sites have been identified for the disposal facilities, the geologic, hydrologic, topographic, and meteorologic conditions chosen for the conceptual design are only representative of conditions in New York and New Jersey. The principal difference in the two sites is the assumed soil permeability which requires an engineered clay liner surrounding the waste for the New York facility, but not for the New Jersey facility. The conceptual designs are intended to be conservative and were developed to be compatible with proposed 10 CFR 61 and proposed 40 CFR 192. The designs are developed in sufficient detail to verify the feasibility of the design concepts and to provide a basis for developing capital cost estimates for below-grade land disposal facilities. (Auth)

375
Ferenbaugh, R.W., T.E. Buhl, A.K. Stoker, and W.R. Hansen, Los Alamos National Laboratory, Los Alamos, NM

Environmental Analysis of Acid/Middle Pueblo Canyon, Los Alamos, New Mexico

LA-9409-MS; 100 pp. (1982, August)

The radiological survey of the former radioactive waste treatment plant site (TA-45), Acid Canyon, and Pueblo Canyon found residual radioactivity at the site itself and in the channel and banks of Acid, Pueblo, and lower Los Alamos Canyons, all the way to the Rio Grande. The largest reservoir of radioactive material is in lower Pueblo Canyon, which is on DOE property. The only areas where residual radioactivity exceeds the proposed cleanup criteria are at the former vehicle decontamination facility, located between the former treatment plant site and Acid Canyon, around the former untreated waste outfall and for a short distance below, and in two small areas farther down in Acid Canyon. The three alternatives proposed are: (1) to take no action; (2) to fence the areas where the residual radioactivity exceeds the proposed criteria (minimal action), and (3) to clean up the former vehicle decontamination facility and around the former untreated waste outfall. Calculations based on actual measurements indicate that the annual dose at the location having the greatest residual radioactivity would be about 12% of the applicable guideline. Most doses are much smaller than that. No environmental impacts are associated with either the no-action or minimal action alternatives. The impact associated with the cleanup alternative is very small. The preferred alternative is to clean up the areas around the former vehicle decontamination facility and the untreated waste outfall. This course of action is recommended not because of any real danger associated with the residual radioactivity, but rather because the cleanup operation is a minor effort and would conform with the ALARA (as low as reasonably achievable) philosophy. (Auth)

376
Ferenbaugh, R.W., T.E. Buhl, A.K. Stoker, and W.R. Hansen, Los Alamos National Laboratory, Los Alamos, NM

Environmental Analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico

LA-9252-MS; 94 pp. (1982, May)

The radiological survey of the old TA-10 site in Bayo Canyon found low levels of surface contamination in the vicinity of the firing sites, and subsurface contamination in the old waste disposal area. The three alternative actions proposed for the site are: (1) to take no action; (2) to restrict usage of the area containing subsurface contamination to activities that cause no subsurface disturbance (minimal action); and (3) to remove the subsurface contamination to levels below the working criteria. Dose calculations indicate that doses from surface contamination for recreational users of the canyon, permanent residents, and construction workers, and

doses for workers involved in excavation of contaminated soil under the cleanup alternative, are only small percentages of recommended levels in applicable guidelines. No environmental impacts are associated with either the no-action or minimal action alternatives. The impact associated with the cleanup alternative is small especially since the area already has been affected by the original TA-10 decommissioning action. Nevertheless, the preferred option is the minimal action alternative, where 0.6 hectare of land is restricted to surface activities. This leaves the rest of the canyon available for development of up to 400 homes. The restricted area can be used for a park, tennis courts, etc., and the strontium-90 activity will decay to levels permitting unrestricted usage in about 160 years. (EDB)(JMF)(RAF)

377

Friedell, H.L., Friedell, (Hymer L.), Birmingham, AL

Overview of Research in Radiation Biology and Protective Measures in the Manhattan Project During the War Years, 1942 to 1946

DOE/EV/10130-1; 301 pp. (1980)

The purpose of this report is to present a cohesive view of the general biological research program associated with the Manhattan Project. The material is arranged in chronological order. Each of the major research sites is identified and the general nature of the research program is indicated. A section is devoted to the question of the various radiation limits which were used in the operational approach to hazard controls. (ACR)(PTO)

378

Fritzsche, A.E., EG&G Energy Measurements Group, Las Vegas, NV

Surface and Subsurface Gamma Survey of the Kellex Site, Jersey City, New Jersey - Date of Survey: September 8-11, 1980

EGG-1183-1795; 21 pp. (1981, April)

The Kellex Site of about 6.2 hectares in Jersey City, New Jersey was surveyed by the use of an in situ gamma measuring system. The system consisted of a high-purity germanium detector and electronics mounted on a tracked vehicle. The entire site was surveyed on a 20-meter grid that may be transformed to New Jersey grid coordinates. A fraction of the site was surveyed on a 5-m grid. The subsurface soil was surveyed to a depth of 1 m by means of a trenching operation that brought the subsurface soil to the surface. The in situ gamma data were converted to activity concentrations of uranium, thorium, and potassium in the Kellex soil. Individual measurements were compared to the mean site concentrations to ascertain those areas that differ significantly from the mean. Only uranium-238 and uranium-235 appear to exist at Kellex in significant excess of the Kellex means, which in turn approximate New Jersey natural concentrations. No Kellex soil appears to exceed the investigative guideline for uranium-238 of 40 pCi/g in a 400 sq m area, 20 cm thick. (Auth)(PTO)

379

Gilbert, T.L., P.C. Chee, M.J. Knight, J.M. Peterson, C.J. Roberts, J.E. Robinson, S.Y.H. Tsai, and Y.C. Yuan, Argonne National Laboratory, Division of Environmental Impact Studies, Argonne, IL

Pathways Analysis and Radiation Dose Estimates for Radioactive Residues at Formerly Utilized MED/AEC Sites

ORO-832 (1983, March)

Methods of analysis are developed for estimating the largest individual radiation dose that could result from residual radioactivity at sites identified by the Formerly Utilized Sites Remedial Action Program (FUSRAP) of the U.S. Department of Energy. Two unique aspects of the methods are: (1) a systematic structuring of the radiation pathways analysis into source terms, source-to-exposure analysis, and exposure-to-dose analysis; and (2) the systematic use of data on the average concentrations of naturally occurring radionuclides in soil, food, and the human body in order to assess the validity of model calculations and obtain more realistic values. The methods are applied to a typical FUSRAP site in order to obtain generic source-to-dose (D/S) conversion factors for estimating the radiation dose to the maximally exposed individual from a known concentration of radionuclides in the soil. The D/S factors are used to derive soil guidelines, i.e., the limiting concentrations of radionuclides at a typical FUSRAP site that are unlikely to result in

vidual dose limits that exceed generally accepted radiation protection standards. The results lead to the conclusion that the soil guidelines should not exceed 17, 75, and 300 pCi/g for Ra-226, U-238, and Th-230, respectively. (Auth)

380

Gilbert, T.L., J.M. Peterson, R.W. Vocke, and J.K. Alexander, Argonne National Laboratory, Argonne, IL; U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, TN

Alternatives for Management of Wastes Generated by the Formerly Utilized Sites Remedial Action Program

CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. III-21 - III-36) (1982, October)

Alternatives for disposal or stabilization of the wastes generated by the Formerly Utilized Sites Remedial Action Program (FUSRAP) - which consists of soil material and rubble containing trace amounts of radionuclides - are identified and compared, with emphasis on the long-term aspects. A detailed pathway analysis for the dose to the maximally exposed individual is carried out using an adaptation of the natural analogue method. Comparisons of the different alternatives, based on the results of the pathway analysis and qualitative cost considerations, indicate that, if the hazard is such that the waste must be removed and disposed of rather than stabilized in place, disposal by immediate dispersal is preferable to containment, and containment followed by slow planned dispersal is preferable to containment without dispersal. (Auth)

381

Golchert, N.W., J. Sedlet, and K.A. Hayes, Argonne National Laboratory, Occupational Health and Safety Division, Argonne, IL

Environmental Surveillance of the Palos Park Forest Preserve

ANL-83-6; 67 pp. (1983, January)

This is the second report describing an ongoing environmental surveillance program conducted at the Palos Park Forest Preserve near Chicago, Illinois. The preserve was the site of a nuclear research laboratory (Site A) from 1943 to 1956 and a radioactive waste burial site (Plot M) from 1944 to 1949. An extensive radiological characterization of the site was conducted from February 1976 to August 1977, and hydrogen-3 (tritium) in the form of water was found to be the only radionuclide that migrated from the nuclear facilities. The results were published in DOE/EV-0005/7. This report summarizes the earlier findings and gives the detailed results of the work from August 1977 through December 1981. The vertical and horizontal distribution of tritium within the glacial till was determined from measurements of tritium in soil moisture. Chemical and radiochemical analyses were performed on a number of wells in the area. Tritiated water continued to be the only species that was observed to have migrated from the Plot M area. There was no migration from the Site A area. The concentration of tritium at the Red Gate Woods well, 1200 feet downgradient from Plot M, continued to show the seasonal fluctuations of high concentrations in the winter and low concentrations in the summer. Monitoring of the Palos Park area is continuing. Radionuclide analyses of moisture extracted from borehole samples show that tritium has migrated from the burial trenches at Plot M into the drift. The tritium plume has migrated horizontally northward at least 165 feet and vertically 130 feet down to the dolomite-bedrock. Tritium concentrations in borehole samples collected just above bedrock are greater than 1000 nCi/l. The estimated total volume of the tritium plume is 8.79 million cu ft. (Auth)(PTO)(RAF)

382

Haywood, F.F., W.A. Goldsmith, R.W. Leggett, R.W. Doane, W.F. Fox, W.H. Shinpaugh, D.R. Stone, and D.J. Crawford, Oak Ridge National Laboratory, Oak Ridge, TN

Radiological Survey of the Former Uranium Recovery Pilot and Process Sites, Gardinier, Incorporated, Tampa, Florida - Final Report

ORNL-5714; 110 pp. (1981, March)

A radiological survey was conducted at a former uranium recovery plant near Tampa, Florida, which was operated as a part of a phosphoric acid plant. The uranium recov-

ery operations were conducted from 1951 through 1960, the primary goal being the extraction of uranium from phosphoric acid. Pilot operations were first carried out at a small plant, and full-scale extraction was later carried out at a larger adjacent process plant. The survey included measurement of the following: radiation levels at the surfaces and 1 m above the floor inside the pilot operations building and process building and outdoors in areas around these buildings; fixed and transferable alpha and beta-gamma contamination levels on the floor, walls, ceilings, and roof of the process building and on the floor, walls, and ceiling of the pilot plant offices; concentrations of radium-226 and uranium-238 in soil samples taken at grid points around the buildings and in residue samples taken inside the process building; concentrations of radium-226 and uranium-238 in water and sediment samples taken outdoors on the site and the concentrations of these same nuclides in background samples collected off the site. It was found that beta-gamma and/or alpha contamination levels on surfaces at some points inside the process building and in the outdoor area near the process building and pilot operations building exceed the standards for unrestricted use. Some samples of soil and residue taken from the floor and equipment on the second level of the process building were contaminated with natural uranium in excess of 0.05% by weight and also contained natural radium in excess of 900 pci/g. (Auth)(JMF)

383

Kennedy, W.E., Jr., R.L. Aaberg, and B.E. Vaughan, Pacific Northwest Laboratory, Richland, WA

Preliminary Radiation Dose Analysis for Reference FUSRAP Waste Sites

PNL-4100 (Part 2); Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness. Part 2: Ecological Sciences, 157 pp. (1982, February)

The purpose of this study is to provide Bechtel National at Oak Ridge, Tennessee, with a preliminary radiation dose analysis of buried radioactive waste for the Formerly Utilized Sites Remedial Action Program (FUSRAP). Bechtel National will use the preliminary results from this analysis to identify important scenarios, radionuclides, and exposure pathways for site-specific cost/benefit analyses. (Auth)(PTO)

384

Kupferman, S.L., D.R. Anderson, L.H. Brush, L.S. Gomez, and J.C. Laul, Sandia National Laboratories, Albuquerque, NM

Ocean FUSRAP: Feasibility of Ocean Disposal of Materials from the Formerly Utilized Sites Remedial Action Program (FUSRAP)

SAND-82-0459C; CONF-320303; Waste Management '82, Waste Isolation in the U.S. and Elsewhere, Technical Programs, and Public Communication, R.G. Post (Ed.), Proceedings of a Conference, Tucson, AZ, March 8-11, 1982, Vol. 2, 655 pp.; (pp. 471-485) (1982)

The Department of Energy's Formerly Utilized Sites Remedial Action Program (FUSRAP) is designed to identify and evaluate the radiological conditions at sites formerly used by the Corps of Engineers Manhattan Engineer District and the U.S. Atomic Energy Commission. Where required, remedial action will be instituted to remove potential restrictions on the use of the sites due to residual low-level radioactive contamination. A total of 31 sites which may require remedial action has been identified. The purpose of the Ocean FUSRAP Program, which began in March 1981, is to assess the technical, environmental, and institutional feasibility of disposing of FUSRAP soil and rubble which contains traces of natural radioactive materials in the ocean and on the ocean floor. The initial focus has been on the Middlesex Sampling Plant in New Jersey and the surrounding properties, which contain on the order of 100,000 metric tons of material. The Belgian Congo uranium ore and other uranium ores used by the United States were handled at the sampling plant site. In studying the feasibility of ocean disposal for FUSRAP material from Middlesex we have begun to examine institutional requirements to be met, the composition of toxic chemical and radiochemical components, and the impact of the source material in the marine environment. To date nothing has been found that would preclude safe and inexpensive disposal of this material in the ocean. (EDB)(JMF)

385

Kupferman, S.L., D.R. Anderson, L.H. Brush, L.S. Gomez, and L.E. Shephard, Sandia National Laboratories, Albuquerque, NM

CHAPTER 3. FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM

Ocean Disposal Feasibility Study: Candidate DOE (FUSRAP) Soil Characterization

CONF-821103; American Nuclear Society 1982 Winter Meeting, Proceedings of a Conference, Washington, DC, November 14-18, 1982, 813 pp.; (p. 101); Transactions of the American Nuclear Society 43:101 (1982, November)

The purpose of the Ocean FUSRAP program, which began in March 1981, is to assess the technical, environmental, and institutional feasibility of the disposal of FUSRAP waste, which contains traces of natural radioactive materials, in the ocean and on the ocean floor. The initial planning has focused on the Middlesex, New Jersey sampling plant site and surrounding properties, which contain on the order of 100,000 megatons of material. In this paper, the following topics are presented: (1) additional soil characterization information; (2) description of the concept of trace contaminants in general, and an application to the FUSRAP Middlesex soils; (3) preliminary ocean dispersion calculations; and (4) status of risk and cost estimates. (Auth)(PTO)

386

Merry-Libby, P., Argonne National Laboratory, Division of Environmental Impact Studies, Argonne, IL

Model Environmental Assessment for a Property-Cleanup/Interim-Storage Remedial Action at a Formerly Utilized Site

Report; 15 pp. (1982, June)

This document has been prepared as a model for the preparation of an Environmental Assessment (EA) for a property-cleanup/interim-storage type of remedial action under the Formerly Utilized Sites Remedial Action Program (FUSRAP) of the U.S. Department of Energy (DOE). Currently, there are low levels of radioactive contamination at these sites and at nearby properties. Remedial action may be needed to reduce potential health and safety risks. DOE will include environmental considerations in its decision-making process regarding what remedial actions should be taken. For major federal actions significantly affecting the quality of the human environment, an Environmental Impact Statement (EIS) must be prepared to aid DOE in making its decision. However, when it is not clear that an action is major and the impacts are significant, an EA may be prepared to determine whether to prepare an EIS or a finding of no significant impact (FONSI). As an example to preparers of site-specific EAs, this model EA was written to meet the intent of the Council of Environmental Quality (CEQ) regulations and to conform to the format and content of DOE EAs according to the DOE "Environmental Compliance Guide" (DOE/EV-0132, February 1981). As specified in the DOE guidelines, only "a brief description of reasonable alternatives to the proposed action and their probable environmental effects" is given in this model EA. Emphasis is placed on the proposed action and assessment of its potential environmental impacts. A section on the hypothetical affected environment is included to orient the reader but is not intended to present enough information to independently assess the impacts. Such information is contained in the references cited. Names such as Main site, Town, State, Jones Road, and John Doe Company are used in lieu of site-specific information. The "Methods" report is incorporated by reference in the environmental consequences section of this model EA, and only the issues and impacts peculiar to the model site and model action are summarized. (Auth)(JMF)

387

NLO, Inc., Decontamination and Decommissioning Division, Cincinnati, OH

Project Report of Phase I Remedial Action of Properties Associated with the Former Middlesex Sampling Plant Site

NLCO-006EV (Rev. 1); 160 pp. (1982, April)

The Phase I remedial action work on properties associated with the Middlesex Sampling Plant Site in Middlesex, New Jersey was completed during 1980. In addition to the two properties included in the original scope of work, three other properties were decontaminated. In the playground across the street from the rectory, contaminated soil was discovered and subsequently removed. Later, at the request of the DOE, the Kays and Rosamilia properties were decontaminated. Decontamination of the properties included in Phase I has, in the judgement of NLO, been successfully achieved, as evidenced by the data presented in this and in the referenced Eberline Instrument Corporation reports. Final certification of the sites for unrestricted use will be

by ASEP/OOS (Office of Occupational Safety) based upon all available data, of which this report is a part. Work completed at Middlesex, together with the lessons learned during the execution of the entire project, is indicative that future decontamination assignments can be accomplished with mutual benefits for the DOE, as well as the local citizens. Restoration of the rectory and the William Street property exemplifies the excellence of work performed by the remedial action subcontractors and is further evidence of the success of the Phase I work. The total Phase I costs were $2,768,572. (Auth)(JMF)

388

Poff, T.A., J.A. Brown, and C.F. Ficker, NLO, Inc., Cincinnati, OH

Environmental Monitoring Program for the DOE Middlesex, New Jersey Site

NLCO-0010EV; 55 pp. (1981, October)

The Middlesex Sampling Plant Site (MSPS) is a United States Department of Energy (DOE) owned facility formerly used for processing and storage of radioactive materials, and currently utilized for interim storage of low-level radioactive residues resulting from the cleanup of surrounding properties. The site occupies 9.61 acres of industrial property at 239 Mountain Avenue in the Borough of Middlesex, New Jersey. As a result of work done at the site from 1943 to 1955, in processing uranium and thorium ores and concentrates, the site, as well as a number of properties in the vicinity, has been contaminated with radioactive residues. The MSPS and associated properties were given high priority for cleanup under the DOE's Formerly Utilized Sites Remedial Action Program (FUSRAP), and late in 1979 NLO, Inc. was named program management contractor by DOE to initiate remedial action work. Phase I of the cleanup commenced in FY-1980 with the construction of an impervious asphalt storage pad and drainage system at the point site, followed by decontamination activities at four of the vicinity properties. Phase II, involving the remaining 30 properties adjoining the plant site, commenced in FY-1981. At the start of FY-1982 (October 1, 1981) management responsibilities at the MSPS were assumed by Bechtel National, Inc., the program management contractor for FUSRAP. Among the contract management responsibilities for the MSPS is the requirement to maintain adequate environmental monitoring and surveillance programs to assure the safety of the general public and the environment. (Auth)

389

U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, TN

Radiological Guidelines for Application to DOE's Formerly Utilized Sites Remedial Action Program

ORO-831 (1983, March)

The U.S. Department of Energy has implemented a program to evaluate and, where necessary, take action to protect the public from contamination at sites that were used in the past to process and/or store radioactive materials for the former U.S. Army Corps of Engineers Manhattan Engineer District or the U.S. Atomic Energy Commission. The program is identified as the Formerly Utilized Sites Remedial Action Program (FUSRAP). This document describes the methods appropriate to the evaluation of the health implications of radiological contamination at FUSRAP sites. The description excludes cost analysis methods and other factors applied to site-specific evaluations. General methods for assessment of the radiation dose to humans using pathways analysis and methods for estimating the health implications of a given dose are described. Generally applicable limits for radiation exposure have been used to derive remedial action guidelines intended for specific application to FUSRAP projects. More detail is provided in a section on applications as to how the guidelines might be applied to site-specific remedial action planning efforts. Appendix A describes the basis for the development of subsurface soil guidelines. Appendix B is provided to summarize the history of radiation protection standards and their basis. Background information, which the nontechnical reader may find useful in understanding the remainder of the document, is included as Appendix C. Application of the "as low as reasonably achievable" (ALARA) philosophy of radiation protection to FUSRAP programs is not discussed in this document. (Auth)(PTO)

390

U.S. Department of Energy, Technical Information Center, Oak Ridge, TN

Formerly Utilized Sites: Remedial Action

DOE/TIC-3392 (1982, November)

CHAPTER 3. FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM

This bibliography contains 115 references on formerly utilized sites included in the Department of Energy's Energy Data Base from January 1981 through October 1982. Indexes are included. (PTO)

391

Vierzba, E.A., and A. Wallo, Aerospace Corporation, Eastern Technical Division, Control Technology Section, Washington, DC

Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works

ATR-82(7963-04)-1; 77 pp. (1982, November)

The DOE Niagara Falls Storage Site (NFSS) and associated properties are commonly referred to as the Atomic Energy Commission (AEC) portion of the Lake Ontario Ordnance Works (LOOW), Lewiston, New York. The site originally included 1511 acres, but in the mid-1950's, the AEC declared much of this facility excess, and the federal government sold the properties. The current DOE portion of the site constitutes approximately 191 acres. This report presents the most comprehensive overview of the site's operating history and land use, a brief description of the recent radiological monitoring performed at the site, a discussion of the remedial actions performed at the site, and a summary of the site's present condition. The detailed information relevant to the proposed survey effort follows the section which contains a description of the residues, scrap, and waste storage operations. The section pertinent to the resurvey is followed by a summary of the disposal and storage areas, recommendations for categorizing plots for the upcoming survey, and a listing of relevant documents. (Auth)(PTO)

392

Wallo, A., and E.A. Vierzba, Aerospace Corporation, Eastern Technical Division, Control Technology Section, Washington, DC

Evaluation of the 1943 to 1946 Liquid Effluent Discharge from the Linde Air Products Company Ceramics Plant

ATR-82(7963-04)-2; 57 pp. (1981, December)

This report presents an evaluation of the consequences of using on-site wells and sewers for disposing of liquid wastes from a uranium extraction process operated from 1943 to 1946 by the Linde Air Products Company, Tonawanda, New York. The process, known as Step I, was designed to extract uranium oxide (U_3O_8) from uranium ores supplied by the Manhattan Engineer District (MED). The primary emphasis of the report is on the liquid effluents discharged from the process. In addition, the chemical process, its history, and operations are discussed; uranium and radium mass flow balances are calculated; and uranium and radium concentrations in residues are estimated. A brief description of the Linde Step I, II, and III processes are also presented. It is estimated that approximately 500 million liters of effluents (liquids that remained after the precipitation and filtration of uranium from the uranium bearing extraction solutions) were discharged as a result of refinery operations. Uranium effluents discharged to the sanitary sewer averaged less than 8 X 10(E-5) uCi/ml, which is below the current NRC limit for natural uranium in water discharged to a sewer. As a result of water and soil monitoring on the site and environs, a worst-case potential exposure determined that doses would be about 0.6% of the guideline value, and that the risk of radiation-induced cancer would be insignificant when compared to the normal risk of contracting cancer. (Auth)(PTO)

393

Wynveen, R.A., W.H. Smith, M.C. Boggs, and A.L. Justus, Argonne National Laboratory, Argonne, IL

Radiological Survey of Eckhart Hall, The University of Chicago, Chicago, Illinois, September 14, 1976-March 22, 1977

DOE/EV-0005/24; ANL-OHS/HP-82-102; 85 pp. (1982, May)

A comprehensive radiological survey was conducted at the Eckhart Hall at the University of Chicago, Chicago, Illinois. General radiochemistry and/or physics research was performed at this facility during the MED/AEC era in the 1940s. The building is now used as laboratories, offices, and classrooms. Survey measurements included alpha and beta-gamma contamination determinations, both fixed and removable; beta-gamma exposure readings at contact and at 1 m (3 ft); estimates of radon-daughter concentrations in the air; and determination of concentrations of cesium-137, the thorium-232 decay

chain, the radium-226 decay chain, and uranium in the soil on the site. Thirteen spots of contamination were found to be fixed to or under existing surfaces and not readily available for transfer to other locations. Under current use conditions, the potential for radiation exposure to occupants of this building from these sources of contamination is remote. Concentrations of radon daughters in the air of the building were less than the limit of 0.01 Working Level (WL) above background. No long-lived radionuclides were detected in any air sample. Concentrations of radionuclides in soil samples collected around the facility indicated background levels. The presumed maximum potential internal radiation 50-year dose commitments from inhalation/ingestion of contamination remaining from MED/AEC activities were calculated to be less than 25% of the appropriate annual standards for an individual in an uncontrolled area. Remedial measures such as stabilization of the contamination in place would be applicable as a short-term measure. In order to reduce the risk in the event that building modifications take place in the future, health physics procedures and coverage are recommended. The long-term solution would involve decontamination by removal of the radioactive residues. (EDB)(JMF)

394

Wynveen, R.A., W.H. Smith, C.B. Mayes, and A.L. Justus, Argonne National Laboratory, Occupational Health and Safety Division, Argonne, IL

Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977

DOE/EV-0005/34; ANL-OHS/HP-82-105; 32 pp. (1982, May)

A radiological survey was conducted at the former locations of the West Stands, the New Chemistry Lab and Annex, and Ricketts Laboratory at the University of Chicago, Chicago, Illinois. General radiochemistry and/or physics research for the MED/AEC program was performed at these sites during the 1940s. The buildings have since been razed. The survey was undertaken to determine the presence of any radionuclides remaining from the MED/AEC operations that could have been spilled or released from the former structures. Environmental soil samples (corings) were collected from the areas where the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory once stood. The soil corings were taken at what appeared to be undisturbed locations near the sites of the three former facilities. Analyses of the soil corings included determination of the concentrations of cesium-137, the thorium-232 decay chain, the radium-226 decay chain, and uranium in the soil. The levels of uranium and the radium-226 decay chain found in the samples indicated that no concentrations above natural background levels were present. Slightly elevated levels of cobalt-60 were found in soil taken from the top 5 cm of the ground at two sampling sites, but this activity was presumed to have been traceable to induced activity from contaminated stainless steel that had been stored in the area during operations not related to MED/AEC activities. No increased radiation dose attributable to exposure to residual radioactivity from MED/AEC activities is expected. (Auth)(JMF)

395

Wynveen, R.A., W.H. Smith, C.B. Mayes, and A.L. Justus, Argonne National Laboratory, Occupational Health and Safety Division, Argonne, IL

Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois

DOE/EV-0005/22; ANL-OHS/HP-83-100; 126 pp. (1983, January)

A comprehensive radiological survey was conducted at the Illinois National Guard Armory at Washington Park in Chicago. This facility, used for uranium processing during the MED/AEC era, is now used as offices, classrooms, and storage and garage areas. The survey was undertaken to determine the location and quantities of any radioactive materials remaining from the MED/AEC operations. Survey measurements included alpha and beta-gamma contamination determinations, both fixed and removable; beta-gamma exposure readings at contact and at 1 m; concentration estimates of radon daughters; and concentration determinations for Cs-137, the Th-232 chain, the Ra-226 decay chain, and uranium in the soil on the site. Forty-two spots of contamination in nine rooms or areas exceeded the allowable limits for uranium as given in the ANSI Standard N13.12. Ir at

instances, the contamination was found to be removable and available for transfer to other locations. However, under current use conditions, the potential for radiation exposure to occupants of this building from these sources of contamination is small. Concentrations of radon daughters in the air in the building, as measured by grab-sampling techniques, were less than the limit of 0.01 WL above background as given in the Surgeon General's Guidelines in 10 CFR 712. No long-lived radionuclides were detected in any air sample. Concentrations of radionuclides in soil samples collected around the facility indicated essentially background levels. The presumed maximum 50-year dose commitments from potential inhalation/ingestion of residual contamination were calculated to be 2.5 mrem to the lung, 0.51 mrem to the bone, 0.12 mrem to the kidney, and 0.031 mrem whole-body; each of these is less than 0.5% of the appropriate standards for an individual in an uncontrolled area. In order to reduce the potential for radiation exposure, remedial measures such as stabilization of the contamination in-place would be applicable as a short-term measure. In order to reduce the risk in the event that building modifications take place in the future, health physics procedures and coverage are recommended. The long-term solution would involve decontamination by removal of the radioactive residues from the 11 rooms or areas in the facility. (Auth)(PTO)

396

Wynveen, R.A., W.H. Smith, C.B. Mayes, and A.L. Justus, Argonne National Laboratory, Argonne, IL

Radiological Survey of Ryerson Physical Laboratory, The University of Chicago, Chicago, Illinois, September 11-25, 1976

DOE/EV-0005/23; ANL-OHS/HP-82-103; 93 pp. (1982, May)

A comprehensive radiological survey was conducted at the Ryerson Physical Laboratory at the University of Chicago, Chicago, Illinois. General radiochemistry and/or physics research was performed at this facility during the MED/AEC era in the 1940s. The building is now used as laboratories, offices, and classrooms. The survey was undertaken to determine the location and quantities of radioactive materials remaining from the MED/AEC activities. Forty spots of contamination in 26 rooms possibly resulting from MED/AEC occupancy exceeded the allowable limits as given in ANSI Standard N13.12 for Group 1 nuclides. The potential for radiation exposure to occupants of this building from these sources of contamination is remote under current use conditions. Concentrations of radon daughters in the air of the building were less than the limit of 0.01 WL above background as given in the Surgeon General's Guidelines. Concentrations of radionuclides in soil samples collected around the facility indicated background levels. The presumed maximum potential dose for external penetrating radiation resulting from exposure to the radioactivity remaining from MED/AEC operations was calculated to be 140 mrem a year, which is 30% of the 500-mrem standard for an individual in an uncontrolled area. In order to reduce the potential for radiation exposure, remedial measures such as stabilization for the contamination in place would be applicable as a short-term measure. In order to reduce the risk in the event that building modifications take place in the future, health physics procedures and coverage are recommended. The long-term solution would involve decontamination by removal of the radioactive residues from the 26 rooms or areas where contamination possibly resulting from MED/AEC activities was detected. (EDB)(JMF)

397

Wynveen, R.A., W.H. Smith, C.B. Mayes, and A.L. Justus, Argonne National Laboratory, Argonne, IL

Radiological Survey of Kent Chemical Laboratory, The University of Chicago, Chicago, Illinois, September 7-13, 1977

DOE/EV-0005/25; ANL-OHS/HP-82-101; 83 pp. (1982, May)

A comprehensive radiological survey was conducted at the Kent Chemical Laboratory at the University of Chicago, Chicago, Illinois. General radiochemistry and/or physics research was performed at this facility during the MED/AEC era in the 1940s. The building is now used for laboratories, offices, and classrooms. The survey was undertaken to determine the location and quantities of any radioactive materials remaining from the MED/AEC operations. Nineteen spots of contamination possibly resulting from MED/AEC occupancy in 12 rooms exceeded the allowable limits for radium-226 and plutonium-239 as given in the ANSI Standard N13.12. Under current use conditions, the potential for radiation exposure to occupants of this building from these sources of contamination is remote. Concentrations of radon

daughters in the air of the building were below the limit of 0.01 Working Level (WL) above background as given in the Surgeon General's Guidelines. Concentrations of radionuclides in soil samples from near the laboratory were essentially at background levels. The maximum potential dose for external penetrating radiation resulting from exposure to the radioactivity remaining from MED/AEC operations was calculated to be 500 mrem a year, which is equal to the 500 mrem standard for an individual in an uncontrolled area. In order to reduce the potential for radiation exposure, remedial measures such as stabilization of the contamination in place would be applicable as a short-term measure. In order to reduce the risk in the event that building modifications take place in the future, health physics procedures and coverage are recommended. The long-term solution would involve decontamination by removal of the radioactive residues from the 12 rooms or areas where possible contamination resulting from MED/AEC activities was detected. (EDB)(JMF)

398

Wynveen, R.A., W.H. Smith, C.B. Mayes, and A.L. Justus, Argonne National Laboratory, Argonne, IL

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977

DOE/EV-0005/26; ANL-OHS/HP-82-100; 104 pp. (1982, May)

A comprehensive survey was conducted at George Herbert Jones Chemical Laboratory at the University of Chicago, Chicago, Illinois. Radiochemistry for the MED/AEC project was performed in this building in the 1940s. The building is now used as laboratories, offices, and classrooms. The survey was undertaken to determine the location and quantities of any radioactive materials remaining from the MED/AEC operations. Forty-three spots of contamination, possibly resulting from MED/AEC occupancy in 17 rooms, exceeded the allowable limits as given in the ANSI Standard N13.12. Under current use conditions, the potential for radiation exposure to occupants of this building from these sources of contamination is remote. Concentrations of radon daughters in the air of the building, as measured with grab-sampling techniques, were below the limit of 0.01 Working Level (WL) above background as given in the Surgeon General's Guidelines. No long-lived radionuclides were detected in any air sample. Concentrations of radionuclides in soil samples from near the laboratory generally indicated background levels. In order to reduce the potential for radiation exposure, remedial measures such as stabilization of the contamination in place would be applicable as a short-term measure. In order to reduce the risk in the event that building modifications take place in the future, health physics procedures and coverage are recommended. The long-term solution would involve decontamination by removal of the radioactive residues from the 17 rooms or areas where contamination, possibly resulting from MED/AEC activities, was detected. (EDB)(JMF)

399

Wynveen, R.A., W.H. Smith, R.L. Mundis, and C.B. Mayes, Argonne National Laboratory, Argonne, IL

Radiological Survey of Universal Cyclops, Inc., Titusville Plant (Formerly Vulcan Crucible Steel Company, Aliquippa, Pennsylvania), May 2-8, 1978

DOE/EV-0005/33; ANL-OHS/HP-82-104; 61 pp. (1982, May)

A survey was conducted at the Universal Cyclops, Inc. Titusville Plant (formerly Vulcan Crucible Steel Company), in Aliquippa, Pennsylvania, to determine the location and quantities of any radioactive materials remaining on the site as a result of MED/AEC activities in the late 1940s. This facility was used for rolling uranium billets during the MED/AEC era. The survey included measurements of alpha and beta-gamma contamination, both fixed and removable; beta-gamma exposure readings at contact and at 1 m (3 ft) above the floor or ground level; and measurements of the concentrations of radon daughters in air and concentrations of cesium-137, the thorium-232 decay chain, the radium-226 decay chain, and uranium in the soil on the site. Fourteen spots of contamination exceeded the allowable limits for natural uranium. Under current use conditions, the potential for radiation exposure of occupants of the building from these sources of contamination is remote. Concentrations of radon daughters were below the 0.01 Working Level (WL) limit. Calculated radon concentrations based on the radon-daughter determin

ranged from 0.11 to 0.27 pCi/l. The concentration guide for radon-222 in uncontrolled areas is 3 pCi/l. Analysis of soil samples from the site indicated elevated concentrations of uranium (15.1 + or - 0.7 to 109.0 + or - 5.5 pCi/g) at one sampling location near the building. After evaluation of results of the survey, it was concluded that although some areas of the Universal Cyclops facility are contaminated, these areas do not pose a significant risk to the present occupants of the building. Nonetheless, in a few cases the contamination does exceed accepted guidelines. Remedial measures are indicated to bring the contaminated areas within the guidelines. (EDB)(JMF)(RAF)

143/144

Chapter 4

URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

400

Bendix Field Engineering Corporation, Grand Junction, CO

Commingled Uranium-Tailings Study, Volume II - Technical Report

DOE/DP-0011 (Vol. 2); 277 pp. (1982, June)

Public Law 96-540, Section 213, directs the Secretary of Energy to develop a plan for a cooperative program to provide assistance in the stabilization and management of defense-related uranium mill tailings commingled with other tailings. In developing the plan, the Secretary is further directed to: (1) establish the amount and condition of tailings generated under federal contracts; (2) examine appropriate methodologies for establishing the extent of federal assistance; and (3) consult with the owners and operators of each site. This technical report summarizes U.S. Department of Energy (DOE) and contractor activities in pursuit of items (1), (2), and (3) above. Recommendations regarding policy and a cooperative plan for federal assistance are under separate cover as Volume I. (EDB)(RAF)

401

Berry, J.B., and J. Velarde, Acres American, Inc., Buffalo, NY; Davy, McKee Corporation, San Mateo, CA

Stabilization of Existing Uranium Mill Tailings Piles at Uravan, Colorado

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 519-536) (1981)

In 1980, the Union Carbide Corporation completed stabilization measures for two tailings impoundment ponds at their Uravan, Colorado, mining and mill complex. One impoundment is approximately 140 ft high and the second impoundment is approximately 100 ft high. Each impoundment was constructed by the upstream method of tailings placement. Stabilization was accomplished by the construction of a rock berm with a filter system. The stabilization program consisted of: a geotechnical field investigation of the tailings ponds including drilling, sampling, testing, and piezometer installation; design of short-term and long-term stabilization berms; design of a seepage collection system including embankment toe drains, pump stations and downstream water collection pond; and implementation of a construction and post-construction monitoring program. (Auth)(PTO)

402

Colbert, T.A., and R.W. Klusman, Gibbs and Hill, Inc., Denver, CO; Colorado School of Mines, Department of Chemistry and Geochemistry, Golden, CO

Evaluation of Radionuclide and Trace Metal Migration Beneath an Inactive Tailing Impoundment

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 275-293) (1982)

This study was conducted at the Cotter Corporation uranium mill in Canon City, Colorado. The purpose was to provide statistically reliable information on the possible migration of contaminants beneath several inactive tailing ponds which are in the process of being excavated and reclaimed. One hundred twenty-six samples from 35 locations and four depths were collected from the study area and analyzed. Seven environmentally significant parameters were identified for statistical analysis: gross alpha, natural uranium, radium-226, total nickel, total lead, total arsenic, and available molybdenum. Results of the statistical analyses were highly significant, showing that the highest concentrations of these parameters occur in the top one foot (30 cm) of the profile. Below one foot, concentrations of these parameters did not vary significantly with depth. Variation in horizontal space was also not significant. The results indicate that excavating the top one foot of the existing profile would significantly reduce levels of contamination of the study area. Additional excavation would result in only minimal contaminant reductions. (Auth)(PTO)

403

England, J.L., Brigham Young University, Center for Health and Environmental Studies, Provo, UT

Baseline Data and Land Use Impact of the Shiprock Uranium Tailings Site

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

Report; 39 pp. (1976, May)

The objectives of this report are to describe the land uses, to provide population estimates, and to discuss the land use impacts of the uranium tailings site in Shiprock, New Mexico. The report is divided into the following five sections as follows: (1) a general description of the demographic, socio-economic, and cultural conditions existing on the Navajo Reservation; (2) a general description of demographic and economic conditions in Shiprock; (3) the current land use patterns; (4) estimates of the current population size and geographic distribution in Shiprock; and (5) the impact of the site on land use and land values. (PTO)

404

England, J.L., Brigham Young University, Center for Health and Environmental Studies, Provo, UT

Baseline Data and Land Use Impact of the Tuba City Uranium Tailings Site

Report; 21 pp. (1976, May)

The objectives of this report are to describe the land uses, to provide population estimates, and to discuss the land use impacts of the uranium tailings site in Tuba City, Arizona. The report is divided into the following four sections: (1) general description of demographic and economic conditions in Tuba City; (2) current land use patterns in the area surrounding the tailings; (3) estimates of the current and projected population size and geographic distribution in Tuba City; and (4) impact of the site on land use and land values. (Auth)(PTO)

405

England, J.L., Brigham Young University, Center for Health and Environmental Studies, Provo, UT

Baseline Data and Land Use Impact of the Mexican Hat Uranium Tailings Site

Report; 19 pp. (1976, May)

The objectives of this report are to describe the land uses, to provide population estimates, and to discuss the land use impacts of the uranium tailings site in Mexican Hat, Utah. The report is divided into the following four sections: (1) general description of demographic and economic conditions in the area of Mexican Hat; (2) current land use patterns in the area; (3) estimates of the current population size and geographic distribution in Mexican Hat; and (4) impact of the site on land use and land values. (PTO)

406

England, J.L., Brigham Young University, Center for Health and Environmental Studies, Provo, UT

Baseline Data and Land Use Impact of the Monument Valley Uranium Tailings Site

Report; 16 pp. (1976, May)

The objectives of this report are to describe the land uses, to provide population estimates, and to discuss the land use impacts of the uranium tailings site in Monument Valley, Arizona. The report is divided into the following four sections: (1) general description of demographic and economic conditions in the area of Monument Valley; (2) current land use patterns in the area; (3) estimates of the current population size and geographic distribution in Monument Valley; and (4) impact of the site on land use and land values. (PTO)

407

England, J.L., Brigham Young University, Center for Health and Environmental Studies, Provo, UT

Baseline Data and Land Use Impact of the Falls City, Texas Uranium Tailings Site

Report; 13 pp. (1977, August)

The objectives of this report are to describe the land uses, to provide population estimates, and to discuss the land use impacts of the uranium tailings site in Falls City, Texas. The report is divided into the following four sections: (1) general description of demographic and economic conditions in the area of Falls City; (2) current land use patterns in the area; (3) estimates of the current population size and geographic distribution in Falls City; and (4) impact of the site on land use and land values. (PTO)

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

408
England, J.L., Brigham Young University, Center for Health and Environmental Studies, Provo, UT

Baseline Data and Land Use Impact of the Lakeview, Oregon Uranium Tailings Site

Report; 17 pp. (1977, July)

The objectives of this report are to describe the land uses, to provide population estimates, and to discuss the land use impacts of the uranium tailings site in Lakeview, Oregon. The report is divided into the following four sections: (1) general description of demographic and economic conditions in the area of Lakeview; (2) current land use patterns in the area; (3) estimates of the current population size and geographic distribution in Lakeview; and (4) impact of the site on land use and land values. (PTO)

409
England, J.L., Brigham Young University, Center for Health and Environmental Studies, Provo, UT

Baseline Data and Land Use Impact of the Slick Rock Uranium Tailings Sites

Report; 12 pp. (1976, August)

The objectives of this report are to describe the land uses, to provide population estimates, and to discuss the land use impacts of the uranium tailings site in Slick Rock, Colorado. The report is divided into the following four sections: (1) general description of demographic and economic conditions in the area of Slick Rock; (2) current land use patterns in the area; (3) estimates of the current population size and geographic distribution in Slick Rock; and (4) impact of the site on land use and land values. (PTO)

410
England, J.L., Brigham Young University, Center for Health and Environmental Studies, Provo, UT

Baseline Data and Land Use Impact of the Naturita Uranium Tailings Sites

Report; 15 pp. (1977)

The objectives of this report are to describe the land uses, to provide population estimates, and to discuss the land use impacts of the uranium tailings site in Naturita, Colorado. The report is divided into the following four sections: (1) general description of demographic and economic conditions in the area of Naturita; (2) current land use patterns in the area; (3) estimates of the current population size and geographic distribution in Naturita; and (4) impact of the site on land use and land values. (PTO)

411
England, J.L., Brigham Young University, Center for Health and Environmental Studies, Provo, UT

Social Impact and Land Use at the Vitro Tailings Site

Report; 136 pp. (1975, October)

The report presented here is a description of a project designed to determine the social impact of the Vitro tailings on the area adjacent to them. The area in which the tailings site is located is largely in transition from agriculture and substandard residential use to light industry and new low cost housing. The report describes the existing land use in the area and the effect of the publicized uranium tailings site on the social well being of residents whose activities take place near the site. The land use survey catalogs and locates various types of land use activity within approximately one mile of the site. The social impact research details the effects of the site and knowledge of its presence on residents, workers, and businesses operating in the area. The results of the research are presented in the following five sections: (1) findings of the land use survey; (2) design and results of a study of the impact of the site on residents; (3) study of the impact of the site on people who work in the area of the tailings; (4) discussion of the socioeconomic impact of the tailings on businesses; and (5) summarization and discussion of the findings. (Auth)(PTO)

412
England, J.L., Brigham Young University, Center for Health and Environmental Studies, Provo, UT

Baseline Data and Land Use Impact of the Lowman, Idaho Uranium Tailings Site

Report; 10 pp. (1977, July)

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

The objectives of this report are to describe the demographic characteristics, present land uses, provide population estimates, and discuss the land use impacts of the uranium tailings site near Lowman, Idaho. The report is divided into the following four sections: (1) general description of demographic and economic conditions in the vicinity of the Lowman uranium tailings site; (2) current land use patterns and land values in the area surrounding the tailings; (3) estimates of the current and projected population size and geographic distribution in the tailings site; and (4) impact of the site on land use and land values. (Auth)(PTO)

413

Erikson, R.L., and D.R. Sherwood, Pacific Northwest Laboratory, Richland, WA

Interaction of Acidic Leachate with Soil Materials at Lucky McPathfinder Mill, Gas Hills, Wyoming

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 335-351) (1982)

Facilities at the Lucky Mc site used for the disposal of uranium mill tailings include tailings impoundments as well as a large evaporation pond. Evaporation Pond Number 4 was constructed to contain excess leachate from four upgrade disposal areas. The soils beneath the pond have been in contact with acidic leachate for about 4 years, at an average hydraulic head of 12 feet (3.66 m). In this study, the soil-leachate interactions were investigated and the extent of radionuclide migration through soils underlying the evaporation pond. Sediment samples were collected to depths of 2 feet (60 cm) at six locations through the pond bottom. The soil profiles of each sample exhibit a distinct stratification with depth, indicative of varying soil-leachate interaction. Soil pH varied from acidic (pH 3) for surface sediments (0 to 20 cm), through an intermediate zone (20 to 38 cm) containing the pH front, to an alkaline pH region (pH 8) similar to that of uncontacted soil (60 cm). Data for the distribution of radionuclides with depth are also presented. Radioanalytical results indicate the distributions of lead-210, uranium-238, thorium-230, and radium-226 in the sediments are dependent on depth, pH, and initial leachate composition. These radionuclides were found to be concentrated in the upper 40 cm of the sediment profile. Radionuclide distributions were used to estimate the hydraulic conductivity of Forelle-Patent alluvium in the field and the advance of the tailings solution through sediments underlying the evaporation pond. The calculated hydraulic conductivity [2.5 X 10(E-7) cm/s] is in reasonable agreement with laboratory-measured values for Forelle-Patent alluvium. The calculations suggest that while the radionuclides were effectively removed from the pon ' seepage solution in the upper 40 to 60 cm of the soil profile, the seepage solution appears to have permeated to depths of about 11.4 m. The radionuclide data also suggest high concentrations of uranium (about 0.17 wt. % U3O8) occur in a zone 10 cm thick at depths between 20 and 30 cm below the pond bottom. The acid buffering capacity of the native soil, calculated to be at least 15.4 ml/g, was in large part responsible for the effectiveness of the native soils as a contaminant barrier. Subsequent to the submission of this paper to the symposium, the authors were informed by the staff at the Lucky Mc Mill that the 4-year contact period assumed throughout this paper is in error. The actual contact time between the tailings solution and the Forelle-Patent alluvium underlying evaporation pond number 4 is approximately 10 years. Because the actual period is 2.5 times longer, the calculated value of the hydraulic conductivity should be 1.0 X 10(E-7) cm/s. This value is still in good agreement with the laboratory-measured value of 2.4 X 10(E-8) cm/s. The corrected contact period (10 years) does not affect any other calculations or the conclusions presented in the paper. (Auth)(PTO)

414

Froisland, L.J., P.L. Placek, and M.B. Shirts, U.S. Bureau of Mines, Salt Lake City Metallurgy Research Center, Salt Lake City, UT

Restoration of Surface Vegetation on Uranium Wastes at Uravan, Colorado

Bureau of Mines Report of Investigation 8653; 19 pp. (1982, May)

The Bureau of Mines conducted a four-year research program at Uravan, Colorado, on a 2.5-acre reclamation plot on the slope of a uranium mill tailings pile that had been covered with mine waste rock. The purpose of this study was to determine the effects of plant species, type of irrigation, type of fertilizers, and the use of dust control chemicals on plant growth and surface coverage. Best grass coverage, nearly 100% with 240 plants/sq [illegible]

developed in a section that was seeded with crested wheatgrass, fertilized with sewage sludge, and sprinkler irrigated. (Auth)(PTO)

415

Gee, G.W., J.T. Zellmer, M. Dodson, R.R. Kirkham, B.E. Opitz, D.R. Sherwood, and J. Tingey, Pacific Northwest Laboratories, Richland, WA

Radon Control by Multilayer Earth Barriers: Field Tests

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 289-308) (1981)

Field tests of multilayer earthen covers for radon control have been conducted for the past two years at Grand Junction, Colorado as part of the Department of Energy's Uranium Mill Tailings Remedial Action Project (UMTRAP) technology development. The initial tests conducted in 1980 used relatively thin (less than 20 cm), compacted layers of clay mixed with gravel as the control layer to limit radon escape from uranium tailings. The first multilayer system was applied in August 1980 and has been monitored for over one year. Results have indicated that the compacted clay/gravel layers have been relatively effective in reducing radon flux. Flux reductions on one of the compacted plots ranged from 98% to 99.9%, but during the first year flux levels at all monitoring points were observed to exceed 2 pCi/sq m/s. The 1981 field tests were designed to test multilayer earth cover systems that could reduce surface radon flux to less than 2 pCi/sq m/s. Materials used in the clay/gravel layer for radon control were tested in the laboratory prior to field application. Laboratory measured diffusion coefficients for the wet, compacted clay/gravel mixtures ranged from 2 X 10(E-6) sq cm/s to 8 X 10(E-6) sq cm/s. Field measurements of clay/gravel layers indicate that compactions greater than 1.9 g/cu cm could be achieved by conventional earthmoving equipment. The compacted layers were hydraulically isolated from the surface soil by a 0.2-m thick capillary barrier composed of 3 cm diameter washed rock. The capillary barrier was determined to be effective in retarding upward migration of water and salts. (Auth)(PTO)

416

Hartley, J.N., and G.W. Gee, Pacific Northwest Laboratory, Richland, WA

Uranium Mill Tailings Remedial Action (UMTRA) Joint Field Test

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 115-134) (1981)

Technologies to reduce radon released from uranium mill tailings are being investigated by PNL as part of DOE's UMTRAP technology development program. These include: (1) earthen cover systems; (2) multilayer cover systems; and (3) asphalt emulsion radon barrier systems. During the summer of 1981, a field test was conducted at the Grand Junction, Colorado uranium tailings pile to evaluate and compare the effectiveness of each radon barrier system. Test plots covered about 1.2 ha (3 acres). In addition, 1.8-m diameter column tests are being carried out with cover systems similar to those in the larger field test plots. This will allow a direct comparison of the two types of test procedures as well as providing detailed information on radon transport. (Auth)(PTO)

417

Highland, W.R., L.T. Murdock, and E. Kemp, Dames and Moore, Inc., Salt Lake City, UT; Kemp (Emmerson) and Associates, Arvada, CO

Design and Seepage Modeling Studies of Below-Grade Disposal, West Gas Hills, Wyoming

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 537-556) (1981)

Detailed studies were conducted at Federal American Partner's West Gas Hills, Wyoming uranium milling facilities to evaluate design and environmental considerations for the below-grade disposal of uranium mill waste in an abandoned mine pit. The investigations presented herein are of considerable interest to uranium mill tailings management because consideration is given to disposal of tailings below the water table without the use

of a liner. Studies conducted by FAP and its consultants included feasibility investigations for the location of evaporation ponds, design of tailings transport and recycle systems, design of a pit drainage system which utilizes spigoted tailings, and detailed seepage investigations of the existing evaporation pond and the proposed below-grade disposal pit. The seepage studies included the conduct and review of field investigations, delineation of hydrogeology, existing groundwater quality and hydraulic characteristics of site aquifers, laboratory investigations to characterize physical properties, mineral compositions and evaluation of geochemical reactions between tailings seepage, liner materials and natural materials, and finally, mathematical modeling of seepage and resultant chemical transport. The results of the investigations indicate that disposal of uranium mill tailings in an abandoned mine pit, below the original water table and without the construction of a seepage barrier will provide long-term containment of radioactive waters, heavy metals and other contaminants added or released during the milling process. A combination of below-grade disposal, use of existing disturbed lands, poor existing aquifer water quality, low aquifer permeability, a sub-drain dewatering system and a relatively thick claystone layer at the base of the pit provide an excellent uranium tailings disposal facility. (Auth)(PTO)

418

Hudman, L.E., Brigham Young University, Department of Geography, Provo, UT

Land Use Study of the Lowman Uranium Site

Report; 4 pp. (1976)

This report is a brief description of the existing land use of the area surrounding the Lowman, Idaho site. A map is included which denotes (1) public lands; (2) commercial property; (3) grazing land; and (4) housing (residential land). (PTO)

419

Hudman, L.E., Brigham Young University, Department of Geography, Provo, UT

Land Use Study of the Ambrosia Lake Tailing Site

Report; 4 pp. (1976)

The land surrounding the Ambrosia Lake, New Mexico uranium mill site is owned by the following: (1) Berryhill Enterprises - a private rancher who uses land primarily for grazing; (2) two mining companies that are engaged in uranium mining in the area; (3) the federal government - the Bureau of Land Management and Forest Service controls much of the land north of the site; and (4) the state of New Mexico also controls land in the area. Land values in the grazing area range from $37 to $62 per acre. A map is included which denotes land as: (a) grazing; (b) industrial; (c) housing; and (d) commercial. (PTO)

420

Hudman, L.E., Brigham Young University, Department of Geography, Provo, UT

Land Use Study of the Riverton, Wyoming Uranium Tailings Site

Report; 4 pp. (1976)

The area surrounding the Riverton, Wyoming uranium mill tailings site is used primarily for ranching and mining, with a few small manufacturing plants nearby. The Wind River Indian Reservation is the major landowner, and future land use and development is unsure. A map is included which denotes housing, industrial, and grazing lands. (PTO)

421

Hudman, L.E., Brigham Young University, Department of Geography, Provo, UT

Land Use Study of the Ray City Uranium Tailing Site

Report; 4 pp. (1976)

The Ray City area, which lies between two urban areas (Corpus Christi-Brownsville and San Antonio), depends upon ranching, farming, and mining for its economic base. Ray City is eight miles north of Three Rivers, Texas. The Army Corps of Engineers is going to build a large dam west of Three Rivers, which will generate new employment and increased demand for housing. A map is included denoting housing, industrial commercial, public, and grazing lands. (PTO)

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

422

Hudman, L.E., Brigham Young University, Department of Geography, Provo, UT

Land Use Study of the Falls River Uranium Site

Report; 4 pp. (1976)

The economic activities in the Falls City, Texas area are mainly ranching, farming, and mining. Land values are approximately $15 per acre for brush land, $20 per acre for improved pasture, and $25 per acre for cropland. It is anticipated that there will be little change in land use. A map is included that denotes land use as housing, industrial, commercial, and grazing. (PTO)

423

Hudman, L.E., Brigham Young University, Department of Geography, Provo, UT

Land Use Study of the Uranium Tailing Site at Lakeview, Oregon

Report; 4 pp. (1976)

The area surrounding the Lakeview, Oregon uranium mill tailings site is used primarily for timber and ranch lands. The Bureau of Land Management and the Forest Service have offices in Lakeview. The area south and west of the tailing pond is used for ranching and grazing. South and north of the tailing pond along an east-west oriented road are some homesites and ranchettes. Southeast of the tailings site and approximately 0.5 mile away is the area where lumber operations are conducted. Land values vary from approximately $130 to $3500 per acre. The value of improvements is reflected in the land use. A map is included which denotes housing, government, commercial, industrial, and agriculture-ranching lands. (PTO)

424

Hudman, L.E., Brigham Young University, Department of Geography, Provo, UT

Land Use Study of the Converse County Uranium Tailing Site

Report; 2 pp. (1976)

The Converse County uranium mill tailings site is located near Douglas, Wyoming. The mill site is in the middle of a ranch and is located about seven miles from the nearest paved road; therefore there is very little traffic near the site. There is a ranch house about 1.5 miles from the site. Land ownership is primarily by individual ranching operations and large land holdings. A land use map was not made due to the lack of alternate land uses in the study area. Little or no change in land use can be expected. (PTO)

425

Johnson, T.D., Woodward-Clyde Consultants, Denver, CO

Sohio Western Mining Company Tailing Dam

CONF-8005177; Uranium Mine Waste Disposal, C.O. Brawner, (Ed.), Proceedings of the First International Conference, Vancouver, British Columbia, Canada, May 19-21, 1980. American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., Society of Mining Engineers, New York, NY, 626 pp.; (pp. 467-481) (1980)

The SOHIO L-Bar Uranium Project Mine and Mill is located about 30 miles west of Albuquerque, New Mexico. The tailing dam is one of the last upstream method dams permitted in the industry. Modifications and improvements made in operating and monitoring procedures, described in the paper, will be of interest to owners and operators of other upstream method dams. The 10-year life dam has a storage capacity of 7.5 million tons. The tailing is about 75% sand sizes and 25% fines (passing the No. 200 sieve). The starter dam is about 2000 feet long, 40 feet high maximum and contains an internal drain system which includes a vertical chimney drain, connected to the sand beach, and horizontal finger drains. Seepage collected by the drain system is pumped back to the pond area. The tailing dam is raised by depositing tailing upstream of small dikes built of sand beach materials dozed from the interior. The ultimate dam height will be about 80 feet high, approximately 3800 feet long and will have an overall exterior slope of 3.5:1. Open well piezometers and movement monitoring points were installed in the starter dam. Modifications and improvements in operating procedures have included: (a) modifying the tailing delivery system to improve

the formation of the sand beach; (b) improving the hydraulic connection between the sand beach area and the starter dam drain system and adding new drains; (c) sleeving the pumped seepage pipeline where it passes over the dam; (d) purchasing a small light track pressure dozer to construct the sand dikes and training dikes to improve tailing deposition; (e) adding a detection device at the end of the tailing delivery line to monitor for disruptions in tailing flow; and (f) constructing small berms outside each roadway for safety and control of runoff. A new evaporation pond is also being considered to help maintain freeboard and the width of the sand beach. Modifications and improvements in monitoring procedures have included: (a) installing additional piezometers and movement points; (b) preparing a surveillance and maintenance manual including daily, weekly and monthly inspections and procedures for interpreting piezometer and movement point information; (c) presenting a training school on surveillance and maintenance procedures by an engineer experienced in tailing dam design, construction and operation; (d) quarterly evaluations of the dam by the same engineer; (e) aerial photos taken at monthly intervals; (f) periodic surveying of monitor movement points and the configuration of the dam; and (g) recent review of the stability of the dam based on piezometer and movement point readings and subsurface information taken from holes drilled for piezometer installation. (Auth)

426

Kearney, P.D., N.D. Kretz, and P.W. Zelle, Argonne National Laboratory, Argonne, IL

Gamma Survey Measurement Techniques at UMTRAP Sites

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 97-113) (1981)

During this past year an investigation was made to determine the appropriate gamma ray detection instruments and the most effective measurement strategy to use as part of the remedial action program from inactive mill tailings sites. This study entailed development of calibration and testing procedures for a variety of instruments, both analogue and digital. These instruments were calibrated to an ionization chamber on a tailings pile over a wide range of exposure levels. Several areas of the tailings pile were surveyed using differing techniques and the results analyzed to produce contour and profile maps. The use of a collimator and shadow shield was explored. The use of TLD's to establish long-term exposure averages was also tested. (Auth)

427

Landa, E.R., U.S. Geological Survey, Water Resources Division, Denver, CO

A Historical Review of the Radium-Extraction Industry in the United States (1906-1926)

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 3-32) (1981)

The radium extraction industry in the United States was active during a period of about 15 years during the early 20th century. Production focused on relatively high-grade carnotite ores from southwestern Colorado and southeastern Utah; the average ore grade was about 2% uranium oxide (U3O8). The radium extraction industry generated several types of wastes: (1) residues resulting from incomplete extraction from ores; (2) chemical precipitators (hydrous iron oxides, CaSO4); and (3) waste solutions. These solids, and soils contaminated by contact with waste solutions, as well as unprocessed ores, constitute a part of the waste inventory remaining at former processing sites. In contrast to these "process wastes," the sites probably also contain what might be termed "economic wastes," material disposed of as waste because of a lack of market. Uranium probably would be classed here; in the 1910-1930's, uranium had only limited uses as a glass and ceramic coloring agent, and as a steel-making alloy. Much of the uranium in treated ores was probably extracted and stockpiled as crude concentrate or merely discarded. Economics also rendered radium an economic waste in the post-1922 period, when carnotites were treated only for their vanadium content. The U.S. Bureau of Mines encouraged recovery and stockpiling of radium-bearing slimes from vanadium tailings, on the assumption that they might be valuable when the rich Congo deposits were played-out. Such desliming of tailings occurred through 1941, at least at one mill in Colorado. Tailings from the late 1930's vanadium only operations at Uravan and Naturita, Colorado, were subsequently retreated for the recovery of uranium for the Manhattan Project. (Auth)(PTO)

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

428

Latkovich, J.M., Pacific Northwest Laboratories, Richland, WA

Uranium Mill Tailings Quarterly Report, January-March, 1982

PNL-4196-2; 40 pp. (1982, May)

Progress is reported on: radon barrier systems for uranium mill tailings; liner evaluation for uranium mill tailings; revegetation/rock cover for stabilizing inactive U-tailings sites; and application of long-term chemical biobarriers for uranium tailings. (EDB)(JMF)

429

Longmire, P.A., and D.G. Brookins, University of New Mexico, Department of Geology, Albuquerque, NM

Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 315-333) (1982)

Safe long-term storage of uranium tailings in the Grants Mineral Belt, New Mexico requires understanding of chemical, physical, and biological processes and their interactions with the disposal site. These tailings contain excessive amounts of soluble sulfate salts as a result of sulfuric acid leaching. Dissolution of acidic tailings salts results in the migration of Ra, U, Th, Fe, Mn, Ca, V, and silicate phases and precipitation of Mo, As, Se bearing species. Seepage from an inactive uranium tailings impoundment shows that acid tailings seepage within a Cretaceous nearshore-marine arkosic sandstone aquifer results in slightly acidic to alkaline pH characterized by elevated concentrations of NO3, SO4, Cl and spurious amounts of Se, Na, and other major elements. There is very limited migration of radionuclides (Ra-226 and Th-230) and trace elements. Uranium is expected to be mobile in groundwater under oxidizing alkaline conditions existing as a soluble UO2(CO3)x species. Buffering [illegible]lings seepage by alkaline groundwater, and interstitial carbonate and clay minerals, including kaolinite and montmorillonite, promotes the precipitation of various metal hydroxides and oxyhydroxides. (Auth)(PTO)

430

Markos, G., and K.J. Bush, GEC Research, Inc., Rapid City, SD

Evaluation of Interface Between Tailings and Subtailings Soil, A Case Study: Vitro Tailings, Salt Lake City, Utah

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 134-153) (1981)

Our evaluation of data from a field investigation of the Vitro tailings done for the DOE UMTRA program indicates that the tailings have not contributed any detectable contamination to the environment since the time of emplacement. No chemical or radiochemical contaminants were found in the waters or soils in the vicinity of the tailings that can be associated with seepage or migration from the pile. Mineralogical, chemical, and radiochemical data from the solid material sampled in intervals through the tailings and into the underlying soils show the existence of a 10- to 30-cm interface zone between the different chemical environments of the tailings and subsoil. This interface zone acts as a chemical barrier for the exchange of materials between the two environments. The chemical changes through this zone cause neutralization of acid and precipitation of iron and carbonates along with the scavenging of contaminants. Precipitation modifies the existing physical conditions by closing pore spaces and reducing flow of water across the interface. Vertical distributions of water-soluble components show an accumulation of contaminants at the interface followed by an abrupt decrease to levels below the established local background. Radionuclides have penetrated a maximum depth of 30 cm below the tailings. Penetration of acid from the tailings is less than 40 cm, according to X-ray diffraction data. Calcite in the natural soil dissolves in the acid and the calcium reprecipitates as a coating of gypsum around the calcite. The interface zone creates a natural chemical seal which functions as a barrier against contaminant migration, precluding any need for a liner to prevent seepage. Interfacial processes also operate at the tailings/atmosphere interface. The primary variable controlling the interface processes appears to be the chemical and physical character of the subtailings soil. (Auth)(PTO)

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

431

Markos, G., K.J. Bush, and T. Freeman, GEC Research, Inc., Rapid City, SD

Geochemical Investigation of UMTRAP Designated Site at Canonsburg, Pennsylvania

UMTRA-DOE/ALO-226; GECR-R-811 (1981, May)

This report is a product of a geochemical investigation under the technology development activity of the "Uranium Mill Tailings Remedial Action Program" to fulfill the provision of Title I of Public Law 95-604, the "Uranium Mill Tailings Radiation Control Act of 1978." The main purposes of the geochemical investigation are: to assess the magnitude and extent of contamination of the environment due to the presence of the designated tailings and mill sites; to establish the conditions of mobility and movement of contaminants; to assess the significance of contaminants; and to assess the significance of chemical conditions and reactions which may, or will, affect the longevity of protective measures taken for final disposal of materials. The results of the investigations are compiled in a series of site-specific reports and in a generic report to be published in September, 1981. The site-specific reports concentrate on the existing geochemical conditions at the sites and provide interpretations of the data obtained in the investigations. The dynamic nature of chemistry and its interpretation with regard to the probable effect on remedial action will be presented in the generic report. The Canonsburg, Pennsylvania site encompasses 7.5 hectares of gently sloping land on the floodplain and higher terrace of Chartiers Creek. The site was utilized from 1911 to 1922 and from 1930 to 1942, first to remove radium from uranium ore, and later to remove uranium from ore, as well as to process various materials supplied by government contractors, ceasing operations in 1957. In Area A, mill residues and unprocessed ore materials are present, mixed with local material and various other industrial debris. Area B consists of mill residues mixed with sediment dredged from Chartiers Creek that are piled about 1.5 to 2 meters above the former surface, a disturbed terrace along Chartiers Creek, and a ditch on the north side. Area C contains the former liquid disposal lagoon; the central part of the area is highly contaminated to a depth of about 3 meters. Contamination outside the site is limited. Calculations of stabilities of the components in the waters suggest oversaturation with respect to uranium, vanadium, barium, strontium, and iron. The slow flow rate of water through the soils, allows time for chemical reactions, such as desorption and precipitation, due to the low permeability of the soils, thus potentially immobilizing contaminants. (PTO)(RAF)

432

Matthews, M.L., U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM

The Status of the Uranium Mill Tailings Remedial Actions Project (UMTRAP)

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 3-10) (1982)

In 1978, Congress enacted Public Law 95-604, the "Uranium Mill Tailings Radiation Control Act of 1978." The act authorizes the U.S. Department of Energy (DOE) to stabilize and control the tailings at designated inactive uranium mill tailings sites in a safe and environmentally acceptable manner. DOE has established the Uranium Mill Tailings Remedial Actions (UMTRA) Project Office to implement, in cooperation with the affected states, Indian tribes, and owners of the sites, remedial actions at the sites. The UMTRA Project Office has initiated efforts to perform remedial actions in accordance with EPA cleanup standards. (Auth)(PTO)

433

Matthews, M.L., U.S. Department of Energy, Albuquerque Operations Office, Uranium Mill Tailings Remedial Actions Project Office, Albuquerque, NM

The Research Effort of the Uranium Mill Tailings Remedial Actions Project

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 33-40) (1981)

Pursuant to Public Law 95-604, the "Uranium Mill Tailings Radiation Control Act of 1978," the Department of Energy established a project office to implement

dial actions at 25 inactive uranium mill tailings sites. The project office has seven years, from the time of the issuance of final EPA standards, to complete the program. A technology development program is being vigorously pursued to develop practical stabilization concepts and techniques. (Auth)(PTO)

434

Mayer, D.W., P.A. Beedlow, and L.L. Cadwell, Pacific Northwest Laboratory, Richland, WA

Moisture Content Analysis of Covered Uranium Mill Tailings

UMT-0207; PNL-4132 (1981, December)

The use of vegetation and rock covers to stabilize uranium mill tailings cover systems is being investigated by Pacific Northwest Laboratory. A modelling study of moisture movement through the tailings and cover layers was initiated to determine the effect of the stabilizing techniques. The cover system was simulated under climatic conditions occurring at Grand Junction, Colorado. The cover consisted of a layer of wet clay/gravel mix followed by a capillary barrier of washed rock and a surface layer of fill soil. Vegetation and rock were used to stabilize the surface layer. The simulation yielded moisture content and moisture storage values for the tailings and cover system along with information about moisture losses due to evaporation, transpiration, and drainage. The study demonstrates that different surface stabilization treatments lead to different degrees of moisture retention in the covered tailings pile. The evapotranspiration from vegetation can result in a relatively stable moisture content. Rock covers, however, may cause drainage to occur because they reduce evaporation and lead to a subsequent increase in moisture content. It is important to consider these effects when designing a surface stabilization treatment. Drainage may contribute to a groundwater pollution problem. A surface treatment that allows the cover system to dry out can increase the risk of atmospheric contamination through elevated radon emission rates. (EDB)

435

Narasimhan, T.N., R.M. Galbraith, A.F. White, A. Smith, H. Schmidt, B.A. Moed, and T. Tokunaga, Lawrence Berkeley Laboratory, Earth Sciences Division, Berkeley, CA

Hydro-Geochemical Studies of Uranium Mill Tailing Piles at Riverton, Wyoming and Maybell, Colorado

LBL-14486; 106 pp. (1982, May)

This is an annual report of the activities carried out by the Lawrence Berkeley Laboratory (LBL) under the Uranium Mill Tailings Remedial Action (UMTRA) program during fiscal year 1981. The LBL study was formally funded in late May 1981, and field work commenced in June. Thus, this annual report essentially covers the period June through September, 1981. The purpose of the study by LBL is to develop an understanding the physico-chemical mechanisms occurring within and beneath the piles. Specifically, LBL would investigate (a) the release of contaminants to the interstitial fluid; and b) the vertical transport of the contaminants either upward to the surface or downward to the water table. This investigation would determine the important contaminants, ascertain the influence of chemical/osmotic potentials (if any) on fluid movement, and investigate the possibility of temporal cycles in the upward/downward movement of fluids with seasonal changes in the moisture content of the piles. Considering the large number of sites and the lack of certainty which of the piles will actually have to be moved, it was decided that LBL should focus on a generic understanding of the problem by conducting studies at two carefully selected "typical sites" - Riverton, Wyoming and Maybell, Colorado. (Auth)(JMF)(RAF)

436

Nussbaumer, D.A., U.S. Nuclear Regulatory Commission, Office of State Programs, Washington, DC

Implementation of the Uranium Mill Tailings Radiation Control Act by the States

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 229-237) (1981)

The Uranium Mill Tailings Radiation Control Act of 1978 requires among other things that the "agreement states" that wish to continue to regulate uranium or thorium mill tailings must enter into an amended agreement prior to November 8, 1981. If such an amended agree-

ment is not obtained by November 8, 1981, the authority to regulate mill tailings reverts back to NRC. One of the key provisions of the act is that the states shall require compliance with standards, adopted by the state which are equivalent, to the extent practicable, or more stringent than standards adopted and enforced by the NRC for the same purpose. This paper discusses the steps the NRC has taken to assist the states in seeking amended agreements, the technical and legal problems encountered by the states in developing their programs and the status of each of the states in entering into an amended agreement. (Auth)(PTO)

437

O'Brien, P.D., Sandia National Laboratories, Albuquerque, NM

The UMTRAP Technology Development Program: A Progress Report

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 41-46) (1981)

Serving as interim technical assistance contractor to the DOE's Uranium Mill Tailings Remedial Action Project Office, Sandia National Laboratories assists the project office in directing and monitoring technology development programs directed toward assuring compliance with EPA standards for tailings disposal. This paper summarizes progress to date in the areas of cover technology, liner technology and "conditioning" technology. The presently proposed EPA standards for tailings disposal include very stringent specifications for long-term stability, radon exhalation and groundwater contamination. These standards are now under review, and some relaxation appears likely. The author offers purely personal speculations as to the content of the revised standards and their effect on the technology development program. (Auth)(PTO)

438

Overmyer, R.F., B.J. Thamer, and E.T. Cannon, Ford, Bacon and Davis Utah, Inc., Salt Lake City, UT

Instrumentation for Off-Site Remedial Action in Salt Lake City, Utah

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 193-208) (1981)

Two radiation instruments based upon commercially available scintillation counters have been developed for use on the off-site remedial action program in Salt Lake City, Utah, as a part of the Uranium Mill Tailings Remedial Action Program. One instrument utilizes a scintillation probe and single-channel analyzer for excavation control of contaminated soils during remedial action. Delta measurements are made with and without a lead shield to reduce the effect of higher than normal radiation background levels. The second instrument, developed at Argonne National Laboratory, utilizes two separate counting systems, each with a portable multichannel analyzer to determine radium concentration in canned samples of contaminated soil. A microcomputer performs the calculations to determine specific activity (pCi/g) of radium in the sample and stores the data on floppy disks. During remedial action, rapid turnaround of radium analyses is essential to avoid project and contractor delay. Methods of extrapolating bismuth-214 gamma data, taken within 48 hours of samples, to equilibrium values of radium-226 are discussed. (Auth)(PTO)

439

Rayno, D.R., M.H. Momeni, and C. Sabau, Argonne National Laboratory, Argonne, IL

Forage Uptake of Uranium Series Radionuclides in the Vicinity of the Anaconda Uranium Mill

CONF-801155; Uranium Mill Tailings Management, Proceedings of the Third Symposium, Fort Collins, CO, November 24-25, 1980, 581 pp.; (pp. 57-66) (1980)

Radiochemical analysis was performed on samples of soil and eight species of common vegetation growing on the Anaconda uranium mill site, located in New Mexico. The concentrations of the long-lived radionuclides uranium-238, uranium-234, thorium-230, radium-226, and lead-210 in these forage plants were determined. The sampling procedures and analytical laboratory methods used are described. The highest radionuclide concent

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

found in a forage species was 130 pCi of radium-226 per gram dry weight for grass growing on the main tailings pile at Anaconda, where the surface soil activity of radium-226 was 236 pCi/g. A comparison of shoots activity with that of roots and soil was used to determine a distribution index and uptake coefficient for each species. The distribution index, the ratio of root activity to shoot activity, ranged from 0.30 (thorium-230) in galleta grass (HILARIA JAMESII) to 38.0 (radium-226) in Indian ricegrass (ORYZOPSIS HYMENOIDES). In nearly all instances, the roots contained higher radionuclide concentrations. The uptake coefficient, the ratio of vegetation activity to soil activity, ranged from 0.69 (uranium-238) in Indian ricegrass roots to 0.01 (uranium-238) in four-wing saltbush (ATRIPLEX CANESCANS) shoots. The range of radionuclide concentrations in plants growing on the Anaconda mill site is compared to that in vegetation from a control site 20 km away. (Auth)

440

Rogers, V.C., K.K. Nielson, D.C. Rich, and G.B. Merrell, Rogers and Associates Engineering Corporation, Salt Lake City, UT

Measurements and Calculations of Radon Flux Attenuation by Western U.S. Soils

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 369-382) (1982)

The reduction of gaseous radon effluents from uranium mill tailings to the atmosphere is a major objective of uranium tailings reclamation and can be accomplished using soil covers. A simple procedure is presented for estimating the required thickness of soil covers. The radon diffusion coefficient for the cover material is the main parameter defining its effectiveness in containing radon. Diffusion coefficients have been measured for a wide variety of western U.S. soils under both ambient and extreme conditions. Moisture content, compaction, and grain size distribution significantly affect the radon diffusion coefficients, with moisture content having the dominant effects. A simple correlation function was fitted to 103 measured diffusion coefficients to allow predictions based on soil moisture and porosity. The geometric standard deviation between measured and predicted diffusion coefficients was 2.5; the standard deviation among diffusion coefficients measured on dry soils was only about 10%. Much larger variations in the 10% to 90% saturation range were attributed to varying soil pore size distributions, and large variations near saturation were attributed to uncertainties in the moisture saturation. (Auth)(PTO)

441

Scarano, R.A., J.B. Martin, and P.J. Magno, University of Nevada, Reno, NV

Current Uranium Mill Licensing Issues

CONF-7704103; Uranium Mining Technology, Proceedings of the First Conference, Reno, NV, April 24-29, 1977; (17 pp.) (1977)

Uranium mill licensing practices are undergoing revision in both the environmental and in-plant radiation safety areas. Concern over inactive uranium tailings sites have led to re-evaluations by state and federal regulatory agencies. Acceptable tailings management and reclamation program objectives have been identified by the U.S. Nuclear Regulatory Commission (NRC) staff. Comprehensive environmental monitoring programs will be required prior to and during mill operation to demonstrate compliance with commission regulations as well as with a recent U.S. Environmental Protection Agency Standard (40 CFR 190). In addition, upgraded in-plant radiation monitoring programs will be required to demonstrate compliance with NRC regulations to reduce occupation exposures as far below the limits specified in 10 CFR 20 as is reasonably achievable. (EDB)(JMF)

442

Schwendiman, L.C., G.W. Gee, J.N. Hartley, J. Mishima, D.R. Sherwood, W.B. Silker, R.J. Serne, R.W. Nelson, N.A. Wogman, and W.J. Deutsch, Pacific Northwest Laboratory, Richland, WA

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report

PNL-4105-2; 76 pp. (1982, April)

Pacific Northwest Laboratory (PNL) has in progress several discrete investigations for the U.S. Nuclear

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

Regulatory Commission (NRC) concerned with process wastes during the active life of uranium mills and during an extended period following their shutdown. The overall objective of this research is to provide NRC and their licensees with technical guidance on several issues related to management of wastes from uranium mills and in situ recovery operations. Principal issues addressed in these studies are: designs and performances of radon-suppression covers; the incentives and constraints in using rock covers (riprap); the design of riprap for armoring tailings pile covers; shorter term stabilization options for controlling windblown particles; leachate movement in soil; tailings dewatering; disposal deliberately below the water table; neutralization incentives; contamination control and restoration in in situ uranium recovery; effluent and environmental measurements; and instrumentation and protocols. It is expected that many results of these studies will be used in developing regulatory studies and better evaluation of environmental impacts during and following the active life of a uranium recovery facility. Progress on each of several separately identified areas is reported. The information reported is preliminary and conclusions should be regarded as tentative. About 20 topical reports are scheduled during the year to provide a detailed description of the phases of the work and conclusions drawn therefrom. (EDB)(JMF)(RAF)

443

Small, D., J. Thompson, and R. Versaw, Universal Linings, Inc., Haverford, PA; Dawn Mining Company, Ford, WA; Golder Associates, Denver, CO

Dawn Mining's Tailings Expansion Project - A Case Study in the Use of HDPE Lining

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 677-693) (1981)

Dawn Mining Company's recently completed tailings pond expansion project incorporates the use of a high density polyethylene (HDPE) lining, the first such lining installed in the north american uranium industry. This paper details the project requirements, site selection, design, regulatory requirements, project construction, and an evaluation of the overall project with special emphasis on the HDPE lining. (Auth)(PTO)

444

Smith, A.R., and B.A. Moed, Lawrence Berkeley Laboratory, Earth Sciences Division, Berkeley, CA

Recent Radiochemistry Observations at the Riverton and Maybell Tailings Piles

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 205-221) (1982)

Preliminary results are presented from the radiochemistry effort of the Lawrence Berkeley Laboratory integrated study of the inactive uranium mill tailings sites at Riverton, Wyoming and Maybell, Colorado. These results were obtained primarily by use of gamma-ray spectrometric techniques, and included both field and laboratory application of NaI(Tl) crystal and Ge-semiconductor detector systems. Current interpretation of this evidence indicates there has been downward migration of uranium within the tailings column since its implacement, and upward movement of several radionuclides from the tailings into the overlying cover material. The mechanisms responsible for these migrations are believed to involve fluid transport, and are thought to be active at the present time. (Auth)(PTO)

445

Tamura, T., and W.J. Boegly, Jr., Oak Ridge National Laboratory, Oak Ridge, TN

In Situ Grouting of Uranium Mill Tailings Piles

ORNL/TM-8539 (1983, May)

Passage in 1978 of the Uranium Mill Tailings Radiation Control Act (UMTRCA) initiated a program of remedial action for 22 existing mill tailings piles generated during the period 1940 to 1970 as part of the nation's defense and nuclear power programs. The presence of these piles poses potential health and environmental contamination concerns. Possible actions proposed include the use of: (1) multilayer covers over the piles to reduce water infiltration, radon gas releases, and airborne transport of tailings fines; (2) liners to prevent groundwater contamination by leachates from the piles; and (3) chemical stabilizers applied to the tailings to retain the radi[illegible]ve

and nonradioactive sources of contamination. Lining of the piles would normally be applicable only to piles that are to be moved from their present location such that the liner could be placed between the tailings and the groundwater. However, by using civil engineering techniques developed for grouting rocks and soils for strength and water control, it may be possible to produce an in situ liner for piles that are not to be relocated. The Uranium Mill Tailings Remedial Action Program (UMTRAP) requested that ORNL assess the potential application of grouting as a remedial action. This report examines the types of grouts, the equipment available, and the costs. An assessment is made concerning the possibility of applying grouting technology as a remedial action alternative for uranium mill tailings piles. (Auth) (PTO)

446

Tierney, M.S., Sandia National Laboratories, Albuquerque, NM

State Policies and Requirements for Management of Uranium Mining and Milling in New Mexico: Volume 3 - Adverse Effects of Uranium Mining and Milling on the Physical Environment

SAND-78-1332; 173 pp. (1979, August)

The first part of this volume is a summary of issues. It complements the second part which is a program plan proposed by the New Mexico Environmental Improvement Division (NMEID) for the study and mitigation of environmental effects of uranium mining and milling. The NMEID program plan was begun, when the lack of an adequate data base upon which the NMEID could base recommendations for new environmental laws and regulations applying to the uranium mining and milling industry, was perceived. The NMEID planning document notes that, in the absence of adequate scientific data state decisions regarding the regulation of the uranium industry may prove to be overly restrictive or not as restrictive as is necessary to assure protection of the public and the environment. To counter these tendencies, certain plans for cooperative studies involving federal and state agencies are proposed. In particular, there is the need to improve the data base for determining population radiation exposure by developing an adequate radon standard. It is concluded that the DOE's [illegible]on of energy development would be advanced by the provision of technical assistance and, in some cases, funds for certain state programs that significantly contribute to the state's ability to deal with federal regulatory agencies as an informed, independent agent in regard to problems of uranium development. (GRA) (RAF)

447

Tokunaga, T., and T.N. Narasimhan, Lawrence Berkeley Laboratory, Earth Sciences Division, Berkeley, CA

Recent Hydrologic Observations from the Riverton and Maybell Tailings Piles

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 463-473) (1982)

Field and laboratory hydrologic studies of two inactive uranium mill tailings piles are presented. The Riverton, Wyoming site is in close proximity to the water table, while the Maybell, Colorado site represents the contrasting case of the local water table being far below the tailings pile. Field studies included monitoring of hydraulic head profiles of the piles with tensiometers and piezometers, and infiltration tests. Laboratory tests on core samples from the tailings and soil cover included saturated and unsaturated hydraulic conductivity measurement, saturation versus matric head measurements, particle-size analysis, as well as determination of bulk densities and porosities. The tensiometer data indicate that the major portion of the tailings water at both piles exists under near steady-state unsaturated conditions with flow downward towards the water table. The zero-flux surface in these regions is within a meter of the upper surface of the tailings. A case of upward flow from the aquifer through the tailings was also observed in the thinnest, eastern portion of the Riverton Tailings. Combined field data and laboratory results lead to an estimated steady-state downward flow of tailings water in a typical region of the Riverton tailings in the range of 10(E-10) m/s to 10(E-9) m/s. This is equivalent to about 3 X 10(E-3) m/yr to 3 X 10(E-2) m/yr, a small fraction of the local mean annual precipitation [2.5 X 10(E-1) m/yr]. This suggests that the bulk of the precipitation input at the Riverton tailings site is lost by evapotranspiration within the upper meter of soil cover and tailings (Auth)(PTO)

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

448
Turley, R.E., University of Utah, Salt Lake City, UT

Study of the Utah Uranium-Milling Industry: Volume 1 - A Policy Analysis

UTEC-80-094; 271 pp. (1980, May)

This is the first volume of a two-volume study of the Utah Uranium Milling Industry. The study was precipitated by a 1977 report issued by the Western Interstate Nuclear Board entitled Policy Recommendations on Financing Stabilization, Perpetual Surveillance and Maintenance of Uranium Mill Tailings. This volume is a policy analysis or technology assessment of the uranium milling industry in the state of Utah; specifically, the issues deal with the perpetual surveillance, monitoring, and maintenance of uranium tailings piles at the end of uranium milling operations, i.e., following shutdown and decommissioning. The topics covered are: today's uranium industry in Utah; management of the industry's characteristic nuclear radiation; uranium mill licensing and regulation; state licensing and regulation of uranium mills; forecast of future milling operations; policy needs relative to perpetual surveillance, monitoring, and maintenance of tailings; policy needs relative to perpetual oversight; economic aspects; state revenue from uranium; and summary with conclusions and recommendations. Appendices, figures and tables are also presented. Volume II of this report serves somewhat as an appendix. It represents a full description of the uranium industry in the state of Utah, including its history and statements regarding its future. (EDB)(CAJ)(RAF)

449
U.S. Atomic Energy Commission, Grand Junction Office, Grand Junction, CO

Summary Report - Phase 1 Study of Inactive Uranium Mill Sites and Tailings Piles

Report (1974, October)

This report contains the findings of AEC, EPA, and state investigative teams that visited 21 inactive uranium mill tailings sites during May 1974. Phase 1 of the project involved a site visit to determine its condition, need for corrective action, ownership, proximity to populated areas, and prospects for increased population near the site. A preliminary report was prepared for each site to determine if a detailed engineering assessment (Phase 2) would be needed. (Auth)(PTO)

450
U.S. Atomic Energy Commission, Grand Junction Office, Grand Junction, CO

Report on Conditions of Uranium Mill Site and Tailings at Ambrosia Lake, New Mexico

Report; 13 pp. (1974)

Pertinent information has been accumulated on the Ambrosia Lake, New Mexico site from available records of the AEC, EPA, the state of New Mexico, and companies involved. An on-site visit was made to note: current conditions, including the mill site and the tailings disposal area; proximity to populated and industrialized areas; present ownership; and whether a need for corrective action exists. It is intended that this report will serve as a basis for determining the necessity of a detailed engineering assessment. (Auth)(PTO)

451
U.S. Congress, Washington, DC

Uranium Mill Tailings Radiation Control Act of 1978

Public Law 95-604 (1978, November 8)

This law authorizes the Secretary of Energy to enter into cooperative agreements with certain states concerning residual radioactive material at existing sites, to provide for the regulation of uranium mill tailings under the Atomic Energy Act of 1954, and for other purposes. The law provides for cooperative programs to assess and remedy existing hazards associated with uranium mill tailings at twenty inactive disposal sites. It also clarifies and reinforces U.S. Nuclear Regulatory Commission (NRC) authority to license and regulate the production and disposal of uranium mill tailings at active sites. The law also requires the NRC to determine the extent of the authority of the state of New Mexico to undertake appropriate remedial action to limit public exposure to radiation. (CIS)(PTO)

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

452
U.S. Congress, Washington, DC

Surface Transportation Assistance Act of 1978 - Amendment

Public Law 96-106; 7 pp. (1979, November 9)

This law amends "Title 23" of the United States Code, the Surface Transportation Assistance Act of 1978. This law also makes technical and clarifying amendments to the Surface Transportation Assistance Act of 1978 and the Uranium Mill Tailings Radiation Control Act of 1978. (CIS)(PTO)

453
U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM

Morrison-Knudsen Receives Contract for First Phase of $275 Million Uranium Mill Tailings Cleanup Project

DOE News (April 22, 1983):1-2 (1983, April)

The Albuquerque Operations Office of the U.S. Department of Energy today announced the awarding of a letter contract to Morrison-Knudsen Company, Inc., Boise, Idaho covering the first "tasks," or increment, of a seven-year program of design engineering and construction-management services under DOE's Uranium Mill Tailings Remedial Actions (UMTRA) project. The program is to be performed under a series of tasks, each subject to DOE authorization, that ultimately are expected to total in excess of $275 million of work aimed at stabilizing and controlling uranium mill tailings at 24 sites in ten states. The first task, with an estimated cost of $2.74 million, will include design work at the Canonsburg, Pennsylvania and Salt Lake City, Utah sites, establishing a job site office in Albuquerque and technical and management support activities. As previously announced, the 24 sites where the work is to be performed are located in Arizona, Colorado, Idaho, New Mexico, North Dakota, Oregon, Pennsylvania, Texas, Utah, and Wyoming. Four of the sites are located on a Navajo Reservation. (Auth)

454
U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM

EPA Issues Standards on Uranium Tailings

UMTRA Action (January 14, 1983):1 (1983)

The U.S. Environmental Protection Agency (EPA) administrator, Anne M. Gorsuch announced on December 15, 1982, that the agency has issued health and environmental protection standards to govern the cleanup and long-term control of tailings generated from uranium ore that was processed during and shortly after World War II. The standards are applicable to the 24 UMTRA project sites and their associated vicinity properties. The cleanup standards for contaminated land require surface contamination to be less than 5 pCi/g radium-226 in soil and less than 15 pCi/g radium-226 in soil below the surface (depths greater than 15 cm). Radon releases from the piles are limited to less than 20 pCi/sq m/s. The standards require control methods for tailings piles to be effective for at least 200 years, and to the extent possible for 1,000 years. EPA surveys indicate as many as 6500 vicinity properties may have been contaminated by tailings dispersed from the piles through wind and water activity or removed for use as construction material. Under the EPA standards, tailings used in construction must be removed where the radon level exceeds 0.03 WL. The standards were published in the Federal Register on January 5, 1983. (Auth)(PTO)

455
U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM

UMTRA Questions and Answers

DOE News (December 1982):1-4 (1982)

This article contains the answers to frequently asked questions concerning the following aspects of the Uranium Mill Tailings Remedial Actions (UMTRA) project: purpose of the project; responsibility for the project; description of uranium mill tailings; description of inactive uranium mill tailings sites; description of vicinity properties; major concerns related to tailings management; necessity of remedial action; reasons for delays in carrying out remedial actions; description of stabiliza-

tion, disposal, and control of uranium tailings piles; identification of the inactive uranium mill tailings sites; description of work to be done at the inactive tailings sites; contractors responsible for the work done at the inactive sites; completion schedule for work to be done; and cost of the remedial actions to be performed at these sites. (Auth)(PTO)

456

U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM

Cost Reduction Study Completed

UMTRA Action (January 14, 1983):1 (1983)

A study team made up of seven members and three advisors representing the DOE, the TAC, and Sandia National Laboratories has been working since late August 1982 on recommendations to reduce the total estimated cost (TEC) of the UMTRA project. Their recommendations, if adopted, could reduce the project's TEC by at least $19.3 million. Potential additional cost savings will be sought in the actual construction phase. The cost reduction study was based on a comprehensive review of the functional, structural, and institutional components and processes of the UMTRA project. All aspects of the project were evaluated to reduce costs, improve management, and increase efficiency. (Auth) (PTO)

457

U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM

DOE Awards Contract for Salt Lake City Cleanup

DOE News (May 1983):1 (1983, May 3)

The U.S. Department of Energy (DOE) has awarded a $97,130.50 contract to the firm of Gerber Concrete Construction, Inc., of Salt Lake City to decontaminate four vicinity properties in Salt Lake County near the old Vitro Chemical Uranium Processing Site. Clean-up work at the four locations will begin this month and is scheduled to be completed in late July 1983. Contamination at the vicinity properties consists mainly of low-level radioactive mill tailings that were removed from the Vitro site and used as both exterior and interior fill material. Remedial actions will primarily consist of excavating the contaminated fill materials, and replacing them with clean fill dirt. Once that is completed, the properties will be restored to their original condition. Approximately 92 locations, both commercial and residential, have been identified as vicinity properties in the Salt Lake City area and will undergo remedial actions over the next three years. All contaminated material will be returned to the Vitro mill site. Clean-up of vicinity properties is being directed by the DOE's Uranium Mill Tailings Remedial Actions Project Office, Albuquerque, New Mexico, as part of the Uranium Mill Tailings Remedial Actions Program. (Complete Text)

458

U.S. Department of Energy, Albuquerque Operations Office, Public Affairs Division, Albuquerque, NM

Canonsburg Construction Firm Selected for Vicinity Property Cleanup Efforts

DOE News (May 1983):1 (1983, May 16)

The U.S. Department of Energy (DOE) has chosen Gregg Inc., a Canonsburg construction firm, as the major subcontractor to perform remedial actions work on vicinity properties contaminated with radioactive materials from the inactive uranium mill tailings pile at the Vitro site (formerly Canon Industrial Park). The construction work will consist of two major efforts. NLO, Inc., formerly National Lead of Ohio, Inc., is already under contract with DOE to oversee all remedial action work on vicinity properties. The first effort to be completed consists of cleanup activities at the Town Park. Work will begin this month, and is scheduled for completion within six weeks. The second stage of the work will be decontamination of approximately 25 residences, and will be completed by the end of August 1983. All vicinity properties will be restored to their original condition. Contaminated material removed from the vicinity properties will be returned to the Vitro site for stabilization. Total cost of the project is estimated at $630,000. Gregg Inc. will use primarily local labor for construction activities. The DOE has also chosen Eberline Instrument Corporation of Albuquerque, New Mexico, to provide radiological support during work on the vicinity properties. Eberline will perform radiological survey and

measurements, and manage the health and safety program for DOE and NLO, Inc. The remedial action activities at Canonsburg are being managed by the Uranium Mill Tailings Remedial Actions Project Office, Albuquerque Operations Office (New Mexico), as part of the DOE's Uranium Mill Tailings Remedial Action Program. (Auth)(PTO)

459

U.S. Department of Energy, Assistant Secretary for Defense Programs, Washington, DC

Commingled Uranium-Tailings Study: Volume 1, Plan for Stabilization and Management of Commingled Uranium-Mill Tailings

DOE/DP-0011 (Vol. 1); 26 pp. (1982, June)

This report, prepared in accordance with Section 213 of Public Law 96-540, presents a plan for a cooperative program to provide assistance in the stabilization and management of commingled uranium mill tailings. The report is organized in two volumes, a summary report (Volume I) and a companion technical report (Volume II). Contents of Volume I are: summary; background; amount and condition of the tailings; regulatory requirements; stabilization cost estimates; cost sharing alternatives; administrative options and plan implementation; standards and regulations. DOE recommends that the standards and regulations for tailings stabilization be relaxed and that any program of stabilization be limited to prevention of migration and erosion of the tailings and prevention of inadvertent exposure to them. The plan presented here shows the effort and costs that would be incurred if the government were to implement such a plan. The Department makes no recommendation as to the advisability of actually implementing legislation authorizing an assistance program, and stands ready to respond to comments on the plan by Congress, other government agencies, or interested parties. (EDB)(JMF)

460

U.S. Department of Energy, Office of Inspector General, Washington, DC

The Management of the Uranium Mill Tailings Remedial Action Program

DOE/IG-0191; 21 pp. (1983, March 18)

The Uranium Mill Tailings Remedial Action (UMTRA) Program was implemented by DOE to comply with Public Law 95-604, the "Uranium Mill Tailings Radiation Control Act of 1978." That act authorized DOE to enter into cooperative agreements with states and Indian tribes for the purpose of remedying radiation health hazards found at inactive uranium mill tailings sites and associated vicinity properties. Under the act, DOE was given seven years to complete the UMTRA program after promulgation of final cleanup standards by the U.S. Environmental Protection Agency (EPA). The major activity of the program is conducted by the UMTRA Project Office at the DOE Albuquerque Operations Office where management is focused on: (1) remedial actions at properties in the vicinity of uranium mill tailings sites; and (2) planning for and implementing stabilization in-place or relocation of the uranium mill tailings at 24 former processing sites that have been designated for remedial actions by the DOE Secretary of Energy. As a result of the inspection of the program, the following recommendations have been made: (1) ensure that EPA's supplemental standards are used in conducting remedial actions when the cost is clearly unreasonably high compared with the benefits; (2) when remedial action is necessary, the most cost-effective option that meets the EPA standards should be identified and selected; consideration should be given to the use of sealants, filtration, and ventilation devices in appropriate circumstances; (3) vicinity properties that do not exceed the EPA standards should not be designated for remedial action; (4) the designated sites and vicinity properties should be ranked according to the health risks they present to the public - remedial actions should proceed according to a schedule that corrects problems at those sites and vicinity properties that present the greatest health risk, unless there are cost advantages to grouping less contaminated properties with those presenting a greater health risk. (PTO)

461

U.S. Department of Energy, Office of Terminal Waste Disposal and Remedial Action, Washington, DC

Annual Status Report on the Uranium Mill Tailings Remedial Action Program

DOE/NE-0025/1; 26 pp. (1982, December)

During FY 1982, aerial radiological surveys were con-

ducted in the vicinity of the Maybell, Colorado and Green River, Utah sites. Mobile gamma radiation surveys were conducted in the vicinity of 15 mill tailings sites; two in Arizona, seven in Colorado, two in Mew Mexico, three in Utah, and one in Wyoming. Comprehensive on-site radiological survey activities were completed in the vicinity of Canonsburg, Pennsylvania site, were continued in Salt Lake City, Utah, and were initiated in Durango, Colorado and Shiprock, New Mexico. To date, approximately 230 comprehensive surveys (62 in FY 1982) have been completed by ORNL and ANL. Draft "cooperative agreements" were forwarded to the states of Idaho, New Mexico, North Dakota, Oregon, Texas, and Wyoming. Cooperative agreements have been previously executed with Colorado, Pennsylvania, and Utah. It is anticipated that an agreement with North Dakota will be executed in December 1982. EPA standards for the UMTRA program were submitted to OMB in September 1982, and are scheduled to be promulgated in the first quarter of FY 1983. On February 10, 1982 Pennsylvania initiated condemnation proceedings to acquire title to the Canonsburg processing site. Accelerated schedules have been developed for two high priority sites, Canonsburg and Salt Lake City. Remedial actions are to begin in October 1983. (PTO)

462

U.S. Department of Energy, Washington, DC

Uranium Mill Tailings Remedial Action Program: Annual Status Report

DOE/NE-0025; 26 pp. (1981, December)

The purposes of this program are to stabilize and control tailings and other radioactive materials located at inactive uranium-processing sites located in 10 states in a safe and environmentally sound manner and to minimize or eliminate the potential radiation health hazards to the public. This report summarizes the activities undertaken during FY 1981 by DOE and other agencies. Progress and present status are described under the following headings: radiological surveys and inclusion of vicinity properties; establishment of cooperative agreements; promulgation of standards for remedial action; acquisition of land and materials; reprocessing of residual radioactive materials; National Environmental Policy Act documentation; program planning; technology development; remedial action; public participation; interagency program activities; other federal agency activities; and state and Indian Tribe activities. (EDB) (JMF)

463

U.S. Environmental Protection Agency, Office of Radiation Programs, Las Vegas, NV

State of Idaho Community Summary Report for Radiation Surveys - Lowman, Idaho

Report; 9 pp. (1973)

This report presents the results of a mobile gamma scan that was conducted in and around the Lowman, Idaho uranium mill tailings site. After the scanning survey was performed, field survey teams performed gamma screening surveys of the locations reported by the mobile scanning unit. During the screening survey, a field report was completed. A survey was performed at a location only after permission was obtained from the owner. The mobile gamma scanning unit reported ten gamma radiation anomalies from the 25 structures scanned in Lowman. Of the 12 field forms prepared for anomalies checked out, nine were tailings locations and three were non-tailings locations. The determined causes of the reported 12 anomalies are as follows: natural activity in fireplace brick (1 location); natural activity in river gravel (2 locations); tailings and ore on property (1 location); and tailings used under or within ten feet of a habitable structure (8 locations). (PTO)

464

U.S. Environmental Protection Agency, Office of Radiation Programs, Washington, DC

Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192): Draft Environmental Impact Statement

PB-81-152662; 269 pp. (1980, December)

The Environmental Protection Agency is proposing standards for disposing of uranium mill tailings from inactive processing sites, and for cleaning up contaminated open land and buildings. These standards were developed pursuant to the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604). This act requires EPA to promulgate standards to protect the environment and the public from radioactive and nonradioactive hazards posed by uranium mill tailings at designated inactive processing sites. The Draft Environmental Impact S

ment examines health, technical, cost, and other factors relevant to determining standards. The proposed standards for disposal of tailings piles cover radon emissions from the tailings to the air, protection of surface and groundwater from radioactive and nonradioactive contaminants, and the length of time the disposal system should provide a reasonable expectation of meeting these standards. The proposed cleanup standards limit indoor radon decay product concentrations and gamma radiation levels and the residual radium concentration of contaminated land after cleanup. (EDB)(JMF)

465

U.S. Environmental Protection Agency, Office of Radiation Programs, Washington, DC

Regulatory Impact Analysis of Environmental Standards for Uranium Mill Tailings at Active Sites

EPA-520/1-82-023 (1983, March)

The Environmental Protection Agency (EPA) is proposing health and environmental protection standards for control of uranium and thorium tailings during ore processing operations and for final disposal. These standards would apply to tailings licensed by the U.S. Nuclear Regulatory Commission and the states under Title II of the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604). This regulatory impact analysis examines the costs, benefits, and economic impacts of alternative control methods and presents the rationale for the selection of the proposed standards. The report contains the following chapters: Introduction; Industry Profile; Objectives of Standards and Control Methods; Benefit-Cost Analysis; Industry Cost and Economic Impact Analysis; Selection of Proposed Standards. The report also contains the following appendices: A - Mill Closure Analysis; B - Projections of Price, Demand, and Production; C - Annual Industry Disposal Costs, by Economic Impact Case and Industry Category, 1980-2000; and D - Regulatory Flexibility Act Certification. (Auth)(PTO)

466

U.S. Environmental Protection Agency, Office of Radiation Programs, Washington, DC

Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 1

EPA-520/4-82-013-1 (1982, October)

The U.S. Environmental Protection Agency (EPA) is issuing final standards for the long-term control of tailings piles at inactive uranium processing sites and for cleanup of contaminated open land and buildings. These standards apply to tailings at locations that qualify for remedial actions under Title I of Public Law 95-604, the Uranium Mill Tailings Radiation Control Act of 1978. This act requires EPA to promulgate standards to protect the environment and the public health and safety from radioactive and nonradioactive hazards posed by residual radioactive materials at the 22 uranium mill tailings sites designated in the act and at additional sites containing deposited material from the 22 sites as designated by the Secretary of the Department of Energy. The final environmental impact statement (Volume 1) examines health and technical considerations, as well as costs and other factors relevant to determining standards. Volume 2 contains EPA's responses to comments on the proposed standards and the draft environmental impact statement (EPA 520/4-80-011). (Auth)(PTO)

467

U.S. Environmental Protection Agency, Office of Radiation Programs, Washington, DC

Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 2

EPA-520/4-82-013-2 (1982, October)

The U.S. Environmental Protection Agency (EPA) is issuing final standards for the long-term control of tailings piles at inactive uranium processing sites and for cleanup of contaminated open land and buildings. These standards apply to tailings at locations that qualify for remedial actions under Title I of Public Law 95-604, the Uranium Mill Tailings Radiation Control Act of 1978. This act requires EPA to promulgate standards to protect the environment and the public health and safety from radioactive and nonradioactive hazards posed by

residual radioactive materials at the 22 uranium mill tailings sites designated in the act and at additional sites containing deposited material from the 22 sites as designated by the Secretary of the Department of Energy. Volume 2 contains EPA's responses to comments on the proposed standards and the draft environmental impact statement (EPA 520/4-80-011). (Auth)(PTO)

468

U.S. Environmental Protection Agency, Office of Radiation Programs, Washington, DC

Draft Environmental Impact Statement for Standards for the Control of Byproduct Materials from Uranium Ore Processing (40 CFR 192)

EPA-520/1-82-022 (1983, March)

The U.S. Environmental Protection Agency is proposing health and environmental protection standards for control of uranium and thorium tailings during ore processing operation and for final disposal. These standards would apply to tailings licensed by the U.S. Nuclear Regulatory Commission and the states under Title II of the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604). This draft environmental impact statement examines health, environmental, technical, and cost considerations and other factors important to developing the proposed standards. In this report alternative standards for disposal of uranium mill tailings and alternative standards for control of environmental releases from tailings during the operational phase of uranium mills are discussed. Both radioactive and nonradioactive releases are considered. Potential effects of tailings on health are estimated, along with the effectiveness and costs of different control approaches. The report also includes coverage of the following topics: description of the uranium industry; description of uranium tailings; description of a model site and tailings pile; description of pathways through which radioactive and hazardous materials may cause exposure to man; estimations of potential health effects; review of emission control measures for the operating period of the mill; discussion of the efficacy and longevity of the principal methods for disposing of tailings; cost estimates for disposal methods for existing and future tailings at model sites; and analysis of costs and benefits for tailings standards options. (Auth)(PTO)

469

U.S. Environmental Protection Agency, Washington, DC

Standards for Remedial Actions at Inactive Uranium Processing Sites

Federal Register 48(3):590-604 (1983, January 5)

Final health and environmental standards have been issued to govern stabilization, control, and cleanup of residual radioactive materials at inactive uranium processing sites. These standards were developed pursuant to Section 275 of the Atomic Energy Act (40 U.S.C. 2022) as added by Section 206 of the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604), and were proposed in April 1980 and January 1981. The standards apply to tailings at locations that qualify for remedial action under Title 1 of Public Law 95-604. The standards for control provide that the tailings be stabilized in a way that gives reasonable assurance that the health hazards associated with the tailings will be controlled and limited for a long period of time. They also establish a requirement to control the releases of radon from tailings piles. The standards for cleanup set limits on the radon decay-product concentration and gamma radiation levels in buildings affected by tailings and on the radium-226 concentration in contaminated land. In response to comments on the proposed standards for disposal and for cleanup, we have evaluated a number of alternatives in terms of their costs and the reductions achievable in potential health effects. A number of changes have been made, including raising some of the numerical limits and eliminating some requirements. The purpose of most of these changes is to make implementation easier and less costly. The changes should not result in any substantial loss of health or environmental protection over that which would have been provided by the proposed standards. (Auth)(PTO)

470

U.S. Environmental Protection Agency, Washington, DC

Proposed Remedial Action Standards for Inactive Uranium Processing Sites - Instructions and Schedule for Public Hearings

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

Federal Register 46(48):167278-167280 (1981, March 12)

The Environmental Protection Agency (EPA) published proposed standards for the cleanup and disposal of residual radioactive materials from inactive uranium processing sites. This notice includes the dates and addresses of public hearings on these proposed standards. In addition a description of the purpose and form of the hearings, and the procedures for submitting and presenting information and comments regarding the proposed standards is included. (PTO)

471
U.S. Environmental Protection Agency, Washington, DC

Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites - Invitation for Comment

Federal Register 48(84):19584-19603 (1983, April 29)

Health and environmental standards are proposed to govern stabilization and control of byproduct materials (primarily mill tailings) at licensed commercial uranium and thorium processing sites. These standards were developed pursuant to Section 275 of the Atomic Energy Act (42 USC 2022) as added by Section 206 of the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604). The standards would apply to tailings at locations that are licensed by the U.S. Nuclear Regulatory Commission (NRC) or the states under Title II of the act. The standards for disposal of tailings would require stabilization so that the health hazards associated with tailings will be controlled and limited, in most cases, for at least one thousand years. The standards would limit releases of radon to 20 pCi/sq m/s, averaged over the surface of the piles, and require measures to avoid releases of other hazardous substances from tailings to water. The standards for tailings at operating mills, prior to disposal, would add limits on the radiation levels in effluents to groundwater to the limits now specified under the Solid Waste Disposal Act, as amended. Existing EPA regulations and Federal Radiation Protection Guidance currently applicable to tailings would remain unchanged. This notice summarizes the technical information and other considerations upon which these proposed standards are based. More detailed background material is contained in a Draft Environmental Impact Statement (DEIS) and in a Regulatory Impact Analysis (RIA). (Auth)(PTO)

472
U.S. Senate, Committee on Environment and Public Works, Washington, DC

Implementation of the Uranium Mill Tailings Radiation Control Act of 1978

Hearing of the Committee on Environment and Public Works, United States Senate, 97th Congress, First Session, June 16, 1981, Serial Number 97-H24; 618 pp. (1981, June 16)

Three panels of witnesses spoke at a June 16, 1981 hearing on the implementation of the Uranium Mill Tailings Radiation Control Act of 1978. Of particular concern are public health effects and the cost effectiveness of U.S. Environmental Protection Agency activities. The nine panel participants represented federal and state health and environmental agencies, the U.S. Nuclear Regulatory Commission, the National Wildlife Federation, and uranium mining companies. Additional statements were submitted by members of the medical profession and others. (DCK)(PTO)

473
U.S. Senate, Washington, DC

Residual Radioactive Materials Act of 1978

U.S. Senate Report 95-1266; 16 pp. (1978, October 3)

This report recommends passage, with an amendment in the nature of a substitute of S. 3078, the Residual Radioactive Materials Act of 1978, to provide for cooperation between U.S. Department of Energy and state programs to assess and remedy existing radioactive hazards associated with uranium mill tailings, the waste product of the uranium ore milling process, at 24 inactive disposal sites. The bill also provides for U.S. Environmental Protection Agency establishment and U.S. Nuclear Regulatory Commission enforcement of standards for mill tailings disposal. (CIS)(PTO)

CHAPTER 4. URANIUM MILL TAILINGS REMEDIAL ACTION PROGRAM

474
Uranium Mill Tailings: Congress Addresses a Long-Neglected Problem

Science 202(4364):191-195 (1978, October)

In view of the hazards connected with previously inadequate disposal of the uranium tailings, Congress is moving to take remedial action, both with respect to eliminating (or otherwise dealing with) piles at inactive sites and making sure that the hazards associated with present and future uranium milling operations are kept to an acceptable minimum. The Senate passed a bill in mid-September to reinforce the NRC's authority to regulate tailings disposal. Under this bill, states that have opted to license uranium mills themselves would have to follow standards at least as stringent as those of the NRC. The House of Representatives is expected to take up a tailings disposal bill which its Interior and Commerce committees have approved. Its provisions for strengthening federal and state regulation of tailings disposal are similar to those of the Senate-passed measure. But, in addition, this bill would have the Department of Energy clean up all of the inactive piles except perhaps a few for which business might be made financially responsible. The federal government would pay 90% of the total cost of an estimated $140 million; the states in which the piles are found, would pay the other 10%. Questions facing the NRC in regard to the disposal problem are discussed. (JGB)(EDB)(JMF)(RAF)

475
Veyera, G.E., and J.D. Nelson, Colorado State University, Department of Civil Engineering, Fort Collins, CO

Unsaturated Hydraulic Parameters of Grand Junction Uranium Tailings

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 557-578) (1981)

Experiments were performed to investigate the effects of grain size and packing on the unsaturated hydraulic parameters of uranium mill tailings. Two soils, beach sand and slimes obtained from an inactive mill site in Grand Junction, Colorado, were used in the experiments. The laboratory technique used employed a pressure saturation apparatus. An empirical analysis developed by Brooks and Corey was used to determine the unsaturated hydraulic parameters. Results indicate that the influence of increasing amounts of fines significantly affects these parameters and the physical behavior of the soils. This information will be especially useful in the reclamation of the inactive uranium mill tailings sites. (Auth)(PTO)

476
Whicker, F.W., Colorado State University, Fort Collins, CO

Radioecological Investigations of Uranium-Mill-Tailings Systems: Second Technical Progress Report, October 1, 1980-September 30, 1981

DOE/EV/10305-2; 103 pp. (1981, October)

This document includes a status report on studies which address some of the problems and questions regarding the integrity and transport of uranium and certain radioactive progeny in active and reclaimed uranium mill tailings. The studies reported are being conducted at Pathfinder Mines Corporation's Shirley Basin Uranium Mine, located in a remote area of Carbon County in southeastern Wyoming. A considerable amount of effort, especially during the first few years of the study, must relate to basic characterization of the general environs as well as of specific study plots. Such characterization, which is essential for interpretations of analytical results for radionuclides, involves investigation of climate, soils, underground water, vegetation, and animals. Early results of such characterization work are reported herein. This investigation includes as a major component, studies relating to disposal of mill tailings by earthen covers. Of interest are the effects of various types and thicknesses of covers on radon emanation, ambient gamma radiation, biological incorporation of radionuclides, stability of soil and plant communities and physical migration of radioactivity. This report also summarizes work relating to levels of thorium-230, radium-226, and polonium-210 in water, soils and vegetation from background (uncontaminated) sites, from areas near the tailings pond, and from reclaimed overburden areas. Another major activity is the investigation of specific mechanisms which lead to contamination of vegetation with radionuclides. The processes of root uptake and aerial deposition are under study through a

variety of designed experiments and sampling schemes. A small-scale study on the metabolism of polonium-210 by mule deer and antelope is also reported. (EDB)(JMF)

477

White, A.F., and J.M. Delany, Lawrence Berkeley Laboratory, Earth Sciences Division, Berkeley, CA

Chemical Transport Beneath a Uranium Mill Tailings Pile, Riverton, Wyoming

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 295-313) (1982)

A detailed geochemical study at the Riverton site was undertaken in order to define the nature of chemical transport between an inactive tailing pile and the relationship between the underlying shallow groundwater system. Isotopic measurements of oxygen, deuterium, and tritium showed that although both the shallow alluvial aquifer and a deeper aquifer in the Wind River Formation were derived from a similar source, the nearby river. Recharge from the tailings pile is occurring only in the shallow alluvium. The S-34/S-32 ratios are used as a conservative tracer in defining zones of tailings water contamination. Offsite, drilling has revealed the existence of a chemical plume in which calcium and sulfate concentrations are an order of magnitude or more above background. The plume is also characterized by high dissolved molybdenum concentrations. Pore waters in the tailings exhibit extremely high concentrations of Al, Fe, and SO4 and a low pH. The dissolution of calcite occurs in the alluvium beneath the pile, which is characterized by high partial pressures of CO2(g) in the tailings while serving to neutralize pH. The groundwater, however, remains saturated with CaCO3, suggesting that a buffering capacity is active. Beneath and downgradient from the tailings, the groundwater becomes saturated with gypsum. The chemical speciation code, PHREEQE, was used to model mixing reactions, assuming a hydrologically static system. Reaction path simulations were fit to observed trends of pH that were depressed in the contaminated groundwater. The simulations estimate 1% mixing of tailings-pore water with groundwater from the shallow alluvial aquifer. (Auth)(PTO)

478

Williams, J.M., E.J. Cokal, and D.R. Dreesen, Los Alamos National Laboratory, Los Alamos, NM

Removal of Radioactivity and Mineral Values from Uranium Mill Tailings

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 81-95) (1981)

One possible approach to remedial action on uranium mill tailings involves the removal of the components that are responsible for the environmental concern (notably radon releases) posed by these materials. Removing mineral values at the same time can defray much of the cost. This paper presents laboratory results on sulfuric acid leachings and their effectiveness in accomplishing these aims. Composite tailings from the Shiprock, Salt Lake City, and Durango sites have been acid-leached with 0.001N, 0.01N, 0.1N, 1N, 10N, and concentrated H2SO4 at a solid-to-liquid mass ratio of 1 to 5. The amount of extractable material has been evaluated for 20 metals and non-metals, 5 anions, and 5 radioactive species. The effectiveness of elemental leaching by different concentrations of sulfuric acid appears to vary according to the quantity of the element present in the tailings and the equilibrium pH of the slurry. Those tailings that have inherent alkalinity do not become acidic until the acid concentrations are often 1N or higher. Maximum extraction occurs for almost every element when the acid concentration is equal to or greater than 1N. Most elements show greater extraction by 10N than by concentrated sulfuric acid. Notable exceptions are Ac-227, Ba, Ca, and Ra-226. Solubilization of the insoluble sulfate forming elements (Ba, Ca, and Ra) is thought to occur through nonaqueous solvation. The extent and type of mineral value extraction is site-dependent, but principally related to the amount of non-sand material and the efficiency of the previous milling operation. The Durango pile and the ferrophos area of the Salt Lake City pile have a large number of potential mineral values including Cu, Mn, Mo, U, V, and Zn. Molybdenum and vanadium may have economic potential at the other sites studied (Shiprock and Salt Lake City). Decontamination of mill tailings is principally needed to reduce radon emanations. This can be achieved if the radon precursors (Th-230 and Ra-226) are removed. Substantial removal of Th-230 is obtained with 10 N acid (55% to 65%). The extractability of Th-230 by sulfuric acid was expected as

thorium salts are acid soluble. The leachability of Ra in concentrated H2SO4 was perceived as a possibility because of the solubility of its alkaline earth analogs calcium and barium. These single-staged extractions give promise that a multi-staged process can reduce these contaminants to acceptable levels whether the tailings are covered or not. (Auth)(PTO)

121/72

Chapter 5

GRAND JUNCTION REMEDIAL ACTION PROGRAM

CHAPTER 5. GRAND JUNCTION REMEDIAL ACTION PROGRAM

479
Addison, S.J., Western Colorado Radiologic Associates; Grand Junction, CO

Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 169-179) (1981)

Mesa County, Colorado has been a location of concern regarding the carcinogenic effect of chronic exposure to uranium mill tailings. This study utilizes a recent comprehensive report on health effects of low-level radiation to determine individual risks of excess cancer in the Mesa County population. Risks from radiation levels throughout the county are considered, with emphasis placed on sites included in the mill tailings removal project. Evidence indicates only a few, if any, cancers would be induced by the county's increased gamma levels, and these would probably not be discernable at a statistically significant level. However, elevated levels of alpha emitters, which cause irradiation of the bronchial epithelium, could conceivably increase an individual's chance of lung cancer. (Auth)

480
Church, H.W., and G.T. Gay, Sandia National Laboratories, Albuquerque, NM

Meteorological Tower Data, Grand Junction Tailings Site, CO - Semi-annual Report, July-December, 1981

SAND-82-0722; 16 pp. (1982, June)

A 10-m tower was erected at the Grand Junction abandoned uranium mill tailings pile to collect on-site, detailed meteorological measurements. This report describes the site, equipment, data processing, and lists the data for the first six months of operation. (EDB) (JMF)

481
U[illegible] Congress, Washington, DC

Radiation Exposure - Remedial Action

Public Law 95-236; 2 pp. (1978, February 21)

This law authorizes appropriations for financial assistance to limit radiation exposure to the public from uranium mill tailings used for construction, and for other purposes. The law extends and increases authorizations for and transfers to the U.S. Department of Energy jurisdiction of the ERDA program, providing financial assistance to Colorado to limit radiation exposure from uranium mill tailings used as fill dirt at construction sites in Grand Junction, Colorado. (CIS)(PTO)

482
U.S. Department of Energy, Assistant Secretary for Nuclear Energy, Washington, DC

Remedial Action Program

DOE/NE-0039; Program Summary - Nuclear Waste Management and Fuel Cycle Programs, 79 pp.; (pp. 39-56) (1982, July)

This section describes in detail each of the U.S. Department of Energy's Remedial Action Programs: Formerly Utilized Sites Remedial Action Program (FUSRAP); (2) Uranium Mill Tailings Remedial Action Program (UMTRAP); (3) Grand Junction Remedial Action Program (GJRAP); and (4) Surplus Facilities Management Program (SFMP). Included are maps of the program sites, charts detailing strategy for the program activities, program milestone schedule, and activity priorities. (PTO)

483
U.S. Department of Energy, Office of Nuclear Waste Management, Washington, DC

Commercial Nuclear Waste - Remedial Action Program

DOE/NE-0008; Nuclear Waste Management Program Summary, 273 pp.; (pp. 156-172) (1980, March)

A description is presented of the four U.S. Department of Energy's Remedial Action Programs: (1) MED/AEC

CHAPTER 5. GRAND JUNCTION REMEDIAL ACTION PROGRAM

Sites (FUSRAP); (2) Grand Junction (GJRAP); Uranium Mill Tailings (UMTRAP); and (4) Decontamination and Decommissioning of Surplus DOE Facilities (SFMP). Also included is a description of the status of each program, planned activities, technology development, and milestones. (PTO)

175/176

Chapter 6

URANIUM MILL TAILINGS MANAGEMENT

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

484

Anderson, L.R., D.S. Bowles, R.V. Canfield, and K.D. Sharp, Utah State University, Logan, UT

Probabilistic Modeling of Tailings Embankment Designs - Volume 1: Model Development and Verification

Bureau of Mines Open File Report 161(1)-82 (1982, January)

A pseudo three-dimensional probabilistic slope stability model has been developed that treats shear strength as a random variable. The model uses the probability of a slope failure as an assessment of slope reliability. The model can accommodate zoned embankments of soil in which the strength is described by the Mohr-Coulomb strength envelope. Autocorrelation functions are used to describe the spatial correlation of the strength parameters c and tan phi. Model error can also be included in the analysis. Examples are presented to illustrate the influence of the choice of the soil strength variability parameters on the probability of failure. (Auth)(PTO)

485

Australia - Management of Mine and Mill Tailings

PNL-4405; Summary of Non-U.S. National and International Fuel Cycle and Radioactive Waste Management Program, 100 pp.; (p. 16) (1982, August)

The Australian Atomic Energy Commission (AAEC) studies of technology to reduce the environmental impact of uranium mining and milling have been focused mainly on improvements in the control of radium and radon. The program includes: (1) study of radium and heavy metal concentrations in tailings and process waste solutions; (2)determination of factors affecting the natural leaching of radium from tailings; (3) laboratory studies of the feasibility of chemical extraction of radium by leaching in strong salt solutions; (4) determination of radon release from ores and tailings under various conditions and assessment of the feasibility of removing radon from air streams; and (5) studies of surface hydrology at prospective mines and mills. (Auth)(PTO)

486

Baker, E.G., H.D. Freeman, J.N. Hartley, and G.W. Gee, Pacific Northwest Laboratory, Richland, WA

Cost and Effectiveness of Radon Barrier Systems

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 383-395) (1982)

Earthen, asphalt, and multilayer radon barrier systems can all provide reductions in the amount of radon gas released from uranium mill tailings. Pacific Northwest Laboratory field tested all three types of covers at Grand Junction, Colorado, during the summer of 1981. All nine individual radon barrier systems tested currently meet the EPA standard for radon flux of 20 pCi/sq m/s. The cost of the asphalt and 3-m earthen covers were about the same; multilayer covers were significantly more costly. Cost estimates for three high priority western sites indicate 3 m of earthen cover is the least costly radon barrier when earthen material is available at or near the disposal site. If earthen material must be imported more than 8 to 19 km, asphalt and possibly multilayer radon barriers can be cost effective. The estimated cost of earthen, asphalt, and multilayer covers at three high priority western sites ranged from $18 to $33/sq m for compacted 3-m earthen cover, $23 to $28/sq m for a 6-cm asphalt cover, and $31 to $36/sq m for a 15-cm alum gel multilayer cover. (Auth)(PTO)(RAF)

487

Baker, E.G., and J.N. Hartley, Pacific Northwest Laboratory, Richland, WA

Cost of Radon-Barrier Systems for Uranium Mill Tailings

DOE/UMT-0211; PNL-4408; 41 pp. (1982, August)

This report deals with the cost of three types of radon barrier systems, earthen covers, asphalt emulsion covers, and multilayer covers, which could meet standards proposed by the Environmental Protection Agency to stabilize uranium mill tailings located primarily in the western US. In addition, the report includes a sensitivity analysis of various factors which significantly affect the

overall cost of the three systems. These analyses were based on a generic disposal site. Four different 3-m thick earthen covers were tested and cost an average of $27/sq m; the least expensive earthen cover was about $21/sq m. The asphalt cover system (6 to 7 cm of asphalt topped with 0.6 m of overburden) cost about $28/sq m. The four multilayer covers averaged $57/sq m, but materials handling problems encountered during the test inflated this cost above what was anticipated and significant cost reductions should be possible. The least expensive multilayer cover was $43/sq m. Based on the results of the Grand Junction field test, we estimated the cost of covering the tailings from three high priority sites, Durango, Shiprock, and Salt Lake City (Vitro). The cost of a 3-m earthen cover ranged from $18 to $33/sq m for the seven disposal sites (two of three at each location) studied. The cost of asphalt cover systems were $23 to $28/sq m and the multilayer cover costs were between $31 to $36/sq m. The earthen cover costs are less than the Grand Junction field test cost primarily because cover material is available at or near most of the disposal sites selected. Earthen material was imported from 6 to 10 miles for the field test. The cost of the multilayer covers should be significantly reduced with more efficient utilization of materials. (EDB)(JMF)

488

Beedlow, P.A., L.L. Cadwell, and M.C. McShane, Pacific Northwest Laboratory, Richland, WA

A Systematic Approach to Designing Surface Covers for Uranium Mill Tailings

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 397-407) (1982)

The wide range of existing environmental conditions and available cover materials at uranium mill tailings sites precludes the use of a single surface cover for effective long-term erosion resistance. The UMTRA program is developing site-specific guidelines for designing effective and lasting surface covers. This paper presents a systematic approach to designing surface covers for tailings that can be tailored to conditions at any site. The approach consists of three phases: (1) an assessment, during which the degree of required surface protection (erosion potential) is determined; (2) a preliminary design that integrates surface cover design with the need to minimize transport of radon and leachates from the tailings; and (3) a final design, where the cost and effectiveness of the surface cover are determined. (Auth)(PTO)

489

Beedlow, P.A., L.L. Cadwell, and B.E. Vaughan, Pacific Northwest Laboratory, Richland, WA

Revegetation/Rock Cover for Stabilization of Inactive U-Tailings Sites

PNL-4100 (Part 2); Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences, 157 pp.; (pp. 29-32) (1982, February)

Soil placed over any sealant/barrier system can provide a protective mantle if the soil is not lost by erosion. Vegetation is an attractive choice for controlling erosion because it can provide an economic self-renewing cover that serves to reduce erosion by both wind and water. Vegetation alone, however, may not adequately stabilize the surface in extremely arid areas. In those areas, a properly designed surface treatment of rock cover, perhaps in conjunction with vegetation, may be necessary to stabilize the tailings surfaces. The objective of this program is to establish guidelines for surface stabilization that are compatible with sealant/barrier systems and are suited to soils and climates at inactive uranium mill tailings sites. These guidelines will provide the means to estimate potential vegetation cover, potential erosion, effects of surface treatments on sealant/barrier systems, and costs of vegetation and rock covers. Methods for establishing vegetation on sealed tailings are also provided. (Auth)(PTO)

490

Beedlow, P.A., M.C. McShane, and L.L. Cadwell, Battelle Pacific Northwest Laboratories, Richland, WA

Revegetation/Rock Cover for Stabilization of Inactive Uranium Mill Tailings Disposal Sites

PNL-4328; UMT-0210; 65 pp. (1982, June)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

Pacific Northwest Laboratory is developing design and performance guidelines for surface stabilization of inactive uranium mill tailings. In this work, vegetation and rock covers are being evaluated for maintaining long-term integrity of impoundment systems. Methods are being developed to estimate erosion rates associated with rock and/or vegetation covers, and to determine the effects of surface treatments on soil moisture. Interactions between surface treatments on barriers (radon and biological) are being studied as well. The product will be a set of guidelines to aid in designing surface covers. This report presents the status of this program and discussion of considerations pertinent to the application of surface covers to tailings. Test plots located in Grand Junction, Colorado and Waterflow, New Mexico are being used to study: (1) the interactions between vegetation and radon and biological barriers, (2) the effects of surface covers on soil moisture, and (3) the effects of rock covers on vegetation. (EDB)

491

Bentel, D., J. Robbertze, M. Smith, and A. Smith, Steffen, Robertson and Kirsten, Inc., Johannesburg, South Africa

Use of Geotextiles in Uranium-Gold Tailings Impoundments in South Africa

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 489-504) (1982)

The cost effectiveness, practical implications and potential problems associated with the incorporation of geofabrics in underdrainage systems of uranium-gold tailings impoundments in South Africa are discussed. Reference is made to the observed performance of geofabric underdrains in tailing impoundments which have been operational for the past six years. Some construction and post-construction problems related to the use of geofabrics in underdrains are discussed and recommendations are made for geofabric grades as it relates to various applications in tailings impoundments. Chemical effects on geofabric performance is discussed. The paper concludes that geofabrics can be successfully used in gold-uranium tailings impoundments and provide both economic and constructional benefits when compared to natural drainage media. (Auth)

492

Bishop, C.T., and R. Bishop, MacLaren Engineers, Planners and Scientists, Inc., Willowdale, Ontario, Canada

Surface-Water Hydrologic Criteria for Uranium-Mine Tailings Impoundments in Ontario

Canadian Journal of Civil Engineering 8(3):364-369 (1981, September)

Tailing disposal is usually achieved by discharging the tailings slurry and waste rock to an isolated impoundment area. Process water from the slurry and natural runoff from the tailings basin and its drainage area collect at the lowest end of the tailings area. This water must be treated to meet water quality standards set by regulatory agencies. However, no firm criteria (at least for Ontario) for the frequency with which spillage of untreated water might be permitted were discovered. Equally, no criteria regarding the design of an emergency spillway for this type of impoundment were found. In view of this, criteria were developed using engineering judgement. The evolution of these criteria is discussed in this paper. The hydrologic methods used in the analysis of both long-term water level variations and the response to severe storm events are outlined. An example of the application of the criteria for the Elliot Lake area is presented. A method of reducing the cost of meeting these criteria is also discussed. There is a need for further independent research on the problem. (Auth)(PTO)

493

Branagan, E.F., Jr., R.L. Gotchy, W.N. Rom, and V.E. Archer, U.S. Nuclear Regulatory Commission, Washington, DC

Health [illegible]ts of Uranium Mining and Milling for Commercial Nuclear Power

CONF-790447; Health Implications of the New Energy Technologies, Proceedings of a Conference, Park City, UT, April 4, 1979; (pp. 99-117) (1979, April)

Radiological health effects potentially associated with uranium mining and milling have been estimated on both a regional and continental basis. Estimates of radon

releases from mining were taken from testimony presented in licensing hearings during 1978. Estimates of the health effects from milling were derived from a draft NRC document titled Draft Generic Environmental Impact Statement on Uranium Milling. Health effects per annual fuel requirement (AFR) were presented on both a cumulative and continuous basis. In general, potential health effects to the general public due to both the mining and milling for one AFR are a very small fraction of the health effects caused by background radiation, on either a cumulative basis or a continuous basis. On a cumulative basis (from 1978 to the year 3000), potential health effects due to milling are about an order of magnitude less than those due to mining. (EDB)(RAF)

494

Brewer, L.W., H.L. Barrick, and D.M. Minnema, Sandia National Laboratories, Albuquerque, NM

Radium-226 Measurements Below Uranium Mill Tailings Piles

SAND-82-0288A; 105 pp. (1982, June)

A total of 2773 radium-226 in-soil measurements have been made in and beneath 12 uranium mill tailings piles. Four conditions were found beneath the piles: (1) rock, with essentially no contamination; (2) very dry soil with contamination of 1000 pCi/g above the interface to 15 pCi/g at 7.5 feet below the interface; (3) near-saturated to saturated soils with contamination similar to condition 2; and (4) saturated soils underlaid by cobbles and water where the water contained very fine particles of radium-226 in suspension. A number of exceptions to the above conditions were found during this study. Vertical-profile holes of the tailings, using 2.5-foot core-barrel samplers, exhibited activities from greater than 2000 pCi/g to approximately 15 pCi/g. This paper describes the counting system used to determine radium-226 and lists the resulting data. (Auth)(JMF)

495

Brookins, D.G., University of New Mexico, Department of Geology, Albuquerque, NM

Caliche-Cover for Stabilization of Abandoned Mill Tailings

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 309-318) (1981)

Caliche, here used to include various forms of calcrete-gypcrete-silcrete, is recognized worldwide as effective in serving as a getter for uranium, vanadium, arsenic, radium and many other elements. In many instances (Australia, Namibia), commercial quantities of uranium have been concentrated in the caliche-type deposits; smaller deposits are known throughout the western United States. Elements which have been more or less concentrated either by direct precipitation or re-working due to surface processes from abandoned mill tailings include U, V, Se, Mo, Ba, Ra, Pb, Ag, and others. In cases where moving of the tailings is deemed difficult, appropriate cover must be designed to minimize the amounts of the above and other elements which may be carcinogenic if allowed to enter the biosphere. It is proposed that an artificial caliche-type cover will effectively and efficiently impound and stabilize all of the above elements, either by caliche-equivalent chemical precipitates or caliche-shale mix to prevent excessive mobilization of elements in the tailings. Use of caliche-type cover is effective in stabilizing uranium and vanadium in several minerals; radium and barium in barite or other sulfates; and chalcophile elements in sulfides with low Eh chemical surroundings. Mineralogical study allows predictions to be made concerning the stability of a wide variety of elements. Arsenic, selenium, and molybdenum on uncovered mill tailings can be quite mobile; with a caliche cover, they will be essentially immobile. Further, the caliche-type cover should reduce, but not completely eliminate radon emission from the tailings. While caliche-type cover will prevent use of the area covered by tailings for man-related activities such as farming or cattle grazing, this loss is considered minor in view of the successful impoundment of potentially carcinogenic elements. (Auth)(PTO)

496

Brookins, D.G., B.M. Thomson, and P.A. Longmire, University of New Mexico, Department of Geology, Albuquerque, NM; University of New Mexico, Department of Civil Engineering, Albuquerque, NM

Early Diagenesis of Uranium Mine Stope Backfill

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 27-37) (1982)

Investigation of cementation processes involving the physical and chemical interactions of mine stope backfill with acid leached uranium tailings and groundwater has shown that precipitation of soluble sulfate salts is significant in early diagenesis. Scanning electron microscopy (SEM) studies demonstrate that gypsum (CaSO4-H2O) is the most ubiquitous salt serving as the most prominent type of cement for the arkosic-argillaceous tailings sands. The precipitation processes contribute to consolidation of backfill sands, resulting in lithification within a twelve month period. Another important sulfate mineral, jarosite [KFe3(SO4O2(OH)6], stable under oxidizing acidic conditions (pH less than 4) with high concentrations of ferric iron and lesser amounts of potassium, is predicted to exist in the early stages of lithification of backfill material. Jarosite is an effective scavenger of several toxic metals including arsenic, molybdenum, and manganese. However, as backfill material undergoes successive pore volume rinsing and as interstitial pore fluid approaches neutrality, jarosite becomes less stable. As pre-mining conditions become restored by flooding of the mine with native groundwater, further cementation of backfill material may occur with the following physico-chemical modification: alteration of detrital grains, including newly formed surface phases; generation of authigenic phases (sulfate and carbonate phases) with associated cementation and lithification; and chemical reduction and subsequent precipitation of oxidized ions. In order to reduce environmental problems inherent to surface disposal of uranium tailings, mine stope backfilling may be a viable alternative to safe, long-term disposal of voluminous amounts of toxic and radioactive materials. (Auth)(PTO)

497

Brown, J.R., W.S. Fyfe, F. Murray, and B.I. Kronberg, University of Western Ontario, London, Ontario, Canada

Immobilization of U-Th-Ra in Mine Wastes

Canadian Mining Journal 102(3):71, 73-76 (1981, March)

Most mine waste containment problems have centered on immobilizing uranium and thorium by reduced alkaline conditions. Radium is coprecipitated in barium sulfate by barium chloride addition. The ultimate problem involves the long-term stability of an above-grade tailings pile. (EIX)(PTO)

498

Brown, J.R., W.S. Fyfe, F. Murray, and B.I. Kronberg, University of Western Ontario, London, Ontario, Canada

Final Report: Immobilization of U-Th-Ra in Mine Wastes

Canadian Mining Journal 103(3):53-55 (1982, March)

By treating typical Elliot Lake uranium mine effluents with calcite (CaCO3), potassium phosphate solutions (300 ppm), with or without glacial tills, radium leach levels have been reduced to below 0.1 pCi/l. Such values are in the range of ocean waters and high quality fresh waters. Mine tailing permeabilities can be reduced to low levels by use of appropriate clay additives, and in particular, thin bentonite layers before closure. (EDB)(PTO)

499

Bryant, D.N.. D.B. Cohen, and R.W. Durham, Environment Canada, Environmental Protection Service, Ottawa, Ontario, Canada

Leachability of Radioactive Constituents from Uranium Mine Tailings - Status Report - June 1974 to January 1977

EPS-4-WP-79-4; 32 pp. (1979, April)

A project was carried out using lysimeters to determine the leaching of radioactive constituents and BaRaSO4 from abandoned uranium mine tailings. Lime addition to the surface of acidic abandoned tailings did not reduce the level of radioactive constituents in the leachate. Considerable increases in levels of the radionuclides thorium-230, thorium-232, and thorium-228, as well as gross alpha and beta activity in the leachate, occurred five months after recycling of BaRaSO4 sediments to the surface layers of abandoned tailings. After nine months of leaching, the levels of radium-226 in the leachate were 30% greater in the tailings plus sediment treatment than

from tailings only (control). Another experiment compared the quality of effluent flowing over chemically-fixed (solidified) BaRaSO4 sediments with that of non-fixed (control) in simulated sedimentation (control). After seven months the release of radium-226 to water from chemically-fixed BaRaSO4 sediments remained less that 1 pCi/l, compared to approximately 7 pCi/l from non-chemically-fixed sediments. A further experiment compared the leaching of radioactive constituents from chemically-fixed fresh tailings to non-fixed tailings. Air-dried digested sewage sludge was applied to supply 3% organic matter in the top 15 cm of the revegetated lysimeters. Undiluted effluent and leachate from chemically-fixed BaRaSO4 sediments and fresh tailings were 100% lethal to DAPHNIA PULEX and SALMO GAIRDNERI in static 96-hour bioassay tests. Diluted (50%) effluent samples were non-toxic to these organisms. (Auth)(PTO)

500

Buelt, J.L., and S.M. Barnes, Pacific Northwest Laboratory, Richland, WA

A Comparative Evaluation of Liner Materials for Inactive Uranium Mill Tailings Piles

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 713-727) (1981)

Under the funding of the Department of Energy's Uranium Mill Tailings Remedial Action (UMTRA) program, Pacific Northwest Laboratory has completed the initial accelerated testing phase of eight candidate liner materials. The tests were designed to make a comparative evaluation of the long-term effectiveness of liner materials as a radionuclide and hazardous chemical leachate barrier. The eight materials tested were selected from a technical review of published literature and industrial specialists. Conditions were then identified that would accelerate the aging processes expected in a uranium tailings environment for 1000 years. High calcium leachates were forced through thin layers of clay liners to accelerate the ion exchange rate of sodium and calcium. Asphalt and synthetic materials were accelerated by exposure to elevated temperatures, high concentrations of oxygen, and increased strengths of aqueous oxidizing agents. By comparing the changes of permeability with time of exposure, the most acceptable materials were then identified. The two materials with the best performance in the tests were a catalytically airblown asphalt membrane and a natural soil amended with sodium bentonite. Both materials showed an increased resistance to leachate penetration throughout the exposure period with final permeabilities less than 10(E-7) cm/s. In addition, the asphalt membrane and sodium bentonite are among the least expensive materials to install at a disposal site. Therefore, based on their economic and technical merits, these two materials are being evaluated further in field tests at Grand Junction, Colorado. (Auth)(PTO)

501

Bureau, G., Civil Systems, Inc., San Leandro, CA

Design of Impervious Clay Liners by Unsaturated Flow Principles

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 647-664) (1981)

The theoretical design of impervious clay liners for tailings disposal and other industrial facilities that impound toxic liquids or hazardous chemicals is often based on Darcy's law, which strictly applies to saturated flow conditions. Seepage losses are generally underestimated, because suction effects are neglected. McWorther and Nelson recently improved one-dimensional seepage calculations by using unsaturated flow principles. The seepage below the liner can be classified into four distinct stages including: (1) the downward progression of a wetting front; (2) the formation of a water mound; (3) the establishment of steady-state seepage; and (4) the drainage of the impoundment. Stage 1 seepage is critical to the design of liners because it may govern, to a large extent, the depth of penetration of potential contaminants within the foundation materials. Stage 1 seepage is preceded by a preliminary stage, herein called phase A, corresponding to the actual penetration of the liner itself by the impounded liquid. McWorther and Nelson's stage 1 will be referred to as phase B in this paper. Subsequent seepage stages will not be analyzed. The purpose of this discussion is to demonstrate that McWorther and Nelson's concepts can be used effectively by the designer to estimate thickness and hydraulic conductivity requirements for impervious pond liners. The study is limited to the consideration of first order effects and downward vertical flow conditions. (Auth)(PTO)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

502

Burton, B.W., V.P. Gutschick, B.A. Perkins, C.L. Reynolds, J.C. Rodgers, J.G. Steger, T.K. Thompson, L.K. Trocki, E.M. Wewerka, and M.L. Wheeler, Los Alamos National Laboratory, Los Alamos, NM

Nuclear Fuel Cycle - Uranium Mining and Uranium Milling

LA-9395-MS; Overview Assessment of Nuclear Waste Management, 90 pp.; (pp. 7-19) (1982, August)

This report identifies DOE nuclear waste management programs that have urgent problems requiring further action or follow-up. There are seven major problem areas: shallow land disposal technology development; active uranium mill tailings piles; uranium mine dewatering; site decommissioning; exhumation/treatment of transuranic waste at Idaho National Engineering Laboratory; uranium mine sp ls; and medical/institutional wastes. A brief description is included of the active uranium mill tailings problem. Remedial action and the new NRC licensing requirements addressing old and new tailings piles are promising, but their long-term effectiveness has yet to be proven. Environmental controls for currently active piles are not adequate, but these facilities are licensed and needed improvements may not be required. It is reasonable to assume that successful developments in the remedial action programs and NRC regulations regarding stabilization/rehabilitation at the close of the operations will be applied to these active piles. However, currently active milling operations,which were not subject to the new NRC requirements at the time they were licensed, should be comprehensively studied to determine the extent to which their current practices are affecting the environment and to determine the cost/feasibility of ameliorative action. (Auth)(PTO)

503

Bush, K.J., and G. Markos, GEC Research, Inc., Rapid City, SD

Statistical Evaluation of Contamination from Uranium Mill Tailings by Physical Transport and Chemical Migration

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 225-239) (1982)

Contamination from abandoned uranium mill tailings into the adjacent area has occurred by physical transport of tailings and fluid transport of aqueous species. Evaluation of chemical data from the analyses of solid samples and water extracts of the solid samples, in conjunction with the analysis of Th-234, Th-230, and Pb-214 in the solid samples from several tailings sites allows identification and distinction of the modes by which contamination has occurred. Statistical and numerical techniques, such as linearized cumulative frequency diagrams, regression analysis, and parametric statistics are useful to distinguish between patterns characteristic of different types of materials and to recognize contamination by fluid migration. The bulk concentrations of Al, Si, K, Fe, and Mn and the isotope ratios in the tailings are significantly different than in the soils adjacent to the piles. Statistical populations intermediate between the tailings and soils appear to represent the physical mixing of the two types of materials. Contamination of trace metals by fluid transport is recognized by evaluating the vertical distribution pattern from water extracts of core samples from the adjacent area. Migration of trace metals generally produces a distribution of the soluble components independent of the composition of the bulk solid. Results show where fluid transport has occurred; a group of soluble contaminants are generally present together in a single location presumed to be along the path of flow with adjacent locations devoid of contamination. This indicates a single event and short distance of migration rather than migration as a function of time. A longer distance or extended period of transport causes a segregation of the metals with varying chemical properties. (Auth)(PTO)

504

Bush, K.J., and G. Markos, GEC Research, Inc., Rapid City, SD

Evidence for the Instability of Silicate Minerals in Acid Leach Uranium Mill Tailings

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 473-486) (1981)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

From an evaluation of geochemical data of the Vitro tailings, sponsored by the DOE UMTRA program, it has been concluded that chemical conditions characteristic of tailings promote the dissolution of silicate minerals which will affect the physical stability of the tailings. X-ray diffraction studies of tailings solids indicate that a decrease in feldspars and clay minerals occurs, accompanied by an increase in X-ray amorphous aluminosilicates, in areas with interstitial solution of high ionic strength. This does not occur in areas of low ionic strength, which contain crystallized feldspars but no amorphous silicates. Parametric statistical treatment of data indicates higher concentrations of total aluminum and silicon in tailings than are found in non-tailings waters. These studies lead to the following conclusions: aluminum concentration is controlled by sulfate ion concentration and pH; and silicon concentration is controlled by pH and sodium and potassium ion concentration, which results from the dissolution of microcline and albite. Stability diagrams for microcline and albite, constructed from thermodynamic calculations based on empirical data from water samples, demonstrate the instability of feldspars in the tailings environment. Non-tailings waters possess ion concentrations higher than those allowed by the solubility product constant for feldspars, probably indicating that precipitation is kinetically controlled. (Auth)(PTO)

505

Champlin, J.B.F., Woodward-Clyde Consultants, San Francisco, CA

Use of Scientific Calculators and Pocket Computers for Evaluation of Seepage and Contaminant Transport

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 443-462) (1982)

Uranium tails, like many other mining, milling or industrial wastes have a liquid fraction subject to seepage. Many such wastes contain contaminants in the form of tracer elements or compounds whose chemical or radioactive nature may make them noxious or hazardous to the environment and man. Unfortunately, uranium tails are exceptionally bulky for the amount of ore recovered and their containment requires features such as a liner and stabilized retention structures. It is commonly of interest to evaluate the seepage rate from such containment to estimate areas or zones of greatest weakness, and to determine means by which the zones of weakness can be materially improved. Such evaluations commonly require use of various forms of environmental and laboratory data, much of which may range significantly with changing topography and water table level. It is useful to account for such changes in an iterative fashion around the impoundment. However, consideration of such problems in detail becomes onorous [sic] and is commonly relegated to a computer in some distant office. Evaluation of such problems has led to use of both scientific programmable calculators and pocket computers because of their advanced capability, relative speed, very low power requirements, and convenience of size. A particular application will be examined, in which such parameters as topography, water surface, bedrock surface, soil thickness and permeability of soil and bedrock have to be handled independently. This is done first under "natural" conditions to estimate how the system operates normally and then under stressed conditions of periodically applied tailings to perceive what changes can occur. Both physical and chemical stresses are considered to show how such studies, whether performed on location or in a distant office, can lead to more informed decisions relative to design and construction. (Auth) (PTO)

506

Chen, S.Y., Y.C. Yuan, and J.M. Peterson, Argonne National Laboratory, Argonne, IL

Estimation of Radiological Impact from Transportation of Uranium Mill Tailings

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 209-228) (1981)

The model development program for evaluation of radiological impacts from transportation of large quantities of radioactive tailings from inactive uranium mill tailings sites to locations for final disposal is divided into three parts: (1) external radiation exposure; (2) dispersion and dosimetry; and (3) evaluation of the models. In this paper the formulation of a model for predicting direct gamma radiation exposure to the population in the vicinity of the transportation routes is presented. The Salt Lake City Vitro tailings site was chosen as an example for initial application of the model. (Auth)(PTO)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

507

Cline, J.F., F.G. Burton, D.A. Cataldo, W.E. Skiens, and K.A. Gano, Pacific Northwest Laboratory, Richland, WA

Long-Term Biobarriers to Plant and Animal Intrusions of Uranium Tailings

DOE/UMT-0209; PNL-4340; 69 pp. (1982, September)

The objective of this project was to develop and evaluate the effectiveness of physical and chemical barriers designed to prevent plant and animal breachment of uranium mill tailings containment systems for an extended period of time. A polymeric carrier/biocide delivery (PCD) system was developed and tested in the laboratory, in the greenhouse and in the field. A continuous flow technique was established to determine the release rates of the biocides from the PCD systems, with polymeric carrier specifications established. Studies were conducted to determine effective biocide concentrations required to produce a phytotoxic response and the relative rates of phytotoxin degradation resulting from chemical and biological breakdown in soils. The final PCD system developed was a pelletized system containing 24% trifluralin, 18% carbon black and 58% polymer. Pellets were placed in the soil at the Grand Junction U-tailings site at one inch and two inch intervals. Data obtained in the field determined that the pellets released enough herbicide to the soil layer to stop root elongation past the barrier. Physical barriers to subsurface movement of burrowing animals were investigated. Small crushed stone (1 to 1 1/2 in. diameter) placed over asphalt emulsion and multilayer soil seals proved effective as barriers to a small mammal (ground squirrel) but were not of sufficient size to stop a larger animal (prairie dog). No penetrations were made through the asphalt emulsion or the clay layer of the multilayer soil seals by either of the two mammals tested. A literature survey was prepared and published on the burrowing habits of the animals that may be found at U-tailings sites. (EDB)(JMF)

508

Cline, J.F., K.A. Gano, and L.E. Rogers, Pacific Northwest Laboratory, Richland, WA

Loose Rock as Biobarriers in Shallow Land Burial

Health Physics 39(3):497-504 (1980, September)

A layer of loose rock placed between buried waste and topsoil successfully prevented plant roots, burrowing mammals and ants from translocating waste materials into the biosphere in an arid climate. Air spaces between the rocks had to be maintained with stones 3.8-7.6 cm diameter. Small rocks and asphalt emulsion prevented the topsoil from sifting between rocks that may make a pathway for plant roots to the waste material. (Auth)

509

Cline, J.F., and B.E. Vaughan, Pacific Northwest Laboratory, Richland, WA

Application of Long-Term Chemical Biobarriers for Uranium Tailings

PNL-4100 (Part 2); Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences, 157 pp.; (pp. 25-27) (1982, February)

The objective of this project is to develop and evaluate the effectiveness of physical and chemical barriers that are designed to prevent plant and animal breachment of uranium tailings containment systems for extended periods of time. (Auth)

510

Cohen, B.L., University of Pittsburgh, Pittsburgh, PA

Health Effects of Radon Emissions from Uranium Mill Tailings

Health Physics 42(5):695-702 (1982, May)

The problem of health effects in radon emissions from uranium mill tailings is reviewed. The history of estimates of these effects and how they have been refined by further research is traced, and a current test estimate is given. The theory and practice of mitigating the effects by covering tailings with soil are described, and the present situation as regulated by the new 10 CFR 40, Appendix A is evaluated. (INSPEC)(JMF)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

511

Cokal, E.J., D.R. Dreesen, and J.M. Williams, Los Alamos National Laboratory, Los Alamos, NM

The Chemical Characterization and Hazard Assessment of Uranium Mill Tailings

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 47-63) (1981)

The rational development of processing technologies for the chemical treatment of uranium mill tailings requires knowledge about both the chemical composition and the mineralogical constitution of the tailings. Knowledge of the tailings composition is also required to evaluate the hazard posed by disposal of either treated or untreated tailings. The potential hazards include not only radiological hazards such as radon and its precursors Ra-226 and Th-230, but also non-radiological hazards such as molybdenum, other heavy metals, and non-metals such as fluoride, nitrate, and sulfate. As a part of the LANL effort in support of UMTRA, a program of chemical and mineralogical analysis of thirty-six mill tailings samples collected at three of the priority sites (Durango, Salt Lake City, and Shiprock) has been undertaken. In addition, data has been obtained on the water leachability of the tailings samples collected at these sites. The analytical techniques employed include: neutron activation analysis and atomic absorption spectrophotometry for metals; ion chromatography for anions; a variety of techniques including fluorimetry and delayed neutron activation analysis for uranium; alpha counting for emanated radon; and low-energy gamma spectrometry for radium and thorium-230. Data is presented to indicate both the degree of hazard posed by the tailings and the potential for economic recovery of metal values remaining in the tailings piles. Three points are particularly noteworthy: (1) assumptions of secular equilibrium in the tailings are inappropriate; (2) recovery of uranium and vanadium may be economically justifiable; and (3) the mobility of soluble arsenic and some metals may present environmental problems at certain sites. (Auth) (PTO)

512

Collings, R.K., Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Ottawa, Ontario, Canada

Mineral Waste Resources of Canada - Mineral Wastes as Potential Fillers

CANMET-80-13E; 27 pp. (1980)

The actual and potential uses of fine-grained mineral wastes such as mill tailings, flue dusts, and chemical sludges as filler materials in asphalt mixes, caulking and sealing compounds and jointing cements are described. Producers of mineral filler materials within 250 km of Montreal and Toronto are listed. (CAS)(PTO)

513

Collings, R.K., Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Ottawa, Ontario, Canada

Mineral Waste Resources of Canada - Mining Wastes in the Atlantic Provinces

CANMET-80-12E; 24 pp. (1980)

The physical, chemical and mineralogical characteristics of waste rock and mill tailings at metal, coal, or industrial mineral mines in the Atlantic provinces were studied to identify and develop viable potential uses for these wastes. (CAS)(PTO)

514

Conference of Radiation Control Program Directors, Inc.

A Survey of Radon Measurement Needs and Activities in State Radiation Control Programs

NBS-GCR82-394; 54 pp (1982, July)

This report summarizes the findings of a survey which was conducted in April-May, 1981 to determine radon measurement needs and presents activities in state radiation control programs. The survey focuses on a wide variety of methods for measurements of radon and related quantities. This includes methods for measurement of radon concentration in air, potential alpha energy concentration, individual radon progeny concentrations, radon exhalation or flux density from surfaces, radon concentration in water, and thoron (radon-22[illegible] or

thoron progeny concentrations in air. The report identifies sources of radon and thoron which necessitate measurements in the states; the types of measurements and measurement methods that are performed routinely, or that the states would like to obtain or improve the capability of performing; existing calibration capabilities for these measurement methods; and the perceived needs for improving the quality of the measurements. (GRA) (JMF)

515

Daniel, D.E., University of Texas, Department of Civil Engineering, Austin, TX

Problems in Predicting the Permeability of Compacted Clay Liners

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 665-675) (1981)

The expanding use of compacted clay for lining waste disposal pits has significantly increased the engineering profession's experience with compacted clay liners. Not all the experience has been good. Several cases exist where use of laboratory permeability tests on samples of compacted clay led to an order of magnitude or more error in predicted leakage rates through the liners. Possible sources of error are reviewed, and where available, quantitative data are given to show the potential magnitude of error. It is concluded that improper preparation of samples, use of the wrong compactive effort, and improper testing technique can easily lead to errors in measured permeability of two to three orders of magnitude. Even with the best methods of sample preparation and testing available today, the engineer in many instances probably cannot predict the permeability of a compacted clay liner with better accuracy than one order of magnitude. (Auth)(PTO)

516

Dave, N.K., T.P. Lim, and A.J. Vivyurka, Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Elliot Lake Laboratory, Elliot Lake, Ontario, Canada; Rio Algom Limited, Elliot Lake, Ontario, Canada

Chemical and Radioisotope Distribution Profiles in an Abandoned Uranium Tailings Pile

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 343-366) (1981)

Chemical and radioisotope distribution profiles were studied in the solid fraction of an abandoned uranium tailings site at Elliot Lake, Ontario, Canada. The tailings, with thickness of 7 to 10 m, over an area of 85 hectares, were deposited approximately 10 to 20 years ago on a layer of black peaty material which overlies deposits of permeable glacio-fluvial sand. Geohydrochemical investigations of this tailings area have been ongoing since 1978. The radioisotope profile study was conducted on various sites. Solid core samples, collected with split spoon and modified Shelby tube samplers at various depths, were analyzed for various chemical and radioisotope constituents. The results indicated two distinct zones of stratification; an upper zone, where the constituents were uniformly distributed and a lower zone, near the peat-tailings interface, which showed increasing concentration with depth. Within the peat layer the concentration decreased rapidly with no significant levels of contamination penetration below the peat layer being observed, though the samples were limited. The pH profile showed that the top 5 m of the tailings have been oxidized with an average soil pH of 3.8 compared to a pH of 6 underneath it. The groundwater hydrology of the system was observed to be complex. Various hypotheses of the tailing profile development are discussed based on the combined segregation and settling process of fine fraction and geohydrochemical interaction of solid and liquid phases. (Auth)(PTO)

517

Davis, L.A., Waste and Land Systems, Inc., Fort Collins, CO

Computer Analysis of Seepage and Groundwater Response Beneath Tailings Impoundments

PB-80-178619; 96 pp. (1980, April)

Research was undertaken to determine the possibility of

using a computer model to estimate tailings seepage rates. Techniques developed by others were modified and combined with an existing computer model for saturated groundwater flow. This computer program is capable of simulating seepage from the impoundment, groundwater response beneath the impoundment, and the effects of previous seepage on the calculation of the subsequent seepage rate. The model is general, allowing for spatial variations of hydraulic properties, complex impoundment geometry, and arbitrary initial conditions. The model analyzed a few simple problems with encouraging results and acceptable data requirements. (Auth)(JMF)

518

Dean, K.C., and M.B. Shirts, U.S. Bureau of Mines, Salt Lake City Metallurgy Research Center, Salt Lake City, UT

Vegetation for Acidic and Alkaline Tailing

Reclamation and Use of Disturbed Land in the Southwest, J.L. Thames, (Ed.). The University of Arizona Press, Tuscon, AZ, Ch. 27, 362 pp.; (pp. 248-261) (1977.

On active mill tailing ponds, air pollution is controlled by keeping the surfaces of ponds wet either by tailings discharge or by sprinkling. On inactive ponds, more lasting stabilization is required. Physical, chemical, vegetative, and combination methods for stabilizing tailings have been developed and are in use. Research indicates that, other than the excessive acidity, basicity, or salinity, perhaps the greatest problem to be overcome in establishing vegetation is that of windblown sands. (Auth)(PTO)

519

DeRemer, D., and D. Bach, Agronomics, Inc., Avondale, AZ; Bach (Dan) Associates, Tucson, AZ

Irrigation of Disturbed Lands

Reclamation and Use of Disturbed Land in the Southwest, J.L. Thames, (Ed.). The University of Arizona Press, Tucson, AZ, Ch. 24, 362 pp.; (pp. 224-228) (1977)

This chapter describes sprinkler and drip irrigation systems that have been installed and the advantages and disadvantages of each system. Sprinkler systems give full area coverage, are durable, and are easily portable. Drip irrigation provides water slowly over a long period of time and achieves maximum soil saturation efficiency. Less water is used and fertilizers and pesticides can be applied easily with this system. (PTO)

520

Dreesen, D.R., E.J. Cokal, and M.A. Maez, Los Alamos National Laboratory, Los Alamos, NM

Assay for Bioavailability of Uranium Mill Tailings Contaminants

LA-9479-PR; Los Alamos Life Sciences Division's Biomedical and Environmental Research Programs: January-December 1981, 151 pp.; (pp. 127-129) (1982, October)

A plant uptake assay technique has been under development at Los Alamos for the past several years. The aim of this research is to develop a method to rapidly determine bioavailable contaminants in various types of solid wastes using a variety of plant species. The results of the studies indicate that appreciable concentration of bioavailable contaminants is found in plants grown on tailings for one month compared with controls. Apparent differences in root and shoot content for many elements illustrate the need for further refinement in experimental methods to better determine if some contaminants are fixed in the roots. The most recent assays indicate a very complex relationship between contaminant uptake and plant species, tailings type, and the element of interest. It is clear that knowledge of total or extractable elemental contents cannot be directly related to uptake. In addition, the assimilation by one species cannot necessarily be extrapolated to other species. (Auth)(JMF) (RAF)

521

Dreesen, D.R., E.J. Cokal, E.F. Thode, L.E. Wangen, and J.M. Williams, Los Alamos National Laboratory, Los Alamos, NM

Preliminary Evaluation of Uranium Mill Tailings Conditioning as an Alternative Remedial Action Technology

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

LA-UR-81-3766; CONF-811049; Uranium Mill Tailings Management, Proceedings of Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (15 pp.) (1981)

Conditioning of uranium mill tailings is being investigated as an alternative remedial action for inactive tailings piles which are to be stabilized by the U.S. Department of Energy. Tailings from high priority sites have been characterized for elemental composition, mineralogy, aqueous leachable contaminants, and radon emanation power to provide a baseline for determining environmental hazard control produced by conditioning. Thermal stabilization of tailings at high temperatures and removal of contaminants by sulfuric acid leaching are being investigated for their technical merit as well as their economic and engineering feasibility. (EDB)(JMF)

522

Elmore, M.R., J.N. Hartley, and C.T. Li, Pacific Northwest Laboratory, Richland, WA

Interim Stabilization of Uranium Mill Tailings

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 91-99) (1982)

An immediate concern associated with the disposal of uranium mill tailings is that wind erosion of tailings from an impoundment area will subsequently deposit tailings on surrounding areas. Pacific Northwest Laboratory, under contract to the U.S. Nuclear Regulatory Commission, is investigating the technology for fugitive dust control. Different methods to control fugitive dust, chemical, physical, and vegetative have been used or tested on mill tailings piles. For interim stabilization, chemical dust suppressants were considered to be cost effective. Therefore, 34 chemical stabilizers were evaluated in a series of laboratory wind tunnel tests at PNL. The more promising stabilizers identified during the laboratory screening tests were applied to the surface of uranium mill tailings at a mill located in Wyoming in order to determine the overall effectiveness of the stabilizers under actual site conditions. This paper presents the results of a literature review of dust suppression technology and laboratory screening tests, and a description of the field test at a uranium mill site. (Auth)(PTO)(JMF)

523

Emeanuwa, A.U., J.J. Mueller, and J.D. Ritts, Controls for Environmental Pollution, Inc., Santa Fe, NM

Observed Reduction of Radon-222 Gas Emanation from Uranium Tailings Using a New Chemical Encapsulation Process

CONF-820525; International Congress on Technology and Technology Exchange, Proceedings of a Symposium, Pittsburgh, PA, May 3-6, 1982; (17 pp.) (1982, May)

One of the most controversial radiological contaminants in the environment is radon-222. Presently, uranium tailings are stored in confinement dams under several feet of liquid in order to contain the radon gas and eliminate its emission to the atmosphere. This method presents a hazard to the environment because of possible groundwater contamination, and it creates a water resource problem in water-scarce areas. A method has recently been developed that contains and reduces radon-222 gas emanation from uranium tailings ponds. This method uses a chemical process in which radon-222 is encapsulated by solidification of uranium tailings slurry. During evaluation, equal amounts of both the unprocessed and processed slurry were allowed to reach secular equilibrium in a sealed container. The built-up gas was then deemanated and analyzed for radon content using two proven radiochemical methods. Based on these radiochemical methods, the process under consideration indicated greater than 92% reduction in radon-222 gas emanation. Other methods of reducing radon emanation are discussed in this presentation. Research for additional application of this process is recommended. (Auth)(PTO)

524

Environment Canada, Environmental Protection Service, Ottawa, Ontario, Canada

Monitoring Program Design Recommendations for Uranium Mining Communities

EPS-3-EC-78-10; 99 pp. (1978, October)

Environmental radiological monitoring requirements have been developed for the operating uranium mine/

mill sites (including the pre-operational phase) and for non-operating tailings areas in order to assess the radiological impact on the environment and follow long-term trends. These requirements have been based on a review of regulatory standards, sources and nature of releases from mines, mills and tailings, and environmental pathway analysis. Media and measurements considered in the routine on-going programs include airborne radon, airborne particulates, external radiation, terrestrial biota, surface water, drinking water, ground water, fish and sediment. Program implementation guides are provided. An overview of sampling, field techniques, and specific recommendations have bee : made. (EDB)(JMF)(RAF)

525

Feenstra, S., R.D. Blair, J.A. Cherry, J.L. Chakravatti, and E. LaRocque, Golder Associates, Mississauga, Ontario, Canada; University of Waterloo, Ontario, Canada; Denison Mines Limited, Elliot Lake, Ontario, Canada

Hydrogeochemical Investigations of Two Inactive Tailings Areas in the Elliot Lake Uranium District, Ontario, Canada

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 367-388) (1981)

Investigations of the movement and chemical composition of porewater in two inactive tailings areas at Elliot Lake, Ontario, Canada were conducted during 1980 and 1981 as part of a continuing uranium mill tailings management program at Denison Mines. The investigations involved the sampling and analysis of tailings materials and the installation of piezometers at various depths at several locations in the tailings basins. The piezometers were installed in order to determine the directions of porewater flow and to obtain samples for the chemical analysis of the tailings porewater. The tailings porewater that occurs deep within the tailings impoundments has a chemical composition similar to that of the original neutralized liquid effluent that was discharged from the mill with the tailings and has not been substantially altered by chemical processes in the tailings. This original liquid effluent is subsequently denoted as "original process water." The tailings porewater that occurs nearer the water table and has recharged into the tailings since tailings deposition ended, has been substantially affected by pyrite oxidation in the unsaturated zone of the tailings. This "recharge water" is characterized by low pH, and high concentrations of iron, sulfate, heavy metals and radionuclides. The "recharge water" in the tailings slowly moves laterally and downward into the tailings areas to displace the "original process water." Although mass balance calculations indicate that there is sufficient pyrite in the unsaturated zone of the tailings to produce high concentrations of iron and sulfate for several hundred years, the variations in iron and sulfate concentrations with depth suggest that the production of iron and sulfate from pyrite oxidation is decreasing with time. An understanding of the hydrogeological and geochemical processes in these tailings basins is necessary for the design of appropriate procedures for the "close out" of inactive tailings areas. (Auth)(PTO)

526

Fontana, P.H., Woodward-Clyde Consultants, Denver, CO

A Simplified Method for Acquiring Meteorological Data for Siting and Licensing of Uranium Mill and Tailings Disposal Facilities

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 175-185) (1982)

The licensing and selection of a site for uranium milling and tailings disposal facilities is governed by federal and state radiation regulations, but can also be influenced by federal and state air quality regulations. The air pathway for potential impacts must be considered at appropriate stages in the siting and licensing process. It is highly desirable, therefore, to have some knowledge of existing meteorological conditions on-site during the early stages of project planning. A simplified method for collecting and processing these data has been developed for use in siting and in subsequent stages of the licensing process. The method uses measurements of wind speed and direction from a 10-meter tower to prepare a data base suitable for input to Gaussian dispersion models. Modeling parameters also include indicators of atmospheric stability that can be estimated from the wind field data. A method based on the interpretation of the wind direction range has been refined to provide st

information. Dispersion modeling results in reductions of dose and concentration increases of airborne effluents. These results are then used in selection and licensing of a site suitable for milling and tailings disposal.(Auth) (PTO)

527

Franklin, J.C., T.O. Meyer, and R.C. Bates, U.S. Bureau of Mines, Spokane Mining Research Center, Spokane, WA

Barriers for Radon in Uranium Mines

Bureau of Mines Report of Investigation 8259 (1977)

Water-based epoxy sealants were examined during a two-year period to determine their effectiveness as barriers to radon release in uranium mines. Radon emanation rates from uranium ore samples were monitored for extended periods in the laboratory before and after sealant application. Reduction of radon flux due to the coating of the laboratory samples was approximately 80%. Test chambers in a dormant uranium mine were monitored to determine both short- and long-term barrier effectiveness. These field studies of the sealants indicated reductions greater than 50% relatively soon after application and nearly 75% more than one year later. An unexpected complication to early monitoring in the form of a large radon emanation increase, believed due to added moisture, is discussed. (Auth)(PTO)

528

Franklin, J.C., R.A. Washington, J.C. Kerkering, H. Montone, and R. Regan, U.S. Bureau of Mines, Spokane Research Center, Spokane, WA; Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Elliot Lake Laboratory, Elliot Lake, Ontario, Canada

Radon Emanation from Stopes Backfilled with Cemented Uranium Mill Tailings

Bureau of Mines Report of Investigation 8664; 8 pp. (1982)

An experiment was conducted by the U.S. Bureau of Mines and the Canada Centre for Mineral and Energy Technology (CANMET) to measure the emanation rate of radon from cemented unclassified mill tailings in two dewatered stopes of a uranium mine at Elliot Lake, Ontario, Canada. The radon was monitored upstream and downstream and in both stopes to determine the concentration in the stopes and the amount exhausted from both stopes. The emanation rate was 0.55 pCi/sq cm/s from the mill tailings, which is approximately 1000 times higher than the average flux in the mine before backfilling. (Auth)(JMF)

529

Freeman, H.D., Pacific Northwest Laboratory, Richland, WA

An Improved Radon Flux Measurement System for Uranium Tailings Pile Measurement

PNL-SA-9215; CONF-8110111; Radiation Hazards in Mining: Control, Measurement, and Medical Aspects, Proceedings of an International Conference, Golden, CO, October 4, 1981. Society of Mining Engineers, American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., New York, NY; (pp. 339-344) (1981)

The Pacific Northwest Laboratory (PNL) is developing cover technology for uranium mill tailings that will inhibit the diffusion of radon to the atmosphere. As part of this cover program, an improved radon flux measurement system has been developed. The radon measurement system is a recirculating, pressure-balanced, flow-through system that uses activated carbon at ambient temperature to collect the radon. With the system, an area of 0.93 sq m is sampled for periods ranging from 1 to 2 hours. The activated carbon is removed from the radon trap and the collected radon is determined by counting the Bi-214 daughter product. Development of the system included studies to determine the efficiency of activated carbon, relative calibration measurements and field measurements made during 1980 at the inactive tailings pile in Grand Junction, Colorado. (Auth)(PTO)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

530

Fry, R.M., Australian Atomic Energy Commission Research Establishment, Lucas Heights, Sutherland, Australia

Radiation Hazards of Uranium Mining and Milling

AAEC/IP9 (1976)

The radiological problems that arise in the mining and milling of uranium are examined, and their scientific backgrounds explained. Radiation standards and procedures that should be used to minimize radiation exposure to all persons are set down in the Australian "Code of Practice on Radiation Protection in the Mining and Milling of Radioactive Ores 1975." The solid waste products from the mill (the tailings) which contain most of the naturally occurring radioactivity must be properly impounded, and after closure of the mill, stabilized to ensure long-term containment. Access by the public to the stabilized tailings must be controlled and habitation within the controlled area prohibited. (CAJ)

531

Fung, R.,

Protective Barriers for Containment of Toxic Materials

Pollution Technology Review No. 66. Noyes Data Corporation, Park Ridge, NJ, 288 pp. (1980)

This book provides information for the engineer or land impoundment owner/operator on physical methods for the containment of toxic wastes. Proper storage and handling via the use of liners, covers or fixation techniques offers an excellent means for controlling the escape of toxic materials and provides an aspect of compliance with the RCRA standards. Descriptive information is included on man-made and natural barrier materials, types of wastes to be contained and testing procedures employed. Solidification of wastes as a form of stabilization is also explored. The chapter headings are as follows: Introduction; RCRA and EPA Standards; State Regulations; Liner Types; Wastes; Testing of Liners; Liner Installation; Liner Case Studies; Liner Suppliers; Covers for Solid Wastes; Design Considerations for Covers; and Solidification/Stabilization of Hazardous Wastes. (PTO)

532

Gates, T.E., Pacific Northwest Laboratory, Richland, WA

Consolidation Theory and Its Applicability to the Dewatering and Covering of Uranium Mill Tailings

NUREG/CR-2894; PNL-4402 (1982, November)

This report is a review and evaluation of soil consolidation theories applicable for evaluating settlement during dewatering and subsequent covering of uranium mill tailings. Such theories may be used to predict both consolidation and water flow related effects in uranium mill tailings during drainage, following sluicing into burial pits. A consolidation theory to be useful must consider the effect of time-dependent loads, nonhomogeneous soil mass, nonlinear variation of soil properties with the stress-state parameters, large strain, and saturated and unsaturated flow. Constitutive relations linking the stress deformation state variable with void ratio should be adopted for predicting both consolidation and fluid flow interaction in unsaturated uranium mill tailings. (Auth)

533

Gee, G.W., C.W. Begej, A.C. Campbell, N.N. Sauter, B.E. Opitz, and D.R. Sherwood, Pacific Northwest Laboratory, Richland, WA; University of Washington, Chemistry Department, Seattle, WA

Groundwater Leaching of Neutralized and Untreated Acid-Leached Uranium Mill Tailings

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 457-472) (1981)

Tailings neutralization was examined to determine the effect of neutralization on contaminant release. Column leaching of acid extracted uranium mill tailings from Exxon Highland Mill, Wyoming, Pathfinder Gas Hills Mill, Wyoming, and the Dawn Midnite Mill, Washington, resulted in the flushing of high concentrations of salts in the first four pore volumes of leachate, followed

by a steady decrease to the original groundwater salt concentrations. Neutralization decreased the concentration of salt and radionuclides leaching from the tailings and decreased the volume of solution required to return the solution to the groundwater pH and EC. Radium-226 and uranium-238 leached quickly from the tailings in the initial pore volumes of both neutralized and unneutralized tailings, and then decreased significantly. (Auth)(PTO)

534

Gerber, D.M., and B.G. Ibbotson, MacLaren (James F.) Limited, Willowdale, Ontario, Canada

Environmental Assessment of Uranium Mining in Elliot Lake, Ontario

CONF-791140; Uranium Mill Tailings Management, Proceedings of the Second Symposium, Fort Collins, CO, November 19-20, 1979, 331 pp.; (pp. 227-239) (1979)

Early in the 1970's, Denison Mines Limited and Rio Algom Limited began preparations for the expansion of production at their Elliot Lake properties. In 1976, the Ontario Minister of the Environment authorized the Environmental Assessment Board to conduct a public hearing in respect to the expansion. During the course of the proceedings, the companies presented the results of their environmental assessment. The study first focused upon the definition of the existing environment and the identification of changes attributable to the mining of uranium. The second phase provided descriptions and assessments of alternatives applicable to mining, milling, and waste management practices. During the hearings a number of environmental concerns were discussed. Numerous alternatives and strategies that were intended to minimize the environmental effects of mining in the area were presented. The consequences and risks associated with various existing conditions and proposed modifications were discussed. The board concluded that the technology exists to carry out the expansion of the uranium mines at Elliot Lake in an environmentally acceptable manner in the short-term and that studies be initiated and/or continued in pursuit of solutions to the long-term aspects of waste management. (Auth)(RAF)

535

Gomez, M., Mine Safety and Health Administration, Arlington, VA

Radiation Hazards in Mining: Control, Measurement, and Medical Aspects

CONF-8110111; Proceedings of an International Conference, Golden, CO, October 4, 1981, 1105 pp. (1981)

The proceedings contain 163 papers covering the following topics: (1) mine and mill waste disposal and handling; (2) instrumentation for radon daughter measurement; (3) tissue dosimetry of radon daughters; (4) radiation in non-uranium mines; (5) epidemiology; (6) radiation exposure assessment; (7) statistics; (8) health concerns and surveillance; (9) carcinogenesis; (10) control of underground atmospheres; (11) radionuclide pathways; and (12) radiation hazards. (EIX)(PTO)

536

Green-Heffern, J.M., and J.A. Cesare, Utah State University, Logan, UT

Probabilistic Modeling of Tailings Embankment Designs, Volume 2: Model Application and Verification

Bureau of Mines Open File Report 161(4)-82; 44 pp. (1981, January)

A probabilistic slope stability computer model was developed as a design and analysis tool. This report gives a description of a field investigation and stability analysis of an existing tailings dam. Based on the results, the tailings dam was evaluated for redesign using probabilistic considerations. Conclusions are made regarding the usefulness of the model as a design tool. Volume I describes the model, Volume III and IV are users manuals for the computer programs. (GRA)(JMF)

537

Green, M.W., V.P. Byers, and S.M. Condon, U.S. Geological Survey, Golden, CO

National Uranium Resource Evaluation: Shiprock Quadrangle, Arizona, New Mexico, Colorado, and Utah

PGJ/F-024-82; 161 pp. (1982, September)

Formations and areas in the Shiprock (one degree by two degrees) Quadrangle, New Mexico, Arizona, Colorado, and Utah, evaluated to be favorable for uranium deposits of 100 tons of U3O8 at a minimum ore grade of 0.01% include, in decreasing order of relative favorability: (1) the Late Jurassic Salt Wash and Recapture Members of the Morrison Formation located along the western flank of the San Juan Basin; (2) the Late Triassic Shinarump Member of the Chinle Formation located in the northwest segment of the quadrangle in the vicinity of Monument Valley; (3) the Late Cretaceous Toreva Formation in the Black Mesa Basin; and (4) the Late Jurassic Westwater Canyon and Brushy Basin Members of the Morrison Formation along the western flank of the San Juan Basin. Favorability of the above rock units is based on the presence of a significant number of recognition criteria in each of the formations, as well as the presence of known uranium deposits in all stratigraphic units, except in the Westwater Canyon and Brushy Basin Members which contain none. All of the favorable units are considered favorable for sandstone-type deposits (Class 240, Subclass 243 and 244). In all units, host rocks are fluvial and fluvial-lacustrine, contain associated fine-grained impermeable facies, are carbonaceous or exhibit evidence of the former presence of organic matter, and are composed, in large part, of feldspathic sandstone. The remainder of formations and areas in the quadrangle are considered unfavorable for uranium deposits of minimum grade and tonnage because they exhibit adverse geologic and geochemical characteristics and, in general, lack uranium occurrences and radioactive anomalies. These rocks include, in order of decreasing age: (1) Precambrian rocks; (2) all Paleozoic rock formations; (3) all Mesozoic rocks, except those listed above as favorable; and (4) all rock formations of Cenozoic age. (EDB)(JMF)

538

Gureghian, A.B., Argonne National Laboratory, Division of Environmental Impact Studies, Argonne, IL

Migration of Radionuclide Chains in a Non-Homogeneous Aquifer under Transient Saturated-Unsaturated Flow Conditions

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 439-456) (1981)

The migration of radionuclide chains from a tailings pond of a typical uranium mill is investigated. Numerical calculations were performed using a mathematical model based on the finite-element method of solution capable of analyzing the simultaneous transport of water and multisolutes in a non-homogeneous anisotropic aquifer under saturated and unsaturated flow conditions. The adsorption mechanism is described by a linear equilibrium isotherm. The model allows for a variety of boundary conditions; e.g., infiltration, drainage, or evaporation. Use of the model is illustrated by the analysis of the movement of hypothetical three-membered radionuclide decay chains leaching from the tailings pond of a typical uranium mill. (Auth)(PTO)

539

Gutknecht, P.J., and T.E. Gates, Battelle Pacific Northwest Laboratories, Richland, WA

Review of Design Approaches Applicable to Dewatering Uranium Mill Tailings Disposal Pits

PNL-4150; 33 pp. (1982, March)

This report reviews design approaches in the literature that may be applicable to uranium mill tailings drainage. Tailings dewatering is required in the deep mined-out pits used for wet tailings disposal. Agricultural drainage theory is reviewed because it is seen as the most applicable technology. The report concludes that the standard drain-pipe envelope design criteria should be easily adapted. The differences in dewatering objectives and physical characteristics between agricultural and tailings drainage systems prevent direct technology transfer with respect to drain spacing calculations. Recommendations for further research are based on the drainage features unique to uranium mill tailings. It is recommended that transient solutions be applied to describe liquid movement through saturated and partially saturated tailings. Modeling should be used to evaluate the benefits of drainage design approaches after careful considerations of potential construction problems. (GRA)(JMF)

540

Hadley, L.M., and G.C. Davenport, Douglas-Robertson and Associates, Inc., Golden, CO

Horizontal Logging as a Monitoring Tool

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 695-712) (1981)

Borehole logging techniques were used to investigate a dam failure in eastern Colorado. Resistivity, SP, gamma, and neutron-neutron borehole logs were run in the remaining sections of the toe drain to determine whether voids had formed in the backfill around the drain. The results of the logging were not conclusive, but the investigation suggested the use of various types of logging techniques as a monitoring tool. For instance, gamma logs run in toe drains of uranium tailings ponds could be very useful in pinpointing radioactive seepage. Types of logs and applications are discussed. (Auth)

541

Hamel, P.E., Atomic Energy Control Board, Ottawa, Ontario, Canada

National/International R and D Programs on Uranium Mill Tailings

INFO-0044; 25 pp. (1981, May)

The mining and milling of uranium ores results in the production of large quantities of wastes containing low concentrations of radionuclides such as uranium, thorium, radium, radon and their daughter products. The current concern of regulatory authorities is with the extent of the problems and disposal methods that must now be required to ensure that an acceptable level of protection is maintained in the long-term. This concern is the subject of a number of R&D programs. In Canada, the Technical Planning Group on Uranium Tailings was established to review on-going activities and to plan a research program for the management of wastes after the mine and mill have shut down. The group has completed its review and report which contain its conclusions and recommendations for a proposed national R&D program. Included is a proposal for a centralized organizational structure for the coordination and management of the total program which is to be supported jointly by the federal government, two provincial governments (Ontario, Saskatchewan), and the uranium producers. At the international level, the Nuclear Energy Agency originated, in 1979, a program to study the extent of the long-term problems of uranium mill tailings, and to develop an internationally acceptable methodology for making rational decisions regarding their long-term management taking into account the ECRP principles and system of dose limitation. (EDB)(JMF)(RAF)

542

Hanchey, L.A., Sandia National Laboratories, Albuquerque, NM

Uranium Mill Tailings and Radon

SAND-80-2142; 30 pp. (1981, January)

The major health hazard from uranium mill tailings is presumed to be respiratory cancer resulting from the inhalation of radon daughter products given off from these tailings sites. A review of studies on inhalation of radon and its daughters indicates that the hazard from the tailings is extremely small. If the assumptions used in the studies are correct, one or two people per year in the U.S. may develop cancer as a result of radon exhaled from all the uranium mill tailings remedial action program sites. The remedial action should reduce the hazard from the tailings by a factor of about 100. (EDB)(JMF)

543

Harley, J.H., Interagency Radiation Research Committee, Washington, DC

Pathways to Man

CONF-800392; Public Meeting on Federal Research into Biological Effects of Ionizing Radiation, Proceedings of a Symposium, Bethesda, MD, March 10, 1982; (pp. 117-144) (1980, March)

The study of radionuclide pathways leading to man generally has the goal of allowing us to predict human exposure from measurements of the radionuclide concentration in some segment of the environment. This modelling process provides a valuable tool in both the regulatory and health protection fields. However, most of the models in the regulatory field and in the health physics profession were designed to maximize exposure estimates. It is preferable to have scientifically defensible estimates and to add suitable safety factors at the end. Thus, we are still faced with the development and validation of suitable models for many of the radionuclides of interest. The most useful models will include means of

assessing variability and uncertainty. In this case variability might be considered as the differences in behavior due to age, sex, or other factors in animals or man and those differences among plant species or animal species that determine their uptake factors. The uncertainty, on the other hand, would be the estimate of possible error in the experimental measurement. Model parameters would always have some variability even for site-specific cases and broad averages for population groups would have to include a factor expressing the possible variability and uncertainty. Any exposure calculations need to be expressed with some range and valid assessments of this range. (Auth)(PTO)

544

Hartley, J.N., and J.L. Buelt, Pacific Northwest Laboratory, Richland, WA

Containment Systems for Uranium Mill Tailings

CONF-821103; American Nuclear Society 1982 Winter Meeting, Proceedings of a Conference, Washington, DC, November 14-18, 1982, 813 pp.; (pp. 310-312); Transactions of the American Nuclear Society 43:310-312 (1982, November)

Cover and liner systems for uranium mill tailings in the U.S. must satisfy stringent requirements regarding long-term stability, radon control, and contaminant migration. The cover placed over a pile serves three purposes: (1) to reduce the release of radon; (2) to prevent the intrusion of humans, plant roots, and burrowing animals into the tailings; and (3) to limit surface erosion. The liner prevents the migration of contaminants into groundwater. The cover and liner technologies discussed in this paper involve: (a) single and multilayer earthen cover systems; (b) asphalt emulsion radon barrier systems; and (c) asphalt, clay, and synthetic liner systems. A liner decision tree diagram and a description of each of the liner and cover systems are presented. (PTO)

545

Hartley, J.N., H.D. Freeman, E.G. Baker, M.R. Elmore, D.A. Nelson, C.F. Voss, and P.L. Koehmstedt, Pacific Northwest Laboratory, Richland, WA

Field Testing of Asphalt Emulsion Radon Barrier System

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 319-339) (1981)

Three years of laboratory and field testing by PNL has demonstrated that asphalt emulsion seals are effective radon diffusion barriers. Both laboratory and field tests in 1979, 1980, and 1981 have shown that an asphalt emulsion seal can reduce radon fluxes by greater than 99.9%. The effective diffusion coefficient for the various asphalt emulsion admix seals averages about 1 X 10(E-6) sq cm/s. The 1981 joint field test is a culmination of all the technology developed to date for asphalt emulsion radon barrier systems. Preliminary results of this field test and the results of the 1980 field test are presented. The conclusions of the field tests are as follows: (1) asphalt emulsion-aggregate admix seals applied with proper techniques are effective in reducing radon exhalation from uranium tailings to less than the proposed EPA standards (2 pCi/sq m/s above background); (2) radon flux reduction greater than 99.9% were achieved during the 1980 and 1981 field tests (i.e. less than 1 pCi/sq m/s) when measured with the radon flux measurement system developed by PNL; (3) a cold-mix paver can successfully apply an admix containing cationic asphalt emulsion and concrete sand with a residual asphalt content of 23 weight percent; and (4) the chemical and physical properties of the radon barrier system are such that it should endure for a long time period. Maintaining overburden over the seal is important in maintaining the integrity of the seal. (Auth)(PTO)

546

Hartley, J.N., P.L. Koehmstedt, D.J. Esterl, and H.D. Freeman, Argonne National Laboratory, Argonne, IL

Stabilization of Uranium Mill Tailings with Asphalt Emulsion

CONF-800334; Nuclear Energy, Conservation, and Solar Energy, Proceedings of the Second U.S. Department of Energy Environmental Control Symposium, Reston, VA, March 17-19, 1980, Vol. 2; (pp. 162-175) (1980)

Uranium mill tailings pose a potential radiation hazard to the public. Therefore, stabilization or disposal of the

tailings in a safe and environmentally sound way is needed to minimize radon exhalation and other environmental hazards. One of the most promising concepts for stabilizing uranium tailings is the use of asphalt emulsion to contain radon and other hazardous materials within uranium tailings. This approach is being investigated at the Pacific Northwest Laboratory. Results of these studies indicate that a radon flux reduction of greater than 99% can be obtained using either a poured-on/sprayed-on seal (3.0 to 7.0 mm thick) or an admixture seal (2.5 to 12.7 cm thick) containing about 18 wt% residual asphalt. A field test was carried out in June 1979 at the Grand Junction tailings pile in order to demonstrate the sealing process. A reduction in radon flux ranging from 4.5 to greater than 99% (76% average) was achieved using a 15.2-cm (6-in.) admix seal with a sprayed-on top coat. A hydrostatic stabilizer was used to apply the admix. Following compaction, a spray coat seal was applied over the admix as the final step in construction of a radon seal. Overburden was applied to provide a protective soil layer over the seal. Included in part of the overburden was a herbicide to prevent root penetration. (EDB)(JMF)

547

Hawley, J.E., Hazen Research, Inc., Golden, CO

Use of Phosphate Compounds to Extract Thorium-230 and Radium-226 from Uranium Ore and Tailings

PB-81-219503; 133 pp. (1980, May)

Orthophosphate and condensed phosphates (pyrophosphate, tripolyphosphate and hexametaphosphate) were tested to determine whether they were capable of forming soluble complexes with thorium-230 and radium-226 in a sulfuric acid or neutral medium. The tests were carried out to determine whether these compounds would be useful for removing thorium and radium from solid uranium mill tailings prior to disposal. Results showed that orthophosphate, pyrophosphate, and tripolyphosphate at concentrations up to 0.1 moles in a sulfuric acid medium showed no tendency to complex thorium or radium. Hexametaphosphate at a 0.1 molar concentrations in a sulfuric acid medium did solubilize approximately 40% of the radium present in the ore. Tests also showed that the hexametaphosphate interferes with uranium extraction from the ore and solubilizes thorium-230 and radium-226 from neutral residues left after acid leaching. This approach was tested further, and 70 to 80% removal of thorium and radium from the slimes fraction (-200 mesh) of the tailings were achieved. A final series of tests included an acid kill stage, followed by wet screening to separate the sands from the slimes. This produced a sands fraction that was relatively free of radium and thorium. The slimes from the acid kill leach were enriched with radium-226. (EDB)(JMF)

548

Hendricks, D.W., and Y.S. Kim, University of Nevada, Reno, NV

Uranium Mill Tailings Storage, Use, and Disposal Problems

CONF-7704103; Uranium Mining Technology, Proceedings of the First Conference, Reno, NV, April 24-29, 1977; (26 pp.) (1977)

Solid and liquid residues (tailings) containing substantial quantities of naturally occurring radionuclides are produced and stored at all U.S. uranium mill sites. These radioactive wastes are a potential health hazard with the degree of hazard depending largely on the tailings management practices at the individual sites. The principal pathways of potential radiation exposure to man are discussed. A description is presented of some past and current tailings storage practices together with a deacription of some possible problems associated with various stabilization and disposal options. (EDB)(JMF)

549

Hinton, T., and F.W. Whicker, Pathfinder Mines Corporation, Shirley Basin, WY; Colorado State University, Department of Radiology and Radiation Biology, Fort Collins, CO

A Field Experiment on Tailings Reclamation: Radon Flux Versus Earthen Cover Depth

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 421-432) (1982)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

Design and construction techniques are described for a 1.6 hectare (4 acre) experimental uranium tailings reclamation plot. A brief review of the objectives of the experiment is given along with initial survey methods used to characterize the plot. These methods include analysis of the source term, overburden, first year vegetation, moisture determination with a neutron probe and gross alpha and gamma surveys. The radon exhalation versus overburden depth experiment is discussed in detail. Radon flux from tailings covered with 1.5 m (5 feet) or more of earthen material was not distinguishable from background fluxes. Problems associated with high variability among replicates within the same treatment areas are noted. (Auth)(PTO)

550

Hodder, R.L., Montana State University, Montana Agricultural Experiment Station, Bozeman, MT

Dry Land Techniques in the Semiarid West

Reclamation and Use of Disturbed Land in the Southwest, J.L. Thames, (Ed.). The University of Arizona Press, Tucson, AZ, Ch. 23, 362 pp.; (pp. 217-223) (1977)

Restoration of bare areas, especially in the dry western states, must start with site stabilization which first demands physically stable gradients. Once physical stability is achieved, the surface soil may be temporarily stabilized with mulches, annual species, mechanical surface manipulation such as pitting, listering, and finally with permanent vegetation. New techniques used in the establishment of permanent vegetation usually hinge on the most limiting factor, the availability of moisture. Impeding runoff, increasing infiltration, and reducing evaporation are means of increasing available soil moisture. Other techniques discussed include: cultivation; mulching; topsoiling; deep chiseling; and gouging. (PTO)

551

Hollocher, T.C., and J.J. MacKenzie, Brandeis University, Waltham, MA; Massachusetts Audubon Society, Lincoln, MA

Radiation Hazards Associated with Uranium Mill Operations

The Nuclear Fuel Cycle: A Survey of the Public Health, Environmental, and National Security Effects of Nuclear Power. Massachusetts Institute of Technology Press, Cambridge, MA, 291 pp.; (pp. 41-69) (1975)

Four recommendations were made involving the management of uranium mill tailings for the protection of public health. They are as follows: (1) exposure levels used to determine if remedial actions are required on structures should be based on the Surgeon General's guidelines of 1970; (2) remedial actions involving radon diffusion, ventilation, or the removal of tailings should be more stringent than the Surgeon General's guidelines; (3) mill tailings piles should be buried underground in old uranium mines or in open pit mines and should be covered by five meters of cover; and (4) alternative methods such as the removal of radium at the time of uranium extraction should be investigated to reduce the radiation hazards to the public. (PTO)

552

Huck, P.M., and B. Anderson, University of Alberta, Department of Civil Engineering, Edmonton, Alberta, Canada

Leachability of Barium-Radium Sulphate Sludges

Nuclear and Chemical Waste Management 3(4) :251-259 (1982)

This paper presents results from the first phase of a research program designed to examine the leachability of radium-226 from barium-radium sulfate sludges. Batch leaching tests were performed. Results showed that liquid:solid contact time was relatively unimportant; radium in the sludge was stable in the presence of deionized water with a slight increase in the amount leached per gram of sludge occurring at higher liquid:solid ratios. Not unexpectedly, low and high values of leachant pH increased radium leaching. Both monovalent and divalent salt solutions also increased leaching; however, dissolved radium-226 activity levels in the leachate decreased as leachant molarity increased. For divalent salts this can be explained by the common ion effect; for monovalent salts it is opposite to results expected from solubility considerations. The interpretation of all results is complicated by the fact that in most te the

amount of radium-226 present in the leachate was lower than the calculated contribution from the mother liquor present with the sludge. This apparent ability of the sludge to absorb radium from solution may be related to reprecipitation of the sludge during the leaching tests. (Auth)(PTO)

553

Huck, P.M., J.R. Brown, G.E. Multamaki, and K.L. Murphy, University of Regina, Regina, Saskatchewan, Canada

Environmental Consequences of the Placement of Radium-Barium Sludge in Tailings Areas

Canadian Institute of Mining and Metallurgy Bulletin 75(839):147-152 (1982, March)

The study was restricted to a consideration of possible increases in the quantities of radionuclides escaping to the environment through either groundwater or surface water from tailings and effluent treatment systems currently operating in Canada. (Auth)

554

Hutchinson, P.G., J. Caldwell, and R. Dorey, Steffen Robertson and Kirsten, Inc., Denver, CO; Steffen Robertson and Kirsten, Inc., Vancouver, British Columbia, Canada

The Use of Stage Curves and Mass Balances in the Design of Uranium Tailings Impoundments

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 579-593) (1981)

This paper briefly summarizes a mass balance analysis approach to the planning, design, and operation of a typical uranium tailings impoundment. The general mass balance equations for both solids and water are presented and various numerical and graphical solution techniques are discussed. Examples of simplified annual average mass balance analyses as well as complex computer mass balance simulations are presented. The graphical method of solution is outlined and several examples are given. The paper concludes with general recommendations and the application of the various techniques described. (Auth)(PTO)

555

Ibrahim, S., S. Flot, and F.W. Whicker, Colorado State University, Department of Radiology and Radiation Biology, Fort Collins, CO

Concentrations and Biological Availability of U-238 and Th-230 in the Environs of a Uranium Milling Operation

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 149-163) (1982)

The primary objectives of this study were to determine U-238 and Th-230 concentrations in soils and native plants from various sites around a conventional acid leach uranium milling operation in the western U.S., and to estimate plant/soil concentration factors. Soil and vegetation samples were collected from: exposed, weathered tailing; near the edge of a tailings pond; from a reclamation area; and at several native range background (control) locations. Water and sediment samples were also collected from a tailings pond and analyzed for U-238 and Th-230 contents. The mean concentrations of U-238 and Th-230 in background soil were within the reported range for normal soils in the United States. Concentrations of these radionuclides in soil and vegetation were generally elevated above background in the disturbed sites. Mean plant/soil concentration factors varied significantly among sites and between radionuclides, but no significant differences between plant groups were found. Frequency distributions of concentration factor values were highly skewed, with arithmetic mean values much higher than modal values. In general, concentration factors for plants growing on exposed tailings and at the edge of a tailings pond were significantly greater than for those in native range and reclamation areas. Concentration factors for Th-230 were greater than for U-238 for plants growing at the edge of the tailings pond. We speculate that the lower concentration factors for uranium relative to thorium at this site may be due to the proportion of their contents in soils that is biologically available for plant uptake. Although Th-230

concentrations in tailings pond water and sediment were an order of magnitude higher than U-238, their partition constants (K sub d) were similar. The relatively low K sub d value (approximately 1.0) for both elements is a function of their high solubility in sulfuric acid. (Auth) (PTO)

556

Jeyapalan, J.K., Texas A&M University, Department of Civil Engineering, College Station, TX; Mine Geotechnique, Bryan, TX

Dam Break Studies for Mine Tailings Impoundments

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 39-53) (1982)

A characteristic common to most tailings dam failures is that the tailings tend to liquefy and flow for substantial distances as a viscous fluid, with the potential for extensive damage to property and life. Failures of El Cobre, Chile (1965), Mochikoshi, Japan (1978), Aberfan, Wales (1966), and Buffalo Creek, West Virginia (1972) are examples of such catastrophic incidents. In these four incidents more than 400 lives were lost, and the loss of property was approximately $200 million. In order to be able to assess the potential for damage in case of such a failure, it is necessary to predict the possible extent of flow slide movement. This paper discusses simple procedures for performing such dam-break analyses. Two case histories are analyzed to illustrate the use of these analytical procedures. (Auth)(PTO)(RAF)

557

Jeyapalan, J.K., J.M. Duncan, and H.B. Seed, Texas A&M University, College Station, TX

Summary of Research on Analyses of Flow Failures of Mine Tailings Impoundments

Bureau of Mines Information Circular 8857; Mine Waste Disposal Technology, Proceedings of a Bureau of Mines Technology Transfer Workshop, Denver, CO, July 16, 1981; (pp. 54-61) (1981)

The behavior of tailings materials during flow can be represented with reasonable accuracy by the Bingham plastic rheological model. Currently available computer programs (GVFP and Freed) can be used for analyses of potential inundation zones likely to result from turbulent flows of very fluid tailings such as phosphate tailings and the mixture of water and coal waste which flowed at Buffalo Creek. Analysis procedures developed during this study can be used for analyses of flow failures in more highly viscous tailings which undergo laminar flow. The analyses can be performed using charts in the case of flow on planes, and by means of a computer program (TFLOW) in the case of flow in prismatic valleys. (EIX) (JMF)

558

Jobst, J.E., EG&G Idaho, Inc., Idaho Falls, ID

Aerial Radiation Surveys

EGG-1183-1759; CONF-800334; Nuclear Energy, Conservation, and Solar Energy, Proceedings of the Second U.S. Department of Energy Environmental Control Symposium, Reston, VA, March 17-19, 1980, Vol. 2; (11 pp.) (1980)

A recent aerial radiation survey of the surroundings of the Vitro Mill in Salt Lake City shows that uranium mill tailings have been removed to many locations outside their original boundary. To date, 52 remote sites have been discovered within a 100 square kilometer aerial survey perimeter surrounding the mill; nine of these were discovered with the recent aerial survey map. Five additional sites, also discovered by aerial survey, contained uranium ore, milling equipment, or radioactive slag. Because of the sources of this survey, plans are being made to extend the aerial survey program to other parts of the Salt Lake Valley where diversions of Vitro tailings are also known to exist. (EDB)(JMF)

559

Kalin, M., University of Toronto, Toronto, Ontario, Canada

Investigations Into Selected Ecological Aspects of the Aquatic and Terrestrial Environment of an Abandoned Uranium Mill Tailings Pond, Bancroft, Ontario

EE-15; 109 pp. (1980, June)

IAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

This report contains four independent studies of uranium mill tailings areas covering surface water movements, limnology, invasion of the tailings by vegetation, and soil nematodes in the mill tailings. (EDB)(JMF)(RAF)

560

Kalin, M., and P.M. Stokes, University of Toronto, Institute of Environmental Studies, Toronto, Ontario, Canada

Macrofungi on Uranium Mill Tailings - Associations and Metal Content

Science of the Total Environment 19(1):83-94 (1981)

Sporocarps of three species of Ascomycota and ten species of Basidiomycota were collected from abandoned uranium mill tailings. On these sites some natural colonization by vegetation had occurred during the last 20 years. The existing vegetation provides some circumstantial evidence for mycorrhizal associations with PINUS STROBUS, POPULUS BALSAMIFERA, PINUS TREMULIODES, and SALIX spp. A new record for HELVELLA CORIUM in Ontario requires confirmation. For twelve fungal collections, representing three different tailings sites, analysis of elemental composition by neutron activation was carried out for aluminum, barium, calcium, magnesium, manganese, and sodium. Fungal concentrations of these elements were for the most part much higher than previously published values. However, the respective substrate values were also higher than values for most soils. (Auth)(PTO)

561

Kay, B.L., University of California at Davis, Davis, CA

Hydroseeding and Erosion Control Chemicals

Reclamation and Use of Disturbed Land in the Southwest, J.L. Thames, (Ed.). The University of Arizona Press, Tucson, AZ, Ch. 26, 362 pp.; (pp. 238-247) (1977)

Hydroseeding or hydraulic seeding is the application of a slurry of seed and water to soil. The slurry may also contain wood fiber and fertilizer (hydromulching). Hydromulching is an excellent method of applying seed and fertilizers to steep areas, where the wood fiber holds the seed and fertilizer in position. On short or gentle slopes the fiber also provides protection against erosion until the vegetation is established. A covering of mulch is desirable to hold the seed in place. Organic seeding additives are generally used to hold the fiber in place, promote germination, hold moisture, and retard erosion. Plastic emulsions are used commercially both with and without plant material. They form a crust which is useful for both erosion and dust control. Straw is an excellent mulch for stabilizing soil, encouraging seed germination, and speeding plant growth. Legumes are important in seeding infertile sites because they can supply their own nitrogen, surviving where other plants might not. (PTO)

562

Kharbanda, J.L. Singh, L.J., P.K. Panicker, and M.P.S. Ramani, Bhabha Atomic Research Centre, Bombay, India

Studies on the Treatment of Uranium Mill Effluents

BARC-1042; 24 pp. (1980)

Uranium mill tailings overflow waters may contain 10 pci/l of radium and 10 mg/l of soluble manganese as opposed to the maximum permissible discharge limit of 3 pci/l of radium and the allowable limit of 0.3 mg/l of manganese. These contaminants must be removed and/or made insoluble to ensure environmental safety. Studies were, therefore, carried out to develop methods for: (1) decontamination of both barren liquors and overflow waters and (2) their insolubilities prior to their release in the pond. Based on the results, a scheme of treatment is formulated. Radium activity in the barren liquor is made insoluble by the addition of 25 mg Ba(2+)/l and precipitation. The liquor is then neutralized with lime. The sludges on liquid-solid separation are subjected to air digestion to stabilize manganese II to highly insoluble manganese IV oxide. The supernatant liquid and the digested sludges are discharged to the tailings pond. Overflow waters from the pond are treated with 5 to 10 mg/l of permanganate to remove manganese and radium. The resulting precipitates may be disposed of as solid radioactive wastes and decontaminated water may be released to the environment or if it meets the mill

specification, may be reused as process water, thus ruling out even the slightest possibility of environmental pollution. The overall cost of the chemicals required for the treatment is about 0.30 rupees/cubic meter of effluent. (EDB)(JMF)(RAF)

563

Kilborn Limited, Toronto, Ontario, Canada; Beak Consultants Limited, Montreal, Quebec, Canada; Atomic Energy Control Board, Ottawa, Ontario, Canada

Assessment of the Long Term Suitability of Present and Proposed Methods for the Management of Uranium Mill Tailings

INFO-0024; 392 pp. (1979, July)

Proposals for safe, long-term containment of conventional tailings include (1) storage under water, (2) storage in active, abandoned or specially created underground mines and, (3) storage in open pits, with subsequent flooding or covering with overburden. The underwater proposal can meet most of the requirements of long-term containment, however, extensive study of existing tailings deposits in deep water locations will be needed. Underground mines cannot provide sufficient storage capacity, since the tailings bulk during mill operation can occupy twice the volume of the original ore. It is possible to reduce the hazard by reducing the radium and thorium content of the tailings. Proposals for such an undertaking include ore beneficiation with rejection of the relatively innocuous fraction, radium-thorium removal in the mill, and significant changes in both ore processing and treatment of tailings. It is concluded that surface-stored tailings are vulnerable over the long-term to dispersion by leaching and water erosion, and that access to a tailings site cannot be prevented, however, only a major climatic or seismic event could disturb tailings stored in suitable underwater or underground mine sites. The criteria for determining suitability for each method will need to be identified, tested, and accepted through the normal process of modeling, pilot plant evaluation, monitoring and evaluation. (EDB)(JMF)

564

Kirkham, R.R., P.A. Beedlow, and G.W. Gee, Pacific Northwest Laboratory, Richland, WA

Effect of Rock Cover on Multilayer Radon Barrier Effectiveness

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982 557 pp.; (pp. 409-419) (1982)

Destruction of cover material by erosion and weathering is a major concern in determining the life expectancy of radon barriers. These barriers are to be covered with earthen material and stabilized with surface covers of rock and/or vegetation to lessen the effects of erosion and weathering processes. These surface covers could alter the moisture content of the radon barrier material and the overlying earthen cover. Two surface covers were evaluated at a multilayer radon-barrier field test plot at Grand Junction, Colorado. The entire plot was seeded in November 1980 and irrigated from March 1981 to August 1981. In November 1981, 50% of the test plot was treated with a soil sterilant and covered to a depth of 15 cm with 4-cm washed rock. An active-flow charcoal collection system measured the radon flux on the vegetation and rock cover plots. The moisture content of the earthen material overlying the multilayer barrier was evaluated with gypsum moisture blocks, a neutron moisture probe, and soil sampling. As expected, the soil moisture content was higher under the rock treatment. Radon flux values were also lower for the rock treatment, but to a greater degree than expected. A flux measurement error is apparent with current flux measurement procedures and rock cover surfaces. (Auth)(PTO)

565

Kisieleski, W.E., Argonne National Laboratory, Argonne, IL

Radon Release and Dispersion from an Open Pit Uranium Mine

NUREG/CR-1583; ANL/ES-97; 68 pp. (1980, June)

Radon-222 flux from representative sections of the United Nuclear St. Anthony open-pit mine complex was measured. A flux measurement system incorporating a collection surface of 0.23 pCi/sq m with a desiccant to remove moisture was designed for this study. The collected radon was adsorbed on activated charcoal [illegible] the

radon activity was measured by gamma spectroscopy (609 keV Bi-214). System design, calibration, and the procedure to determine radon flux density (pCi/sq m/s) are described. A continuous series of radon flux densities was measured over a 5-month period at a control point in the mine. The average flux density at the control point was 1.9 pCi/sq m/s (range: 0.44 to 10.6 pCi/sq m/s). A close correlation between radon flux density variations and changes in barometric pressure was observed by a comparison of meteorological data and average daily radon flux density measured at the control point. The data from the control point was used to normalize measurements at other locations for variations in radon release rates caused by changing meteorological and climatic conditions. The release rate from each section of the mine was calculated from the average radon flux density and the area of the section, as determined from enlarged aerial photographs. The average radon flux density for eight locations over the ore-bearing section was 7.3 pCi/sq m/s (range: 0.41 to 36.0 pCi/sq m/s). The average flux density for four locations over undisturbed topsoil was 0.17 pCi/sq m/s (range: 0.12 to 0.22 pCi/sq m/s). The average Ra-226 content of ten samples taken from the ore-bearing region was 102 pCi/g ore. The ratio of radon flux density to radium content (specific flux) was 0.072 [(pCi Rn-222/sq m)/(pCi Ra-226/g ore)] This specific flux density is about five times lower than indicated by our previous measurements over aged tailings. The release rate from the entire St. Anthony open pit was determined to be 350,000 pCi/s. This rate is comparable to the natural release of radon from one square mile of undisturbed topsoil. (Auth)(PTO)

566

Knight, G.B., and C.E. Makepeace, Atomic Energy Control Board, Ottawa, Ontario, Canada

Modification of the Natural Radionuclide Distribution by Some Human Activities in Canada

CONF-780422; Natural Radiation Environment III, Proceedings of a Symposium, T.F. Gesell and W.M. Lowder, (Eds.), Houston, TX, April 23-28, 1978. U.S. Department of Energy, Technical Information Center, Oak Ridge, TN, Vol. 2, 881 pp.; (pp. 1494-1510) (1980)

Examples are presented of three types of human activity that have resulted in elevated natural radiation levels. Investigations carried out by a federal provincial task force are described. The distributions of grab sample measurements of radon and radon daughter concentrations are compared for the Bancroft area, Cobourg, Deloro, Elliot Lake, and Port Hope in Ontario, and Uranium City in Saskatchewan; it is concluded that the major point of difference between the communities that were investigated and the reference community of Cobourg is the departure from a symmetrical lognormal distribution at the higher concentrations. (Auth)

567

Leiter, A.J., U.S. Environmental Protection Agency, Office of Radiation Programs, Washington, DC

A Benefit-Cost Methodology for Developing Environmental Standards for Uranium Mill Tailings Disposal

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 11-25) (1982)

This paper describes a method for using benefit-cost analysis in developing generally applicable environmental standards for uranium mill tailings disposal. Several disposal alternatives were selected which consist of different combinations of control measures. The resulting cost and benefit estimations allow the calculation of the incremental cost of obtaining incremental benefits of radiation protection. The overall benefit of a disposal alternative is expressed in terms of an index which is based on weighting factors assigned to individual benefits. The results show that some disposal alternatives have higher costs while providing no additional benefit than other alternatives. These alternatives should be eliminated from consideration in developing standards. The results appear to conform to economic theory; beyond some level of control, additional environmental benefits are realized only by spending increasingly larger sums of money. This type of analysis should be helpful in developing environmental standards because the trade-off between costs and benefits is clearly shown. (Auth)(PTO)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

568

Lindsay, D.B., J.E. Oberholtzer, and C.H. Summers, Little (Arthur D.), Inc., Cambridge, MA

Sealant Tests to Control Radon Emanation in a Uranium Mine

Bureau of Mines Open File Report 172-82; 91 pp. (1981, December)

This report describes a field-test program to determine the effectiveness of a polymeric wall sealant which reduces the escape of naturally occurring radioactive radon gas from the walls of an underground uranium mine into the ventilation air. (GRA)(JMF)

569

Lindsey, C.G., J.M. Doesburg, and R.W. Vallario, Pacific Northwest Laboratory, Richland, WA

A Review of Long-Term Rock Durability: Implications for Survivability of Riprap Used to Protect Uranium Mill Tailings

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 101-115) (1982)

This paper summarizes salient geological and petrological properties of rock that may be selected for use as uranium mill tailings riprap. Riprap durability depends on the weathering environment and lithological properties of the material chosen for the riprap. A number of tests are available to assess riprap durability, but they suffer from several shortcomings, including: (1) quantitative analyses are limited for the most part to measurements of physical weathering susceptibilities; (2) a final determination of a rock's suitability frequently requires a qualitative judgment on the part of the examiner; (3) the reliability of accelerated weathering tests is uncertain; (4) little corroborative evidence exists between durability tests and actual field performance of the material; and (5) current riprap durability tests are meant to evaluate durability for shorter time intervals than are relevant to uranium mill tailings riprap. Riprap failure is not a unique or isolated problem, as demonstrated by survey of riprapped structures that are only a few decades old. Part of the problem may rest with current testing procedures, particularly the lack of studies on the correlation between field performance and laboratory practices. The best available information to date indicates that at most western U.S. mill sites physical weathering agents will be the principal cause of riprap deterioration, although unpredictable long-term climatic variations could alter this situation. Our findings show that certain rock types may be suitable for mill tailings armoring, including varieties of igneous rocks (e.g. rhyolites and fine-grained granites), metamorphic rocks (e.g. quartzites and granitic gneisses), and perhaps a few sedimentary rocks (e.g. limestones). (Auth)(PTO)

570

Lindsey, C.G., L.W. Long, and C.W. Begej, Pacific Northwest Laboratories, Richland, WA

Long-Term Survivability of Riprap for Armoring Uranium-Mill Tailings and Covers: A Literature Review

NUREG/CR-2642; PNL-4225; 136 pp. (1982, June)

Pacific Northwest Laboratory (PNL) is investigating the use of a rock armoring blanket (riprap) to mitigate wind and water erosion of an earthen radon suppression cover applied to uranium mill tailings. Because the radon suppression cover and the tailings must remain intact for up to 1000 years or longer, the riprap must withstand natural weathering forces. This report is a review of information on rock weathering and riprap durability. Chemical and physical weathering processes, rock characteristics related to durability, climatic conditions affecting the degree and rate of weathering, and testing procedures which are used to measure weathering susceptibilities have been reviewed. Sampling and testing techniques, as well as analyses of physical and chemical weathering susceptibilities, are necessary to evaluate rock durability. Many potential riprap materials may not be able to survive 1000 years of weathering. Available techniques for durability testing cannot adequately predict rock durability or the 1000-year period because they do not consider the time factor (i.e., how long must riprap remain stable). This report includes an Appendix on rock weathering by Dr. Richard Jahns of Stanford University. (EDB)(JMF)(RAF)

571

Lindsey, C.G., J. Mishima, and S.E. King, Pacific Northwest Laboratory, Richland, WA

HAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

Evidence for the Long-Term Stability of Uranium Mill Tailings: Survivability of Ancient Man-Made Earthen Structures

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 77-89) (1982)

Pacific Northwest Laboratory, as part of a study for the Nuclear Regulatory Commission, is investigating long-term stabilization techniques for uranium mill tailings piles. Part of this investigation involves the design of a rock armoring blanket to mitigate wind and water erosion of the underlying soil cover, which, in turn, prevents exposure of the tailings to the environment. However, the need for the armoring blanket, as well as this blanket's effectiveness, depends on the stability of the underlying soil cap (radon suppression cover) and on the tailings themselves. Compelling evidence in archaeological records suggests that large man-made earthen structures can remain sound and intact for time periods comparable to those required for the tailings piles. In this paper we present archaeological evidence of the existence and survivability of man-made earthen and rock structures through specific examples of such structures around the world. We also review factors contributing to the survival or destruction of these structures. Archaeological evidence suggests that whereas natural erosional forces have affected these structures, man's activities (e.g. agriculture, looting) have been the most damaging. The influence of climate, building materials, and construction techniques on survivability is addressed in this paper. (Auth)(PTO)

572

Longfellow, R.L., D.C. Hoffman, and R.B. Pojasek,

Methodology Used in Devising a New Solution to the Disposal of Hazardous Wastes Using Uranium Tailings as a Current Example

Toxic and Hazardous Waste Disposal: New and Promising Ultimate Disposal Options. Ann Arbor Science Publishers, Inc., Ann Arbor, MI, Vol. 4; (pp. 135-148) (1980)

This chapter extends the technology that was specifically developed to resolve the slurry waste disposal problem resulting from the use of lime or limestone reagents in flue gas desulfurization (FGD). This technology involves the use of Dravo's Calcilox additive. The application of this technology to solve the problems of disposing other inorganic slurry wastes is also given. Overall, this chapter summarizes the development of Calcilox, briefly defines stabilization and, most importantly, discusses the method used in applying this technique to various inorganic wastes. (EDB)(JMF)(RAF)

573

Longmire, P.A., R.T. Hicks, and D.G. Brookins, New Mexico Department of Health and Environment, Environmental Improvement Division, Santa Fe, NM; University of New Mexico, Albuquerque, NM

Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 389-414) (1981)

Sand backfilling, a reclamation/engineering technique which returns cyclone or centrifugally separated uranium mill tailings to the mine, is commonly practiced within the Grants Mineral Belt, New Mexico. Important aqueous geochemical parameters contributing to the interactions between backfill tailings and groundwater are complex and include: Eh, pH, ionic strength, activities of species, buffering capacities, adsorption phenomena, and mixing of waters of different origin (i.e. treated-oxidized waters and formational reduced waters). This geochemical complexity is a function of the chemical character of the tailings, including a low pH (i.e. equal to or less than 2.0), which reacts with pore fluid (i.e. formational water) to produce anomalous concentrations of SO4, Cl, Si, Al, Mg, Na, Ca, Fe, As, Mo, Zn, Co, Cr, U, Mn, and Cu. Eh-pH diagrams provide one of the most useful tools for depicting stability fields for various solids and aqueous species where the element(s) under consideration exist in more than one valence state, species change as a function of Eh or pH, and solid aqueous spe-

cies boundaries vary as a function of amount of ionic strength of the solution. The Eh-pH diagrams do not consider kinetic aspects of chemical reactions; they are dependent on the accuracy of thermodynamic data, and equilibrium conditions are assumed to exist for air saturated conditions. A critical aspect concerning the application of Eh-pH diagrams to mine stope backfilling is that it is important to know if the rate of mine dewatering will allow these elements to remain sorbed on other species until they are stable or whether they will be highly mobile and are likely to escape with the fluid released during compaction. The Eh-pH diagrams and numerous chemical analyses (assuming that the accuracy of the analytical techniques used is not impaired by matrix effects caused by SO4-rich fluid) indicate the following: removal of Fe, As, Se, Mo, Pb, Co, Cr, U, V, Cu, and Mn is predicted by incorporation of these elements into sulfide, sulfate, oxide, carbonate and possibly silicate phases either as major or trace elements constituents for individual phases or as interstitial cement under the appropriate Eh and pH conditions. Dissolution of recently precipitated Ca-Mg-Fe-Na-K-Al rich salts may continue to occur within water saturated backfill tailings since these species are highly soluble. Possible dissolution of silicate species (e.g. clay minerals), characterized by anomalous concentrations of Al and Si with minor amounts of Na, Ca, and Mg may occur within backfill tailings. Although this study is based upon a combined theoretical and field investigation for the Grants Mineral Belt, the concepts and methods utilized are applicable for other situations where mine stope backfilling with uranium tailings is practiced. (Auth) (PTO)

574

Lucia, P.C., J.M. Duncan, and H.B. Seed, Converse-Ward-Davis-Dixon, San Francisco, CA

Summary of Research on Case Histories of Flow Failures of Mine Tailings Impoundments

Bureau of Mines Information Circular 8857; Mine Waste Disposal Technology, Proceedings of a Bureau of Mines Technology Transfer Workshop, Denver, CO, July 16, 1981; (pp. 46-53) (1981, July)

A review of impoundment failure case histories shows that liquefied mine tailings composed of sand- and silt-sizes have some small residual strength after liquefaction, and they will come to rest at slopes of one to four degrees. Mine tailings such as phosphates, which consist of clay-size particles and have water contents of several hundred percent, flow in much the same way as water when loss of impoundment occurs. A simplified procedure has been developed for predicting how far tailings will flow in case of failure when the slope of the surface on which the material flows is less than about four degrees. The procedure requires that the residual shear strength of liquefied tailings be known. (EIX)(JMF)

575

Ludeke, K.L., Pima Mining Company, Tucson, AZ

Tailing Reclamation

Reclamation and Use of Disturbed Land in the Southwest, J.L. Thames, (Ed.). The University of Arizona Press, Tucson, AZ, Ch. 28, 362 pp.; (pp. 262-276) (1977)

Irrigation may be a critical factor in vegetative stabilization of tailings slopes in the desert southwest. Erosion due to rapid rainfall and precipitation losses from the tailing slopes not only result in surface disturbances that require backfilling, but also restrict vegetative establishment and growth by limited soils moisture. Until recently, few effective procedures had been developed to reduce the rate or amount of surface runoff from 1.5:1 tailing slopes. Consequently, tailing erosion and surface water losses were severe. Several new approaches to alleviate these conditions were evaluated. They included: (1) preparation of a smooth, loose seedbed for planting, accomplished by dragging a "Klodbuster" over the tailing slope, filling in the smaller erosion crevices, and smoothing the larger rills; (2) application of barley straw mulch to insulate against heat and cold and to provide organic matter through decomposition, and to protect the slope against rainfall impact; (3) application of sewage effluent and composted manure as a basic soil conditioner and micronutrient supply; and (4) use of hydroseeding. (PTO)

576

Marcus, D., and D.A. Sangrey, Gulf Research and Development Company, Pittsburgh, PA; Carnegie-Mellon University, Department of Civil Engineering, Pittsburgh, PA

Stabilization of Fine Uranium Mill Tailings

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 489-505) (1981)

The disposal of fine mill tailings presents problems because of the low shearing resistance offered by this material both on a short- and long-term basis. Newer disposal techniques, such as trench burial, are particularly sensitive to the low shearing resistance. This paper discusses methods for increasing the shear resistance of the fine tailings through stabilization with additives. Increased strength or shear resistance is produced by either a decrease in the moisture content or an increase in the concentration of the additives. These major variables and the nature of additives were investigated in an experimental program conducted to optimize the stabilization procedure for fine mill tailings. Certain combinations were found to be most advantageous for high strength stabilized material. These results are discussed with emphasis on practical applications. (Auth) (PTO)(RAF)

577

Markos, G., and K.J. Bush, GEC Research, Inc., Rapid City, SD

Thermodynamic Calculations and Phase Diagrams in Evaluating Tailings-Soil-Water Interactions

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 259-274) (1982)

Interaction between aqueous and solid phases occur in uranium mill tailings and between the migrating solution and natural soils and waters. With accumulation of geochemical data and improvement in empirical understanding of interactions, feasible interpretations and prediction of thermodynamic calculations and utilization of phase diagrams. These approaches can greatly facilitate tailings related investigations, such as compatibility of materials in contact with tailings, feasibility of neutralization or estimating the migration of contaminant. (Auth)

578

Markose, P.M., K.P. Eappen, S. Venkataraman, and P.R. Kamath, Bhabha Atomic Research Centre, Health Physics Division, Bombay, India

Distribution of Radium and Chemical Toxins in the Environment of a Uranium Complex

CONF-780422; Natural Radiation Environment III, Proceedings of a Symposium, T.F. Gesell and W.M. Lowder, (Eds.), Houston, TX, April 23-28, 1978. U.S. Department of Energy, Technical Information Center, Oak Ridge, TN, Vol. 2, 881 pp.; (pp. 165-66) (1980)

The chemical and radiological impact of uranium mining and milling on the local aquatic environment has been investigated at the uranium complex in Bihar, India. Concentrations of radium and manganese, as well as other elements and compounds of concern, were measured at various stages along the effluent course. The uptake of these elements in aquatic life, the deposition in silts, and the dispersal into groundwaters in the vicinity are discussed. Methods for the removal of radium and manganese from the effluent stream are discussed. (Auth)

579

Mayer, D.W., P.A. Beedlow, and L.L. Cadwell, Pacific Northwest Laboratory, Richland, WA

Soil-Water Impacts from Using Vegetation and Rock Covers for Surface Stabilization of Uranium-Mill Tailings

PNL-SA-9895; CONF-820303; Waste Management '82, Waste Isolation in the U.S. and Elsewhere, Technical Programs, and Public Communication, R.G. Post (Ed.), Proceedings of a Conference, Tucson, AZ, March 8-11, 1982, Vol. 1, 612 pp.; (9 pp.) (1982)

This paper presents the results from an analysis of vegetated and rock covers and their effect on the moisture content in a covered uranium mill tailings system. Based on a one-dimensional analysis of moisture movement, the results indicate that care must be taken when selecting

a surface stabilization system for a tailings pile. The moisture-content response of the tailings pile and cover system can be radically altered by different surface treatments. The two cases considered in this study indicate that (under climatic conditions occurring at Grand Junction, Colorado) the evapotranspiration from a vegetated cover can result in a relatively stable moisture content. A rock cover, however, may increase the moisture content of the tailings pile by significantly reducing evaporation. In fact, moisture storage may increase to the point that drainage occurs. If drainage does occur, the potential for groundwater pollution is increased. These results suggest that vegetation, thinner rock covers, engineered drainage systems, and/or liner systems may be needed to reduce drainage and potential leaching of contaminants. Additional work is needed to improve the description of the surface boundary condition and provide a more accurate moisture sink term. This work should focus on better descriptions of plant growth and moisture extraction behavior as a function of climatological and soil conditions. Additional work is required to more accurately describe the diffusion of water vapor through rock covers, and to quantify the effects of wind. (Auth)(PTO)

580

Mayer, D.W., R.W. Nelson, and G.W. Gee, Pacific Northwest Laboratory, Richland, WA

Multidimensional Analysis of Radon Diffusion Through Uranium Mill Tailings and Cover Systems

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 275-287) (1981)

A new capability has been developed for modeling radon diffusion through uranium mill tailings and covers. This capability allows the transient solution for radon concentrations and fluxes in one, two and three dimensions. The method utilizes an integrated-finite difference solution to the conservation of mass equation for radon gas. The effects of variable soil moisture content can also be taken into account. Results are presented from the analysis of both bare and covered tailings piles. Comparisons of the numerical results are made with an available one dimensional analytic solution. The two-dimensional effects of a discontinuous cover system are also analyzed. (Auth)

581

McCorkell, R.H., and M.P. Brameld, Bondar-Clegg and Company, Ottawa, Ontario, Canada

Distribution of Radon and Other Radioactive Decay Products of Uranium from a Uranium Deposit into Overlying Overburden

Canadian Institute of Mining and Metallurgy Bulletin 75(843):125-130 (1982, July)

Major points presented in this article include: the uranium flux into the overburden was greater in the past; oxidation and dissolution have since removed most of the uranium, leaving decay products which indicate the presence of uranium deposits when uranium itself does not. Distributions of uranium and decay products and their ratios to each other reflect uranium migration and the degree of uranium removal. Radon distribution in overburden is related to the uranium content in overburden samples and the presence and movement of groundwater. Rapid methods of total alpha and uranium measurement are described. (EIX)(PTO)

582

McDowell-Boyer, L.M., A.P. Watson, and C.C. Travis, Oak Ridge National Laboratory, Health and Safety Research Division, Oak Ridge, TN

Review of Parameters Describing Terrestrial Food-Chain Transport of Lead-210 and Radium-226

Nuclear Safety 21(4):486-495 (1980, July-August)

Because of the technological enhancement and environmental persistence of the naturally occurring Pb-210 and Ra-226, food chain transport of these nuclides is important to the evaluation of man's potential internal radiation exposure. Parameters describing this transport are determined in this article for use in currently available equilibrium models through which potential dietary exposures may be evaluated. (EIX)(PTO)

583

McKee, P., W. Snodgrass, D.L. Lush, and P. Ross, Beak Consultants Limited, Toronto, Ontario, Canada

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

A Qualitative Evaluation of Long-Term Processes Governing the Behaviour of Uranium Mill Tailings Placed in Deep Lakes

INFO-0070; 300 pp. (1982, March)

The emplacement of uranium mill tailings in deep lakes may provide an acceptable method of tailings disposal at certain sites in Canada. Disposal in a depositional environment typical of deep lakes appears to offer greater prospects for long-term stability than present methods of land-based management. From the regulatory point of view, it is necessary to know which factors should be taken into account in assessing the acceptability of such an approach. This report examines the environmental variables governing the behaviour of radionuclides and trace elements in the groundwater systems, lake water, and finally in the biosphere over the short and long-term. Physical, chemical, and biological factors are each considered. Conclusions are presented in terms of points for and against disposal in deep lakes. The primary advantages of deep lake disposal are: (1) placement in a depositional environment promotes increasing isolation with time; (2) a covering of water over the tailings reduces radon release to negligible levels and buffers the tailings against meteorological extremes; (3) a covering of water and isolation of tailings at depth ensures a minimum of bioperturbation from humans and other natural communities; (4)seepage of contaminants from the tailings into deep flow systems underlying the lake basin offers the opportunity for geological attenuation at depth and effective isolation of the biosphere; (5) insertion of tailings into a reducing environment places them in a situation in which most minerals are stable, new minerals may precipitate, thus providing a mechanism for coprecipitating contaminants and new surfaces for contaminant adsorption; and (6) if a deep-lake system is chosen, natural processes within the lake can contribute to conditions such as meromixis, leading to a further natural barrier isolating the tailings from the biosphere. (Auth)(PTO)(RAF)

584

Minnema, D.M., H.L. Rarrick, and L.W. Brewer, Sandia National Laboratories, Albuquerque, NM

A Counting System for Field Determination of Radium-226 in Soils

SA[illegible]-82-0287C; 10 pp. (1982, June)

A counting system has been developed to determine the radium-226 content of soils in core barrel samplers either on or near uranium mill tailings piles. More than 3000 samples have been counted to determine the radium-226 activity of tailings and of soils beneath the tailings. Minimum detectable activity is about 2 pCi radium-226/g of soil in a 0.5 mrem/hr background with a three minute count. The counting system consists of a 136 kg lead shield, a 5 cm X 2.5 cm NaI crystal coupled to a photomultiplier tube, a preamplifier and amplifier, and two single channel analyzers (SCAs). The window on one SCA is set to pass gamma energies between 150 keV and 380 keV. To determine the contribution of thorium-232 daughters the second SCA is set to pass gamma rays between 225 and 260 keV. The counts from the two SCAs, a standard source and background are entered into a programmable printing calculator to perform the necessary calculations. The system is mounted in a delivery van. Power is supplied by a 500 W gasoline-powered generator. This system operated reliably under field conditions for over nine months in temperatures from below freezing to over 40 degrees C. Approximate cost of the system excluding vehicle is $8000. Problems concerning sampling, calibration, radiation standards, statistical analysis and operational difficulties and the solutions to these problems are discussed. (Auth)(JMF)

585

Mishima, J., Pacific Northwest Laboratory, Richland, WA

Long-Term Stabilization of Uranium Mill Tailings Pile Surface, Project Overview

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 73-75) (1982)

Materials with a long-term potential for adversely affecting the biosphere must be disposed of in a manner that will keep them separate from the biosphere for a long time period. To assure such long-term stability of decommissioned uranium mill tailings piles, we must consider many factors. Pacific Northwest Laboratory, under a contract with the Nuclear Regulatory Commission, is investigating the use of a rock armoring blanket (riprap) to mitigate wind and water erosion of an earthen radon suppression cover applied to uranium mill tailings. This task is divided into various subtasks, some of which are

addressed in other papers to be presented during this symposium. The initial subtask was to accumulate baseline data in significant areas from the published literature. Areas surveyed were: site characteristics; calculational techniques to evaluate cover loss from wind stresses; calculational techniques to estimate cover loss from water erosion (from overland flow and flood); and examples of the survivability of man-made earthen and rock mounds. The last four areas are discussed in the other presentations. The data accumulated were used, along with additional information, in an interim version of a handbook on rock cover design and installation. A draft of the handbook has been completed and a report on this effort will be presented later. Publication is planned for the first quarter in FY 83. We are currently evaluating the technical and economic feasibility of the proposed rock cover procedure. A final version of the handbook is planned for late FY-83 or early FY-84. (Auth)(PTO)

586

Mittal, H.K., and N.R. Morgenstern, Hardy (R.M.) and Associates Limited, Edmonton, Alberta, Canada

Design and Performance of Tailings Dams

CONF-7706158; Geotechnical Practices for Disposal of Solid Waste Materials, Proceedings of a Conference, Ann Arbor, MI, June 13-15, 1977; (pp. 475-492) (1977)

Operating and construction conditions are delineated for the safe design of tailings embankments by the more conventional upstream technique used in dike building. The exceptionally high dams must be constructed by the more demanding newly developed downstream techniques. Analyses and construction conditions are described whereby sand containing a higher percentage of fines can be used providing more sand for the embankment. Degree of compaction which can be expected from hydraulic placement is discussed. When additional mechanical compaction is required, methods of construction are discussed to achieve the needed densification at minimum cost. (EIX)(JMF)

587

Moffett, D., Rio Algom Limited, Elliot Lake, Ontario, Canada

Characterization and Disposal of Radioactive Effluents from Uranium Mining

Canadian Institute of Mining and Metallurgy Bulletin 70(806):152-156 (1979, June)

Rio Algom Limited has mined uranium at Elliot Lake, Ontario for 20 years. The production of this energy-generating element results in the need to dispose of low-level radioactive solid wastes and liquid effluents. Because of the wet-temperate climate at Elliot Lake, the liquid effluents are of particular importance. Analyses of typical effluents and waste streams are discussed and typical levels of radium-226, thorium-230, thorium-232, thorium-228, lead-210, polonium-210, and uranium isotopes are presented. (EIX)

588

Moffett, D., E. Barnes, and J.N. Hilton, Rio Algom Limited, Elliot Lake, Ontario, Canada; MacLaren Engineers, Planners and Scientists, Inc., Willowdale, Ontario, Canada

Radium-226 Removal by Precipitation and Sedimentation in Settling Ponds

Canadian Institute of Mining and Metallurgy Bulletin 74(832):128-134 (1981, August)

A recent pilot plant program carried out at Rio Algom's Quirke uranium mine at Elliot Lake, Ontario, is described. The goal was the production of tailings basin effluents which were low in total radium-226. The process tested involved precipitation of radium with barium chloride and sedimentation in plastic-lined settling ponds. Adjustment of the tailings basin overflow from its normal value of pH 9.5 by addition of sulfuric acid to about pH 7.5 was found to give an approximately fivefold improvement in total radium-226 removal. A five-month demonstration test resulted in an effluent with a mean total radium-226 activity of 44 pCi/l after 2.5 days settling time and 29 pCi/l after five days settling time. The results are used to propose a schedule of achievable total radium-226 activities where precipitation and sedimentation are employed. The maximum suggested values after five days nominal settling time are: 30 pCi/l in an annual mean, 60 pCi/l in a monthly mean, 60 pCi/l in a weekly mean, and 80 pCi/l in any single grab sample. (EDB)(JMF)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

589

Morin, K.A., J.A. Cherry, T.P. Lim, and A.J. Vivyurka, University of Waterloo, Ontario, Canada

Contaminant Migration in a Sand Aquifer near an Inactive Uranium Tailings Impoundment, Elliot Lake, Ontario

Canadian Geotechnical Journal 19(1):49-62 (1982, February)

Chemical analysis of water samples from bundle piezometers installed around the edge of the tailings impoundment indicates that a major contaminant plume extends through a sand aquifer. The plume consists of two segments, the inner core and the outer zone. The inner core has a pH of 4.3 to 5.0, extends about 15 m from the foot of the tailings dam, contains several g/l of iron and sulfate, and tens of pCi/l of radium-226 and lead-210. The outer zone, which extends a few hundred meters downgrade from the dam, is characterized by hundreds to thousands of mg/l of iron and sulfate, less than 15 pCi/l of radium-226, and a pH greater than 5.7. (EDB)(JMF)(RAF)

590

Murphy, K.L., and G.E. Multamaki, Atomic Energy Control Board, Ottawa, Ontario, Canada

Placement of Radium/Barium Sludges in Tailings Areas

INFO-0019; 65 pp. (1980, March)

Radium is currently removed from uranium mining and milling effluents by the addition of barium chloride to precipitate the radium as radium/barium sulfate. The precipitate is allowed to settle in sedimentation basins prior to discharge of the effluent. The sedimentation basins are not suitable for final disposal of the sludge, and placement of the sludges in the tailings area has been proposed. The geochemical environment of fresh tailings areas was characterized as an acidic, oxidized surface zone underlain by an alkaline, reduced zone comprising the rest of the tailings. The quantity of sludge produced was estimated to be small relative to the quantity of tailings, and therefore a relatively small amount of radium would be added to the tailings disposal area by the addition of sludge. To confirm whether sludge addition affected radionuclide solubilization, laboratory leaching tests were conducted on slurries of acid leach tailings, and sludge-tailings mixtures. Radium in the (radium, barium)SO4 sludge was at least as stable as radium in the tailings, and the sludge was able to absorb radium released from the tailings. The addition of sludge did not affect uranium and thorium solubilization. From these results it appears that the placement of sludge in tailings areas would not adversely affect the stability of radionuclides in the tailings or sludge. (EDB)(JMF)

591

Nasiatka, D.M., T.A. Shepherd, and J.D. Nelson, Colorado State University, Department of Civil Engineering, Fort Collins, CO

Clay Liner Permeability in Low pH Environments

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 627-645) (1981)

An investigation was undertaken to study the permeability of various clay materials for use as liners in low pH environments of uranium tailings impoundments. A natural clay and three commercially processed clays were used. A uranium mill tailings solution and a sulfuric acid solution were used as permeants. Permeability was measured using falling head permeameters. Permeability and pore volumes passed were recorded. Chemical analyses were performed on the clay materials and effluent. The results indicated that three of the clay materials exhibited relatively stable coefficients of permeability for the permeant solution. One of the clay materials had variable permeability coefficients for the solutions. The number of pore volumes passed was larger than would normally be expected during a mill operation design life. (Auth)

592

Nathwani, J.S.,

Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment

Thesis (1979)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

Information about leachability of radium-226 from uranium mill wastes and its mobility in the environment is necessary for evaluation of proposed disposal concepts. Narrow range size fractions (53 um to 75 um) of fresh and weathered mill tailings (a pyritic quartz conglomerate) were leached for up to 110 days. Consolidated mill tailings samples were prepared by solidifying a slurry of fresh mill tailings with Portland cement, bentonite clay and sphagnum peat. A significant reduction in leachability was obtained by the consolidation process. It was established that leaching of radium-226 from mill tailings is a diffusion controlled phenomenon. Two first order desorption processes, one before and the other after a leaching period of approximately 15 to 30 days were observed. In a kinetic study of the leaching mechanisms, it was found that intra-particle diffusion was the rate controlling step for desorption periods greater than 84 hours. In leaching of radium-bearing soils from Prot Hope, Ontario, it was found that soil texture significantly affects the total amounts leached. The maximum concentrations reached were much greater for coarser and intermediate size fractions than for fine soil fractions. Organic matter and clay content of the soils are dominant constituents contributing to adsorption of radium by soils. A mathematical model for predicting the effectiveness of consolidation of mill tailings in reducing the release of radon from decay of radium was developed. (EDB)(JMF)

593

National Technical Information Service, Springfield, VA

Uranium Ore Treatment: January, 1970-May, 1981 (Citations from the Engineering Index Data Base)

PB-81-864290; 267 pp. (1981, May)

Uranium ore treatment is presented with emphasis placed on acid leaching as the primary step in the process. Tailing disposal and proper handling of radioactive materials, including environmental monitoring is stressed. Primary treatment procedures include ion exchange, sulfuric acid leaching, solvent extraction and sedimentation. (Contains 300 citations fully indexed, including a title list.) (EDB)(JMF)

594

National Technical Information Service, Springfield, VA

Uranium Mining and Milling Environmental Studies: 1970 - February, 1981 (Citations from the Engineering Index Data Base)

PB-81-804932; 147 pp. (1981, March)

Worldwide research is cited on uranium mining waste management and effluent control. Studies on mining practices, radon monitoring, health hazards, and land reclamation are covered. Government policies and regulations concerning present and long-term waste handling are included. (This updated bibliography has 140 citations, 30 of which are new entries to the previous edition.) (EDB)(JMF)

595

Nelson, J.D., and D.B. McWhorter, Colorado State University, Department of Agricultural and Chemical Engineering, Fort Collins, CO

Influence of Impoundment and Substratum Configuration on Seepage from Impoundments

CONF-8005177; Uranium Mine Waste Disposal, C.O. Brawner, (Ed.), Proceedings of the First International Conference, Vancouver, British Columbia, Canada, May 19-21, 1980. American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., Society of Mining Engineers, New York, NY, 626 pp.; (pp. 193-203) (1980)

The quantity of seepage that will be released from a tailings impoundment depends not only on the characteristics of the seepage control system, but also on the properties of the foundation soil or rock beneath the impoundment and the nature of the groundwater in the area. The interaction between various elements of the seepage control system and the influence the various characteristics of the site and impoundment have on seepage are the subject of this paper. The results of analyses are presented herein to indicate the nature and magnitude of the effect that the various factors will have

on seepage losses. It has been shown that liner systems can be installed to be effective in reducing seepage rates to minimize the impact on the environment. Various types of liner systems can be very effective, particularly when used in conjunction with underdrains. All seepage rates presented herein were expressed in terms of the seepage rates out of the impoundment. However, other factors must also be considered along with seepage. Environmental impact must be considered in terms of the rate of introduction of contaminants or toxicants into the groundwater. Seepage water which remains in the groundwater mound does not enter the groundwater regime immediately. The water is stored in the foundation material overlying the groundwater table. The neutralizing ability and cation exchange capacity of the foundation materials will play an important part in determining the quality of the water which actually reaches the groundwater. That factor is beyond the scope of this paper but it cannot be ignored. (Auth)(PTO)

596

Nelson, J.D., and T.A. Shepherd, Colorado State University, Fort Collins, CO

Uranium Mill Tailings Management

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp. (1981)

The first three symposia on Uranium Mill Tailings Management were held in Fort Collins, Colorado in November of 1978, 1979, and 1980. During those years considerable effort was devoted to advancement of the state-of-the-art and development of innovations in uranium mill tailings management. Regulations and standards have been developed and promulgated during this period by the various regulatory agencies. The science and engineering of uranium mill tailings management has matured over this period of time. Present economic factors have caused a shift in emphasis from design of new impoundments to operation and reclamation of existing sites. The nature of activities in this challenging field have taken an added dimension. The response to this symposium reflects a continued and broadened interest in uranium tailings management. It is expected that these proceedings will redefine the state-of-the-art and provide a basis for further dialog. The proceedings of this symposium contains 43 papers, presented during six sessions. The sessions are as follows: (1) Remedial Action Program; (2) Health Effects, Regulations and Long-Term Aspects; (3) Radon Control and Covers; (4) Groundwater and Geochemistry; (5) Design for Seepage Control and Stability Measures; and (6) Liners and Seepage. (Auth)(PTO)

597

Nelson, J.D., T.A. Shepherd, and W.A. Charlie, Colorado State University, Fort Collins, CO

Parameters Affecting Stability of Tailings Dams

CONF-7706158; Geotechnical Practices for Disposal of Solid Waste Materials, Proceedings of a Conference, Ann Arbor, MI, June 13-15, 1977; (pp. 444-460) (1977)

An investigation was conducted to provide further insight into the general behavior of a tailings dam and to develop conclusions regarding the effects of various operational and construction factors on the overall stability of the embankment. Engineering properties were determined in the laboratory for samples taken from the tailings dams at Climax, Colorado. A model was developed to analyze the effects of drainage at the toe, stratification throughout the embankment, and infiltration of water from the surface on the elevation of the phreatic surface and slope stability. Of primary importance to the behavior of the embankment is the permeability of the starter dam and infiltration of water from the surface. (EIX)(JMF)

598

Nielson, K.K., V.C. Rogers, M.L. Mauch, J.N. Hartley, and H.D. Freeman, Rogers and Associates Engineering Corporation, Salt Lake City, UT; Pacific Northwest Laboratory, Richland, WA

Radon Emanation Characteristics of Uranium Mill Tailings

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 355-367) (1982)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

Radon emanation from uranium mill tailings was examined with respect to the mechanisms of emanation and the physical properties of the tailings which affect emanation. Radon emanation coefficients were measured at ambient moisture on 135 samples from the 1981 field test site at the Grand Junction tailings pile. These coefficients showed a similar trend with moisture to those observed previously with uranium ores, and averaged 0.10 + or - 0.02 at dryness and 0.38 + or - 0.04 for all samples having greater than 5 weight-percent moisture. Small differences were noted between the maximum values of the coefficients for the sand and slime fractions of the tailings. Separate measurements on tailings from the Vitro tailings pile exhibited much lower emanation coefficients for most samples, and similar coefficients for dry samples. Alternative emanation measurement techniques were examined and procedures are recommended for use in future work. (Auth)(PTO)

599

Overmyer, R.F., B.J. Thamer, K.K. Nielson, and V.C. Rogers, Ford, Bacon and Davis Utah, Inc., Salt Lake City, UT

Research on Radon Flux Reduction from Uranium Mill Tailings

CONF-800334; Nuclear Energy, Conservation, and Solar Energy, Proceedings of the Second U.S. Department of Energy Environmental Control Symposium, Reston, VA, March 17-19, 1980, Vol. 2; (pp. 176-204) (1980)

Radon flux from tailings may be reduced by the use of an impermeable cover to contain the radon until it decays (half life is 2.8 days). The use of the thick, relatively impermeable cover can attenuate radon flux because a large fraction of the radon would decay before it diffuses through the cover into the atmosphere. This method of reducing radon flux may require soil cover thicknesses on the order of 10 feet. In some locations, obtaining 10 feet of soil to cover 200 acres of tailings may be difficult or may lead to other significant environmental impacts. The Department of Energy is sponsoring research to identify alternatives to thick soil covers for reducing radon flux from uranium tailings to meet the forthcoming standards. The two most effective and practical materials tested thus far are calcilox and asphalt emulsion. Currently, asphalt emulsions are being tested at the Grand Junction tailings pile in Grand Junction, Colorado, by Battelle Pacific Northwest Laboratory. Other asphalt formulations, such as foamed asphalt that requires less water than asphalt emulsions, may be practical and will be tested this year. Some sulfur-based materials and sulfur-extended asphalt also appear promising and will be tested for effectiveness in reducing radon flux. It is also important to investigate methods of applying various stabilizers to inactive tailings piles of varying moisture content and physical stability. Finally, since the EPA standards for remedial action at tailings piles are stated in terms of radon flux, it is important that radon flux measurements be standardized so that reliable flux measurements can be obtained and directly compared among various laboratories. (EDB)(JMF)

600

Parker, G.B., Pacific Northwest Laboratory, Richland, WA

Handbook for the Design, Selection, and Construction of a Rock Cover for Retired Uranium Mill Tailings

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 127-132) (1982)

As part of a NRC study to assess the long-term protection of retired uranium mill tailings, PNL is developing a handbook to guide the design, selection, and construction of a rock cover (riprap) for decommissioned and reclaimed uranium mill tailings. The rock cover is designed for long-term protection of mill tailings from wind and water erosion. The handbook was intended to be used by uranium mill operators for designing, selecting, and constructing a rock cover, and by the NRC to aid in evaluating the decommissioning and reclamation plans submitted to them by mill operators. The handbook is not site-specific; it is structured to allow the design of a rock cover for any NRC-licensed tailings impoundment. The first draft of the handbook, entitled the "Interim Handbook," is currently being reviewed by the NRC. A final handbook is scheduled to be issued in early 1983. (Auth)(PTO)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

601

Perry, R.D., and F.C. Kresse, Harding-Lawson Associates, Novato, CA

Development of Methods for Reclaiming Abandoned Tailings Ponds and Dams: Volume 1

Bureau of Mines Open File Report 40(1)-82; 34 pp. (1981, June)

This report describes methods of reclaiming abandoned or inactive tailings ponds and dams. The investigated sites were selected tailings deposits adjacent to metal mines in the northwestern and southwestern United States. The basic data developed for each site consisted of a review of existing literature, a site visit that included sampling of the tailings and surrounding materials, laboratory and engineering studies, and development of reclamation plans. Laboratory tests determined the gold and silver content of each deposit and the chemistry of the tailings and surrounding materials. Reclamation plans that include approximate costs were developed for five sites that contain from 52,000 to 103 million tons of tailings (GRA)(PTO)

602

Peterson, S.R., and K.M. Krupka, Pacific Northwest Laboratory, Richland, WA

Contact of Clay Liner Materials with Acidic Tailings Solutions

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 609-626) (1981)

The ion speciation-solubility model WATEQ3 was used to model original aqueous solutions and solutions resulting from liner materials contacted with uranium mill tailings, synthetic mill tailings, or H2SO4. The modeling results indicate solution species which are in apparent equilibrium with respect to particular solids. These solids provide potential solubility controls for their corresponding dissolved constituents. The disequilibrium indices computed by WATEQ3 indicate amorphic Fe(OH)3, AlOHSO4, alunite [KAl3(SO4)2(OH)6], gypsum CaSO4.2H2O, celestite (SrO4), anglesite (PbSO4), and MnHPO4 may have precipitated in the contacted liner materials and may also provide solubility controls for their dissolved constituents. The disequilibrium indices also show that the solutions resulting from the interaction of Highland Mill tailings are oversaturated with K-, H-, and Na-jarosites [K, H, Na)Fe3(SO4)2(OH)6]. Because jarosite has been identified by X-ray diffraction as a precipitate in these reacted liner materials, it would appear that there is a kinetic barrier which prohibits jarosite from being an effective solubility control. Results of this study also show that the solubilities of many solid phases were pH dependent. This exploratory use of geochemical modeling has demonstrated its capability to test solubility hypotheses for clay liners reacted with tailings solutions and to guide the analyses of important constituents and parameters for these solutions. Geochemical modeling can be used, in parallel with characterization techniques for the solid phases, to support the presence of the solid phase and to guide the search for further solid phases. Geochemical modeling is also an effective tool in delineating the chemical causes for changes in permeability of line materials. (Auth)(PTO)

603

Phillips, C.R., and Y.C. Poon, University of Toronto, Toronto, Ontario, Canada

Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching

Minerals Science and Engineering 12(2):53-72 (1980, April)

Uranium ore processing practices in Canada are described. Special problems and potentials of recovering uranium, thorium, radium and rare earths from ores are examined. Present extraction and treatment methods are both expensive and inefficient. Research to develope a new ore treatment process that would allow the simultaneous recovery of uranium, radium, thorium, and rare earth elements from the ore is a high priority. Such a process would make the disposal of ore tailings much easier and would provide additional revenue from the sale of thorium and rare earths. (Auth)(PTO)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

604

Phillips, C.R., P.L. Sears, and Y.C. Poon, University of Toronto, Toronto, Ontario, Canada

Leaching of Uranium Ore with Emphasis on the Fate of Radium

Energy Sources 6(3):215-243 (1982)

Alternative leaching agents to sulfuric acid in the leaching of uranium ore are examined in terms of their ability to leach uranium, radium, and thorium from the ore. The leaching conditions used in these experiments were single stage, 70 deg C, 16 hour duration, and up to 3N leachant concentration in a solid to liquid ratio of 50 g/200 ml. These conditions were not optimized. The percentages of elements leached under these conditions were as follows: HNO3 - 95% uranium, 70-80% thorium; HCl - 90% uranium, 80% thorium, and 85% radium; HCl-HNO3 mixture - 97% uranium, and 85% thorium. Anomalies in the leaching of radium by nitric acid are examined and attributed to the presence of colloids in the leach liquor resulting from the dissolution of iron pyrites in the ore by nitric acid. (EIX)(PTO)

605

Rafferty, P.J., Nuclear Energy Agency, Organization for Economic Co-operation and Development, Radiation Protection and Waste Management Division, Paris, France

NEA Program on the Long-Term Aspects of Uranium Mill Tailings Management and Disposal

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 239-244) (1981)

This paper briefly describes the NEA program of work on the long-term aspects of the management and disposal of uranium mill tailings and summarizes the status of work as of October 1981. The NEA work on the management of uranium mill tailings began with the NEA Seminar, "Management, Stabilization and Environmental Impact of the Uranium Mill Tailings," which was held in Albuquerque, NM in July 1978. As an outcome of that seminar, the Committee on Radiation Protection and Public Health and the Radioactive Waste Management Committee agreed to set up a coordinating group to undertake a specific program of work on the management and disposal of uranium mill tailings. The group met for the first time in September 1979 and set up three expert working groups to undertake various sections of the work dealing with uranium mill tailings management. The three working groups are as follows: (1) Working Group on the Long-Term Aspects of Uranium Mill Tailings Management; (2) Working Group on the Engineering of Uranium Mill Tailings Retention Facilities; and (3) Working Group on Environmental Monitoring. (Auth) (PTO)

606

Raicevic, D., Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Ottawa, Ontario, Canada

Decontamination of Elliot Lake Uranium Tailings

Canadian Institute of Mining and Metallurgy Bulletin 72(808):109-115 (1979, August)

After more than 93% of the uranium is extracted from Elliot Lake uranium ores by a sulfuric acid leaching process, the leach residue (tailings) contains small amounts of uranium and radioactive isotopes, particularly radium-226, which is the most serious health hazard. Heavy metal components and pyrite are also present, along with the gangue minerals. Currently, over 1000 acres of the Elliot Lake area are covered with these tailings, which contain over five million tons of pyrite. Because of constant oxidation of the pyrite by bacteria (thiobacillus) and the presence of moisture, pyrite slowly generates sulfuric acid, which steadily leaches the metal-bearing constituents from the tailings. The seepage-flows of the dissolved contaminants, although often quite low in volume, have an environmental impact on the Elliot Lake area. Although these seepages are treated and most of the contaminants removed and impounded, a small amount of the radioactive contaminants reaches Lake Huron via the Serpent River. This paper describes a flotation approach for treatment of the Elliot Lake uranium tailings to produce new, decontaminated tailings practically free of pyrite, with radium, thorium and uranium contents considerably reduced. The decontaminated tailing produced, which comprises about 75% by weight of the current uranium tailings, appears to be suitable f[illegible]ine

backfill. Because mine backfilling normally uses about 50% of the plant tailings, the surface storage of about half of the uranium tailings would be eliminated by this process. Mine backfilling would also increase the mine production and thus enlarge the overall uranium resources due to recovery of the ore from pillars. The pyrite concentrate produced from the current uranium tailings would be suitable for sulfuric acid production. The possibility of uranium recovery, and disposal of radium and thorium from the concentrates produced, is now being studied at CANMET. (Auth)(JMF)

607

Rayno, D.R., Argonne National Laboratory, Argonne, IL

Estimated Dose to Man from Uranium Milling Via the Terrestrial Food-Chain Pathway

ANL/ES-125; 33 pp. (1982, January)

One major pathway of radiological exposure to man from uranium milling operations is through the terrestrial food chain. Studies by various investigators have shown the extent of uptake and distribution of uranium-238, uranium-234, thorium-230, radium-226, lead-210, and polonium-210 in plants and animals. These long-lived natural radioisotopes, all nuclides of the uranium decay series, are found in concentrated amounts in uranium mill tailings. Data from these investigations are used to estimate the dose to man from consumption of beef and milk contaminated by the tailings. The dose estimate from this technologically enhanced source is compared with that from average normal dietary intake of these radionuclides from natural sources. (EDB)(JMF)

608

Reades, D.W., J.B. Davis, H.M. Goldby, and R.R. Stanlick, Golder Associates, Mississauga, Ontario, Canada

Remedial Works at Dam No. 1, Elliot Lake, Ontario

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 507-518) (1981)

Dam No. 1 is located at the western end of the Williams Lake Tailings Management Area in Elliot Lake, Ontario, Canada. The area is generally underlain by bedrock and contains approximately one million tons of tailings discharged to this area between 1957 and 1959. The western end was closed by the construction of a pervious sand and gravel dike 300 ft (90 m) long, with a maximum height of 30 ft (9 m). From a subsurface investigation in 1977-1978, the stability of this existing dike was found to be marginal. As part of Denison Mines' continuing tailings management program in Elliot Lake directed at close-out of this tailings management area, a new dam was constructed in 1979, downstream of the existing dam. This instrumented dam incorporated a synthetic membrane anchored to bedrock. Construction included grouting of the bedrock and excavation of a spillway through bedrock to pass the probable maximum flood. Aspects of the design and construction of this new dam are presented in this paper. (Auth)(PTO)

609

Relyea, J.F., and W.J. Martin, Pacific Northwest Laboratory, Richland, WA

Evaluation of Inactive Uranium Mill Tailings Sites for Liner Requirements: Characterization and Interaction of Tailings, Soil and Liner Materials

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 507-519) (1982)

The interactions of earthen materials with uranium mill tailings leachate are under investigation to help determine if liners are necessary to meet EPA criteria for inactive uranium mill tailings sites. Contaminant concentrations, pH, electrical conductivity, and redox potential of tailings leachate from three inactive sites (both acid and alkaline processed) were characterized using a batch leaching method. One tailings sample from each site was then selected for more detailed study using column leaching methods. Elemental concentrations of Al, As, Cr, Cu, Fe, Mg, Mn, Na, Ni, and Zn were one to two orders of magnitude higher in initial tailings column leachate than in leachate from batch tests. However, column leachate concentrations generally decreased by an order of magnitude after one pore volume of water had leached through the tailings. The interactions of these

leachates with soils and liner material were studied using both batch and column methods. Contact of acidic tailings leachate with two calcareous soils and a soil amended with 10% bentonite (by weight) showed that acidic tailings leachates were neutralized and contaminant concentrations after contact with soil were significantly reduced. The pH buffering capacity (or leachate neutralization capacity) of these earthen materials is caused by two reactions: (1) dissolution of carbonate minerals; and (2) dissolution of Al and perhaps Fe precipitates formed during the leachate-carbonate reaction. Tests with leachate from alkaline tailings showed that contaminant concentrations tended to be unchanged by contact with soils in the batch test. The permeability of a Na-bentonite amended soil was observed to decrease with time because of particle dispersion and swelling of the clay when contacted with both acidic and alkaline leachate. Permeabilities were also found to decrease with time because of the precipitation of gypsum as high-sulfate acidic-leachate percolated through columns packed with calcareous soils. (Auth)(PTO)

610

Riedel, D.W., Kilborn/NUS Inc., Denver, CO

Estimates of Uranium Content and Radon Flux for Uranium Mine Dumps Based on Borehole Radioactivity Logs - Topical Report

NUREG/CR-1549; 37 pp. (1980, July)

In exploratory drilling to locate uranium deposits, borehole logs of gamma radiation from naturally radioactive elements are used to indicate the presence of uranium and the concentrations in which it is found at various depths. This report describes a method of using borehole log data to estimate uranium concentrations in the rock surrounding or overlying uranium deposits, and to predict radon releases from waste rock brought to the ground surface in mining operations. The method can be used to predict radon releases before mining operations are started so that potential environmental impacts can be evaluated. (EDB)(JMF)

611

Robertson, A.M., J.W. Fisher, and D. van Zyl, Steffen, Robertson and Kirsten, Inc., Vancouver, British Columbia, Canada; Steffen, Robertson and Kirsten, Inc., Tuscon, AZ

The Production and Handling of Dry Uranium and Other Tailings

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 55-69) (1982)

Because of concerns regarding pollution and contamination migration from uranium tailings impoundments, there is a continued search for innovative more secure methods of tailings disposal. The production and placement of "dry" tailings offers a number of advantages over conventional wet tailings. The "sloppy" nature of "dry" tailings often makes them difficult to handle in bulk. Methods for assessing handleability, trafficability, and stability problems associated with such tailings have not yet been fully developed. Equipment for producing dry tailings are reviewed. A simple test procedure is proposed to evaluate the effectiveness with which the resulting sloppy products can be handled in the field. Examples are given of the application of "dry" tailings disposal methods for uranium tailings and for other tailings products in the United States and in other countries. (Auth)(PTO)

612

Robinson, P.,

Attempt to Control Tailings

Mine Talk 1(1):16-18 (1981, May)

There are no fully reclaimed uranium mill or mine waste dumps in the United States, despite the passage of the Uranium Mill Tailings Radiation Control Act of 1978. The act contained the findings of Congress concerning uranium mill tailings hazards, defined a remedial action program aimed at inactive or abandoned tailings sites, and clarified the regulatory system for controlling current and future uranium tailings production. Uranium waste and radiation dose standards are to be enforced by DOE, NRC, and EPA. (Auth)(PTO)

613

Robinson, W.P., Southwest Research and Information Center, Albuquerque, NM

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

Responsible Uranium Mining and Milling: An Overview

CONF-8005177; Uranium Mine Waste Disposal, C.O. Brawner, (Ed.), Proceedings of the First International Conference, Vancouver, British Columbia, Canada, May 19-21, 1980. American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., Society of Mining Engineers, New York, NY, 626 pp.; (pp. 19-31) (1980)

The three main topics discussed in the paper include: (1) the relevant health information relating to the workers and general populations around uranium mining as a basis for understanding the hazards associated with these operations and their available remedies; (2) the literature on radon and its daughters; and (3) waste handling in the uranium industry - past, present and future (exploration, mining, and milling and the volumes of water and solid and gaseous wastes which are associated with uranium operations). A discussion of the various past and present materials handling technologies and their responsiveness to the concern for uranium waste isolation is presented. A summary of recent modifications in the relevant standards as applied to uranium mining and milling is included. (PTO)

614

Rogers, V.C., and K.K. Nielson, Rogers and Associates Engineering Corporation, Salt Lake City, UT

A Complete Description of Radon Diffusion in Earthen Materials

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 247-263) (1981)

Radon migration in porous, earthen materials is characterized by diffusion in both the air and water components of the system as well as the interaction of the radon between the air and water. The size distribution and configuration of the pore spaces are also key parameters of the diffusion model. Calculations based on the model yield radon diffusion coefficients that do not depend upon radon diffusion measurements. The diffusion coefficients are expressed in a form suitable for use in simple homogeneous-medium diffusion expressions for predicting radon transport and compare well with measured values of the diffusion coefficients. (Auth)

615

Rogers, V.C., G.M. Sandquist, and K.K. Nielson, Rogers and Associates Engineering Corporation, Salt Lake City, UT

Radon Attenuation Effectiveness and Cost Optimization of Composite Covers for Uranium Mill Tailings

DOE/AL 165/UMTRA; 102 pp. (1981, June)

A computer code RAECO (Radon Attenuation Effectiveness and Cost Optimization), developed for the Uranium Mill Tailings Remedial Action Program, calculates the radon flux and concentrations through tailings and cover materials. The code obtains steady-state analytical solutions using a rapid upper triangulation and backward solving routine. The code also obtains the lowest cost cover subject to radon flux and cover layer thickness constraints which are specified. The optimization routine presently applies to two specified layers which is sufficient for most practical cover systems. (EDB)(PTO)

616

Rothschild, H., Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Elliot Lake Laboratory, Elliot Lake, Ontario, Canada

Uranium Mine Tailings

Episodes 1981(1):13-15 (1981, April)

In view of the well publicized debate on nuclear issues that is taking place around the world, the safe disposal of nuclear wastes poses an important multidisciplinary challenge. The problem as it pertains to uranium tailings is analyzed, and progress made towards solving it in Canada and through such international organizations as the International Commission on Radiation Protection, the Organization for Economic Co-operation and Development, and the International Atomic Energy Agency is pointed out. (EDB)(NPK)

617

Rutherford, G.K., and G.W. van Loon, Queen's University, Kingston, Ontario, Canada

Tailings and Soils

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

Canadian Institute of Mining and Metallurgy Bulletin 75(837):60-65 (1982)

Uranium mill tailings have a parent material similar to soils, and they also are comminuted to similar size fractions; they might be expected to react in a similar fashion as soils. There is an increasing body of evidence and experience which both supports and negates this supposition. This paper points out the similarities and contrasts between these two materials which may influence the revegetation and rehabilitation of tailings. (Auth)(JMF)(RAF)

618

Schiager, K.J., and W.J. Smith, ALARA, Inc., Fort Collins, CO; Colorado State University, Department of Radiology and Radiation Biology, Fort Collins, CO

Simple Field Method for Determining Compliance with EPA Land Cleanup Standards

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 135-148) (1982)

A simple, field gamma spectrometric technique for determining the Ra-226 and Ra-228 content of soils and tailings has been developed. The method is specifically intended to verify compliance with EPA cleanup limits for inactive uranium or thorium processing sites by rapid, on-site measurements. A large sample volume is used to alleviate the need for a massive shield, making the equipment readily portable. The equipment consists of a portable multi-channel analyzer, a 3 in. by 3 in. NaI gamma scintillation detector, a compact high voltage supply with reamplifier, and an easily fabricated, reusable sample container. The minimum detectable concentration (MDC) for Ra-228 (based on Tl-208) is about 0.2 pCi/g with a 1000 second counting time. In the absence of thorium decay series radionuclides, the comparable MDC for Ra-226 (based on Bi-214) is about 0.2 pCi/g; in their presence the MDC for Ra-226 will increase somewhat. (Auth)

619

Schwendiman, L.C., Pacific Northwest Laboratory, Richland, WA

Stabilization, Engineering, and Monitoring Alternatives Assessment for Improving Regulation of Uranium Recovery Operations and Waste Management

IAEA/WMRA/13-81/11 (1982)

This research effort will address many of the technical issues of concern in providing and assessing methods for predicting, evaluating, and limiting the environmental impacts of wastes from uranium milling operations. The principal objective of the program is to provide information essential in licensing actions to assure that individuals and the public will be adequately protected during the active life of the mill and over an indefinitely long period of time following shutdown. The six tasks are as follows: (1) long-term stabilization; (2) interim stabilization; (3) tailing dewatering technique; (4) tailing neutralization; (5) disposal technique allowing contact with ground water; and (6) effluent and environment monitoring methods. (Auth)(PTO)

620

Shepherd, T.A., and S.E. Brown, Colorado State University, Department of Civil Engineering, Fort Collins, CO; Waste and Land Systems, Inc., Fort Collins, CO

A Generic Model of Contaminant Migration from Uranium Tailings Impoundments

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 241-257) (1982)

Objectives of recent studies of contamination migration at acid-leach uranium tailings impoundments have been to identify the geochemical and hydrogeologic processes which control contaminant transfer and to apply models from which predictions of future migration can be made. Extensive investigations have demonstrated that acid neutralization is the most important process influencing the rate and extent of contaminant migration at uranium tailings sites. Complex and expensive numerical models have been developed to predict contaminant movement at these sites. However, given the number and magnitude of uncertainties associated with such prediction of contaminant transport in natural geologic syst the

application of these models does not appear to be justified. Instead, an alternative analytical hydrogeochemical model based upon acid consumption-neutralization front movement is presented. The development of contaminant plumes is discussed and distinct zones within these plumes are identified and characterized. (Auth)(PTO)

621

Shuey, C., L. Kemp, D. Snow, P. Robinson, L. Sachs, J. Kellar, and S. Bourgeois, Arizonans for a Better Environment, Phoenix, AZ

State-By-State Reports

Mine Talk 1(1):30-45 (1981, May)

Current uranium, coal, and non-fuel mineral mining activities in the following states are surveyed: Arizona; Colorado; Minnesota; Montana; New Jersey; New Mexico; Nevada; Oregon; South Dakota; Utah; Virginia; Wyoming; Wisconsin; and Washington. Environmental problems associated with such mining operations, citizen reaction, and subsequent actions are discussed. Public opposition to uranium mining, due to radiation hazards posed by mine tailings, is highlighted. (EDB)(PTO)

622

Silker, W.B., Battelle Pacific Northwest Laboratories, Richland, WA

A Radon Attenuation Test Facility

PNL-3899; NUREG/CR-2243; 17 pp. (1981, September)

Covering layers of clays and soils will be applied to uranium mill tailings to reduce the quantities of radon gas escaping to the atmosphere. Knowledge of the rates of the thickness required to attain prescribed radon limits. This paper describes both a method and the laboratory facility designed to provide a rapid and straightforward means for measurement of diffusion rates through possible cover materials. (Auth)

623

Silker, W.B., and V.C. Rogers, Pacific Northwest Laboratory, Richland, WA; Rogers and Associates Engineering Corporation, Salt Lake City, UT

Factors Influencing Radon Attenuation by Tailings Covers

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 265-273) (1981)

The U.S. NRC, in its Generic Environmental Impact Statement (GEIS) on uranium milling has specified that the radon flux escaping a uranium mill tailings pile will be reduced to 2 pCi/sq m by application of covering layers of soils and clays. These covers present a radon diffusion barrier, which sufficiently increases the time required for radon passage from the tailings to the atmosphere to allow for decay of Rn-222 within the cover. The depth of cover necessary to reduce the escaping radon flux to the prescribed level is to be determined by calculation, and requires precise knowledge of the radon diffusion coefficient in the covering media. (Auth)(PTO)

624

Simmons, C.S., and G.W. Gee, Pacific Northwest Laboratories, Richland, WA

Simulation of Water Flow and Retention in Earthen-Cover Materials Overlying Uranium Mill Tailings

PNL-3877; UMT-0203; 102 pp (1981, September)

The water retention characteristics of a multilayer earthen cover for uranium mill tailings were simulated under arid weather conditions common to Grand Junction, Colorado. The multilayer system described in this report consists of a layer of wet clay/gravel (radon barrier), which is separated from a surface covering of fill soil by a washed rock material used as a capillary barrier. The capillary barrier is designed to prevent the upward migration of water and salt from the tailings to the soil surface and subsequent loss of water from the wet clay. The flow model, UNSATV, described in this report uses hydraulic properties of the layered materials and historical climatic data for two years (1976 and 1979) to simulate long-term hydrologic response of the multilayer system. Application of this model to simulate the processes of infiltration, evaporation, and drainage is described in detail. Simulations over a trial period of one relatively wet and two dry years indicated that the clay-

gravel layer remained near saturation, and hence, that the layer was an effective radon barrier. Estimates show that the clay-gravel layer would not dry out (i.e., revert to drying dominated by isothermal vapor-flow conditions) for at least 20 years, provided that the modeled dry-climate period continues. (EDB)(JMF)

625

Skeaff, J.M., Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Elliot Lake Laboratory, Elliot Lake, Ontario, Canada

Survey of the Occurrence of Ra-226 in the Rio Algom Quirke I Uranium Mill, Elliot Lake

Canadian Institute of Mining and Metallurgy Bulletin 74(830):115-121 (1981, June)

The main solution ore and residue pulp streams in the Rio Algom Quirke I uranium mill at Elliot Lake have been sampled and analyzed for radium-226. Analysis of the ore and leached residues indicates that Ra-226 dissolves and precipitates within the first pachuca tank. A maximum of approximately 0.2% of the Ra-226 in the ore remains in solution during leaching. (EDB)(PTO)

626

Smith, E.S., D.R. Poindexter, and R.H. Bleikamp, International Engineering Co., Inc., San Francisco, CA

Observational Approach to Tailings Dam Enlargement

CONF-7706158; Geotechnical Practices for Disposal of Solid Waste Materials, Proceedings of a Conference, Ann Arbor, MI, June 13-15, 1977; (pp. 461-474) (1977)

A case history is presented describing the staged enlargement of an existing 140-ft high earth-rock tailings retention dike. Monitoring of the dike was initiated to provide baseline data for a steady state condition and to establish trends in behavior following the various stages of increased loading as a result of the construction. Seepage, settlement, spreading, and internal movements were measured before completing each stage of design, during placement of the enlargement fill, and after completion of each stage of construction. Designs of dike enlargement were based on studies of monitoring program observations, data from exploration programs, and materials test results. Use of the observational approach resulted in more economical tailings disposal consistent with acceptable embankment safety standards. (EIX)(JMF)

627

Soderberg, R.L., and R.A. Busch, U.S. Bureau of Mines, Washington, DC

Design Guide for Metal and Nonmetal Tailings Disposal

Bureau of Mines Information Circular 8755; 136 pp. (1977)

The Bureau of Mines has conducted considerable research on the design, construction, and operation of metal and nonmetal tailings ponds. This design guide and other related Bureau publications that preceded it are produced to assist the industry in the management of mill tailings disposal. It covers the site selection, sampling, laboratory testing, design, construction, operation and inspection of tailings embankments. The effects of environment, topography, and hydrogeology are also included. A review of various methods of stability analysis and factors affecting stability are presented. Because of the diversity of problems encountered in tailings embankments, specific solutions are not intended. The guide is, however, a useful checklist for designers, operators, and inspectors of this type of structure. (Auth)

628

Spalding, B.P., and T. Tamura, Oak Ridge National Laboratory, Environmental Sciences Division, Oak Ridge, TN

Grouting Research for Uranium Mill Tailings

CONF-821103; American Nuclear Society 1982 Winter Meeting, Proceedings of a Conference, Washington, DC, November 14-18, 1982, 813 pp.; (pp. 309-310); Transactions of the American Nuclear Society 43:309-310 (1982, Novem

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

Two contaminant transport problems result from uranium mill tailings: (1) radon emanation from the surface of the piles; and (2) subsurface leaching of soluble radionuclides. In situ stabilization can be achieved by the use of grouts to fill the void space in the waste. An ideal grout would have low viscosity, few suspended solids, low permeability, resistance to chemical and microbial stress, low toxicity, and low cost. Hydraulic conductivities are reported for various soils for the following grouts: polyacrylamide (10%); bentonite (5%); resorcinol-formaldehyde (10%); urea-formaldehyde (20%); and sodium silicate (15%). (PTO)

629

Strong, K.P., and D.M. Levins, Australian Atomic Energy Commission Research Establishment, Lucas Heights, Sutherland, Australia

Effect of Moisture Content on Radon Emanation from Uranium Ore and Tailings

Health Physics 42(1):27-32 (1982, January)

A study was made of the effect of moisture on the emanation coefficient and radon flux from uranium mill tailings. A sharp rise in the emanation coefficient occurred as the moisture content was increased from the absolutely dry state to 2% water by weight. The emanation coefficients from water-saturated tailings were about four times those from absolutely dry materials. Radon flux was measured from columns of dry, moist and water-saturated tailings. The highest flux came from the column filled with moist tailings. This can be explained by the effect of moisture content on the emanation coefficient. Water-saturated tailings gave the lowest flux because of the much lower diffusion coefficient of radon through water. (EDB)(JMF)

630

Sutherland, A.A., V.C. Rogers, and P.J. Macbeth, Rogers and Associates Engineering Corporation, Salt Lake City, UT

Long-Term Monitoring of Closed Low-Level Waste and Uranium Mill Tailings Disposal Sites

IEEE Transactions on Nuclear Science 29(1):242-246; CONF-811012; Nuclear Power Systems, Proceedings of an IEEE Symposium, San Francisco, CA, October 21-23, 1981; (pp. 242-246) (1981)

The goals of radioactive waste disposal are reviewed and their impact on long-term monitoring of closed low-level waste and uranium mill tailings disposal sites are described. It is shown that existing instruments are adequate for long-term monitoring and that advances in instrumentation can be accommodated as they become available. The important role of long-term monitoring in improved predictive models of the system performance is described. (EIX)(PTO)

631

Sutherland, H.J., and R.P. Rechard, Sandia National Laboratories, Albuquerque, NM

Physical Modeling of Tailings Dams Using Centrifuge Simulation Techniques

SAND-82-1191; 54 pp. (1982, August)

Development of the phreatic surface in a stable tailings dam is investigated by using centrifuge simulation techniques and analytical techniques. The centrifuge simulations, conducted on an 8-m (25-ft) radius machine, uses a modeling-of-models approach to determine the effects of scaling and model construction on the development of the phreatic surface. The analytical and numerical techniques include predictions of the effects of scaling on the development of the phreatic surface, determination of the location of the steady-state phreatic surface in a full scale prototype dam and determination of the stability of a prototype dam in terms of the conventional factor-of-safety. While these analyses indicate that there should be no scaling effect on the steady-state phreatic surface, tests run at over 100 g scaling show a rise in the phreatic surface with increasing g load. Numerical predictions of the steady-state phreatic surface compare well with data taken below 100 g scaling. (EDB)(JMF)

632

Taylor, M.J., D'Appolonia Consulting Engineers, Inc., Englewood, CO

Radionuclide Movement in Seepage and Its Control

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

CONF-8005177; Uranium Mine Waste Disposal, C.O. Brawner, (Ed.), Proceedings of the First International Conference, Vancouver, British Columbia, Canada, May 19-21, 1980. American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., Society of Mining Engineers, New York, NY, 626 pp.; (pp. 205-244) (1980)

Radionuclide and other detrimental chemical elements in uranium tailing water can be controlled by the following types of systems: Type I Systems where seepage into the ground is allowed to occur from the tailing disposal facility. Control of radionuclides and other elements is accomplished by natural purification in the subsurface materials. Type II Systems where seepage is partially retained or leakage from a retention system is possible. Partial natural purification in subsurface is anticipated but positive means to reduce seepage are employed. Type III Systems where total seepage retention is required because the subsurface materials are not capable of natural purification. This paper discusses methods to evaluate sites to determine which type of system is appropriate, or to assess the effects of existing disposal operations. At all sites an understanding of the movement of radionuclides and chemical elements in the subsurface ground and water regimes is required and is discussed. At those sites where movement is not possible, a Type III system is appropriate, but an understanding that the subsurface materials will not prevent this movement is key to the selection of a Type III system. Each type of system is discussed as to techniques used to evaluate the site and conclusions to be drawn upon reviewing the results of these evaluations. Each type of system is then illustrated by a real project. The approaches described in the paper have been used in the practical examples presented. (Auth)(RAF)

633

Taylor, M.J., C.E. Oldweiler, W.E. Jenkins, and N.T Ng-A-Qui, D'Appolonia Consulting Engineers, Inc., Englewood, CO

Reclamation of Uranium Tailings - A Critical Assessment of Current Practice

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 539-556) (1982)

Uranium mills are required to prepare detailed reclamation plans to reclaim inactive uranium tailings ponds. Currently proposed regulations require placement of at least a three-meter soil cover to reduce radon flux emanation to 2 pCi/sq m/s above background and to provide long-term stabilization. The requirements for radon reduction are not based on rigorous health and safety protection evaluations. The minimum three-meter cover requirement is primarily based on theoretical assessments with minimum in-field verification. Long-term stabilization is not adequately addressed by single thickness cover specifications. The effective construction of the reclamation system can be greatly affected by past operational conditions not considered in theoretical evaluations. This paper presents a detailed review of the often misunderstood theoretical approach to cover design construction. Areas are delineated where current data bases are inadequate to require large expenditures for non-optimum designs. (Auth)(PTO)

634

Thamer, B.J., K.K. Nielson, and K. Felthauser, Ford, Bacon and Davis Utah, Inc., Salt Lake City, UT

The Effects of Moisture on Radon Emanation Including the Effects on Diffusion

Bureau of Mines Open File Report 184-82; 213 pp. (1981, November)

Radon emanation coefficients of 0.02 to 0.55 were measured at moisture contents ranging from dry to saturation in 18 different ores. The emanation coefficients rose from a minimum when dry to a plateau usually starting at 5% to 20% of saturation. A model, using measured pore-size distributions, suggested that the radium mineralization may be confined to annular layers about 0.02 um thick around pores. Radon's diffusion coefficient was determined as a function of moisture. The techniques involved comparing a disk's exhalation as a function of time whether or not the disk had a distributed source. The model was free of approximations and included the effects of porosity and adsorption. An increase of diffusion coefficient with moisture for one or two ores was explained by a model's equation for the diffusion coefficient in terms of both volume and surface diffusion. Radon's adsorption coefficient was determined on an uranium ore. (Auth)(PTO)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

635

Thomas, K.T., International Atomic Energy Agency, Vienna, Austria

Management of Wastes from Uranium Mines and Mills

IAEA Bulletin 23(2):33-35 (1981, June)

Uranium mining and milling operations have not given rise to much concern about their hazards, and with advancing technologies for mill processing and waste management, the situation will continue to improve. However, the disposal of large quantities of waste produced in mining and milling does have an environmental impact, owing to the long half-lives and the ready availability of the toxic radionuclides, radium-226 and radon-222. This article deals with the management of wastes from uranium mines and mills. (EDB)(JMF)

636

Thomson, B.M., and R.J. Heggen, University of New Mexico, Department of Civil Engineering, Albuquerque, NM

Contaminant Transport from Uranium Mill Tailings in Ambrosia Lake, New Mexico

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 415-437) (1981)

One-dimensional transport of non-radioactive contaminants was investigated through a combination laboratory and model study of alluvium and shales found in the Ambrosia Lake mining district of northwest New Mexico. The chemical ion exchange/adsorptive properties of these soils were measured in the laboratory with emphasis on their dependence on pH and ionic strength. Both batch and column studies were performed. Constituents examined include Al, Ba, Cu, Pb, Fe, Mn, SO4, and Se. The soil properties of importance to groundwater flow were determined. The results of the laboratory studies were combined with a one-dimensional contaminant transport model through a saturated matrix to enable estimation of rates of constituent migration through a saturated near-surface aquifer. The model was used to in[illegible]rate transport of dissolved contaminants through alluvium and shale under conditions encountered near active and abandoned uranium tailings piles. Limitations of the approach are discussed. (Auth)(PTO)

637

Thorpe, R., Stevens (J.P.) Company, Easthampton, MA

Cotter Corporation's New Tailings Pond Has a Synthetic Liner

Engineering Mining Journal 182(7):94-95 (1981, July)

When Cotter Corporation, a vanadium and uranium processor in Canon City, CO, decided to build a new tailings pond, it was required to make special provisions to prevent seepage. A two-cell impoundment was designed to hold acidic tailings and reprocessed alkaline tailings from older ponds. It will also receive runoff from the mill site. (EIX)(JMF)

638

Torma, A.E., J.J. Santana, A. Singh, and W.M. Fleming, New Mexico Institute of Mining and Technology, Socorro, NM

A Novel Approach to Tailings Disposal

CONF-810949; Proceedings of the Fifth Annual Uranium Seminar, Albuquerque, NM, September 20-23, 1981; (pp. 59-67) (1981, September)

The present study investigated the extraction of uranium from a low-grade ore by sulfuric acid and the removal of radium from the leach residues by brine solutions. The optimum leaching conditions were found to be 1.5 mole/l H2SO4, 6.0 g/l NaClO3, 75 deg C, 50% pulp density, and 750 rpm with respect to the rate of uranium extraction. The maximum theoretical attainable rate of uranium extraction was determined to be V sub m = 1.09 X 10(E-2) mole/l/hr with respect to pulp density. The order of reaction was found to be zero regarding the effect of sodium chlorate concentrations. The apparent activation energy of uranium extraction was calculated from the Arrhenius plot: delta E sub a = -2.36 kcal/mole (9.87 kJ/mole). Based on a statistical design, an empirical equation has been developed describing the rate of uranium

extraction with the leaching parameters. This equation can be used to generate data which may be useful for scaling up the process to pilot plant level. The most efficient brine solution for the extraction of radium-226 from the leach residue was found to contain 1 mole/l $CaCl_2$ and 0.01 mole/l HCl. The two step leaching with this solution resulted in a 87% removal of radium from the leach residue. On the basis of this study, a flow-sheet has been proposed for the extraction of uranium and radionuclides from the ore and leach residue to yield almost innocuous tailings. (Auth)(PTO)

639
Torrie, R.,

What the Record Shows: Uranium Mine Tailings

Alternatives 10(2/3):15-26 (1982)

In 1979, the British Columbia Royal Commission of Inquiry - Health and Environmental Protection - Uranium Mining (hereafter referred to as the Bates Commission) conducted a comprehensive technical review of the problem of uranium mine tailings handling. The quoted comments in the article are taken directly from submissions to the Bates Commission. (Auth) (JMF)

640
U.S. Department of Energy, Technical Information Center, Oak Ridge, TN

Uranium Mill Tailings

DOE/TIC-3393 (1982, November)

This bibliography contains 335 references with abstracts on uranium mill tailings included in the Department of Energy's Energy Data Base from January 1981 through October 1982. The references are arranged by subject category, and within each subject category by report number; non-reports are arranged in reverse chronological order. Indexes are included. (PTO)

641
U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, Washington, DC

Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations

Regulatory Guide 3.51 (1982, March)

This guide describes models used by the Nuclear Regulatory Commission (NRC) staff to estimate the radiological impacts resulting from uranium mills for the purpose of evaluating compliance with 40 CFR Part 190 and 10 CFR Part 20 and of assessing overall environmental radiological impacts in accordance with the National Environmental Policy Act of 1969 (NEPA). The NRC staff is required to make analyses of radiation doses to the public, or individual members thereof, resulting from the radioactive effluents from uranium mills for the following purposes: (1) evaluating compliance with 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations"; (2) evaluating compliance with the "as low as is reasonably achievable" (ALARA) criterion embodied in 10 CFR Part 20, "Standards for Protection Against Radiation"; and (3) evaluating overall radiological impact as part of the complete environmental impact assessment required by NEPA (Public Law 91-190, 83 Statute 852). This regulatory guide describes basic features of calculational models used by the NRC staff for such elevations and suggests values for various parameters used in the estimation of radiation doses to man from uranium milling operations. Specifically, this guide addresses the calculation of radiation doses to man from previously estimated environmental radioactivity concentrations in air. The environmental radioactivity concentrations in air required for this calculation result from extensive and detailed analyses of effluent release rates and atmospheric dispersion phenomena. (Auth)(PTO)

642
Uranium Mill Tailings Management

CONF-821209; Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp. (1982)

The first four symposia on Uranium Mill Tailings Management were held in Fort Collins, Colorado in November of 1978, 1979, 1980, and October 1981. At the first symposium, attention was focused primarily on development of dialogue between industry and regula-

tory agencies and the development of the state-of-the-art. After the first symposium was held, regulations and standards were developed and promulgated by a number of regulatory agencies. Considerable advancement has been made with regard to innovations in uranium mill tailings management at active sites. During the five-year period over which these symposia have been held, significant advances have been made with regard to uranium mill tailings management, environmental effects, regulations, and reclamation. Changes in the economy over the past two years have caused a shift of emphasis from design of new impoundments to operation of existing impoundments and reclamation of inactive sites. Significant advances have taken place with regard to reclamation and environmental impacts of sites over long-term periods. Much of that work has been accomplished as part of the Uranium Mill Tailings Remedial Action Program. The papers included in these proceedings document the technology development that has taken place and define the current state-of-the-art. It is hoped that this symposium will enhance the dialogue between research, industry, and regulator personnel. This symposium includes 38 papers presented during the seven symposium sessions: (1) Tailings Management and Design; (2) Surface Stabilization; (3) Radiological Aspects; (4) Contaminant Migration; (5) Radon Control and Covers; (6) Seepage and Liners I; and (7) Seepage and Liners II. (Auth)(PTO)

643

Uranium Tailings Need Consolidating

Canadian Chemical Processing 63(1):22-23 (1979, February)

The environmental and economic problems of uranium mine tailings in Ontario and Saskatchewan are outlined. There are already about 100 metric tons of tailings. Seepage from tailings piles contains radium in amounts exceeding the 27 mBq/l permitted federally, or 10 mBq/l permitted in Ontario. A promising method of treatment which was developed at Carleton University is spherical agglomeration and sintering. At a cost of $7.00 to $8.00 per ton (excluding final disposal), the rate of leaching of radium is reduced 3000 times. (EDB)(JMF)

644

Uziemblo, N.H., R.L. Erikson, and G.W. Gee, Pacific Northwest Laboratory, Richland, WA

Contact of Clay Liner Materials with Acidic Tailings Solutions: 1 - Mineral Characterization

CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 597-608) (1981)

Experiments were conducted to determine mineralogical changes of liner materials after contact with acidic tailings solutions. The liner materials used in this study included: (1) clay liner from Morton Ranch, Wyoming; (2) a sodium-saturated bentonite; and (3) a polymer-treated bentonite. Each of the above clay liner materials was added to Exxon Highland Mill tailings solutions and agitated synthetic tailings solution, sulfuric acid solutions, and agitated for durations of up to 16 months. The mineralogy of the clay liner materials has characterized before and after reaction with all tailings solutions using powder X-ray diffraction techniques. The X-ray results suggest that the chemical stability of the liner material did not deteriorate greatly when reacted with the tailings solutions. However, jarosite and alunite formed in the clay liner samples reacted with the Highland Mill tailings solution. (Auth)(PTO)(RAF)

645

van de Steeg, G.E., M.D. Coe, W.J. Shelley, and J.E. Cleveland, Kerr-McGee Corporation, Oklahoma City, OK; Kerr-McGee Nuclear Corporation, Oklahoma City, OK

Radioactive Composition of Airborne Particulates at Ambrosia Lake, New Mexico

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 187-204) (1982)

The concentration and distribution of radionuclides in airborne particulates from the Ambrosia Lake Uranium mining district in New Mexico are discussed. Analysis of over 500 weekly samples, collected over four years at eight various locations, including the Kerr-McGee uranium mill area, has provided a large data base. A description of the airborne radiological environment in the district resulting from the chemical and statistical evaluations of the data base are presented. (Auth)(PTO)

CHAPTER 6. URANIUM MILL TAILINGS MANAGEMENT

646

van Zyl, D., University of Arizona, Department of Civil Engineering, Tucson, AZ

Design, Construction, and Field Testing of a Heap Leach Clay Pad

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 521-537) (1982)

A number of uranium waste disposal and heap leach facilities have been constructed with clay liners. The case history presented here describes the design, construction, and field testing of a heap leach clay pad for silver recovery from agglomerated tailings. Clay was selected as a liner material on the basis of permeability, construction constraints, and cost. The laboratory testing procedure and results are described for the selection of the liner material mix as well as the construction specification. The 18-inch thick pad is constructed in three lifts in cells 50 feet by 500 feet. The construction procedure is described. Field quality control testing consists of nuclear moisture-density measurements as well as permeability testing in a field laboratory. A flow pump apparatus is used for laboratory testing of samples removed from the pad. Permeability results are presented indicating that a clay pad can be constructed having consistently low permeability. (Auth)(PTO)

647

van Zyl, D.J.A., and M.E. Harr, Purdue University, West Lafayette, Indiana

Modeling of Seepage Through Mine Tailings Dams

CONF-7706158; Geotechnical Practices for Disposal of Solid Waste Materials, Proceedings of a Conference, Ann Arbor, MI, June 13-15, 1977; (pp. 727-743) (1977)

The modeling of seepage through mine tailings dams is very difficult if not impossible. Approximations have to be made in order to analyze seepage conditions. This paper presents a number of solutions for homogeneous isotropic sections with different bounding geometries. The results are presented in easy to use figures. Examples are given of the use of trench drains as well as of filter blankets. A number of practical design concepts are explored. (EIX)(JMF)

648

Waligora, S.J., Eberline Instrument Corporation, Santa Fe, NM

Operational Experience on Radon Monitoring

INIS-MF-5983; Uranium Health Physics, Proceedings of a Summer School, Pretoria, South Africa, April 14-15, 1980 (1980)

Radon sources (e.g. uranium ores, tailings and groundwater), as well as the sampling and analysis of radon are presented. Two basic types of air monitors and the measurement of radon flux is also described. (EDB)(JMF)(RAF)

649

Wallace, A., E.M. Romney, and R.B. Hunter, University of California, Laboratory of Nuclear Medicine and Radiation Biology, Los Angeles, CA

The Challenge of a Desert: Revegetation of Disturbed Desert Lands

NVO-181; CONF-770369; Transuranics in Desert Ecosystems: Nevada Applied Ecology Group, M.G. White, (Ed.), Proceedings of a NAEG Plutonium Report Meeting, Las Vegas, NV, March 2, 1977, 469 pp.; (pp. 17-40) (1977, November)

The revegetation of disturbed, arid lands is one of the great challenges of a desert. Where rainfall and temperature conditions approach or exceed those of the Great Basin Desert, restoration of disturbed land will occur through natural vegetation processes within a reasonable period of time. This is not generally the case in the more arid Mohave Desert areas where the moisture and temperature conditions are less favorable for germination and seedling survival. Restoration of vegetation by natural reseeding can occur where moisture has concentrated as the result of terrain features forming catchment basins. Otherwise, the natural revegetation proce[illegible] in

the Mohave Desert areas require much longer periods of time than are practical for meeting environmental protection standards. Through better understanding of the processes governing revegetation and the ability to control them, it is possible for man to more rapidly restore disturbed desert lands. Terrain manipulation to form moisture catchment basins, selection of seed from pioneering shrub species, preservation of existing shrub clump "fertile islands" in the soil, supplemental fertilization and irrigation and organic amendments, and transplanting vigorous shrub species are some of the important actions that can be taken to help restore disturbed desert land. (Auth)(PTO)

650

Walters, W.H., Pacific Northwest Laboratory, Richland, WA

Riprap Design Considerations for Long-Term Protection of Uranium Mill Tailings

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 117-126) (1982)

As part of a NRC study to assess the long-term protection of retired uranium mill tailings, PNL has reviewed the processes of water erosion and the protection requirements of earthen radon suppression covers. Existing and proposed designs of the covers are briefly presented here. The "Riprap Design with Safety Factor Method" is recommended for uranium mill tailings impoundments. The basic steps required in designing riprap to protect against flood erosion are discussed in this paper and other design criteria related to the problems of long-term protection are identified. The "Safety Factor Method" offers a versatile approach to riprap design based on the concepts of hydrodynamic lift and drag and critical shear stress. This method allows more flexibility in design than other methods and could be adapted to mill tailings impoundments. The set of equations applicable to typical conditions at impoundment locations would be selected and graphical solutions developed to speed up calculations. An outstanding feature of this method is the rate determination of a safety factor associated with the stone size and weight. (Auth)(PTO)

651

Walters, W.H., Pacific Northwest Laboratory, Richland, WA

Rock Riprap Design Methods and Their Applicability to Long-Term Protection of Uranium Mill Tailings Impoundments

NUREG/CR-2684; PNL-4252; 84 pp. (1982, August)

This report reviews the more accepted and recommended riprap design methods currently used to design rock riprap protection against soil erosion by flowing water. The basic theories used to develop the various methods are presented. The riprap design with safety factors method is identified as the logical choice for uranium mill tailings impoundments. This method is compared to the other methods and its applicability to the protection requirements of tailings impoundments is discussed. Other design problems are identified and investigative studies are recommended. (EDB)(JMF)

652

Warkentien, J.S., L.S. Busch, J. DePue, R. Sundell, and C.Z. Gordon, Argonne National Laboratory, Argonne, IL

Directory and Profile of Licensed Uranium-Recovery Facilities

ANL/ES-128; NUREG/CR-2869; 110 pp. (1982, July)

The Directory and Profile of Licensed Uranium-Recovery Facilities contains facts, data, and information about conventional uranium mills, in situ mining facilities, heap leach operations, and other operations which process and produce marketable quantities of yellowcake. In the United States, such facilities are found in Agreement States (Arizona, Colorado, Florida, Louisiana, New Mexico, Texas, and Washington) and in Non-Agreement States (Utah and Wyoming). Each facility is described on a case-by-case basis. Reporting of information on the conventional uranium mills begins with a brief narrative description that outlines general and specific characteristics about the site. Data sheets summarize the principal operating characteristics of the facility by listing the following information: location/

ownership, licensing data, processing of uranium, characteristics of effluent releases and/or tailings, and radiological parameters. For in situ and heap leach facilities, only data sheets are included. Data and information in this report is current through calendar year 1981. The final section contains a description of the system used for storage and retrieval of all information presented. (Auth)(JMF)

653

Wilson, D., Klohn Leonoff, Inc., Richmond, British Columbia, Canada

Design and Construction of Tailings Dams

Proceedings of a Seminar, Golden, CO, November 6-7, 1980, 280 pp. (1980)

The volume contains 13 papers presented at the meeting, which outline state-of-the-art technology and describe selected case histories. Subjects include: geotechnical investigations; seismic response analysis; surface and groundwater pollution; hydrotransport of tailings; seismic investigations; oil production wastes; and regulatory aspects. (EIX)(JMF)

654

Winter, G.V., G.L. Bloomsburg, R.E. Williams, and B.M. Stewart, Williams (Roy E.) and Associates, Inc., Moscow, ID; University of Idaho, Moscow, ID; U.S. Bureau of Mines, Spokane Research Center, Spokane, WA

Horizontal Pipe Drain Design for Existing Mill Tailings Embankments

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 475-487) (1982)

Mill tailings embankments can develop high phreatic surfaces owing to several factors. Original features such as chimney, finger, or blanket drains can become clogged with fine-grained material, rendering them inoperable. A layer of low-hydraulic-conductivity material can be deposited on the upstream face of the starter dam, thereby preventing the movement of any significant amounts of mill tailings water into the original drainage features. This lack of movement prevents the impounded tailings from desaturating. A stability problem can develop in subsequent raises constructed from tailings without additional drainage features. The stability problem occurs owing to a rising phreatic surface that can result in a seepage face developing on the raise above the original starter dam. A post-construction drainage technique would have obvious beneficial uses wherein the phreatic surface could be lowered. Consequent to this study, the spacing between drains and the length of a drain can be determined from the use of a computer model such as UNSAT2. A finite-element mesh is constructed for a vertical section through the tailings embankment. This mesh is used first to simulate steady-state conditions as they exist in the field. A blanket drain is then simulated by a narrow row of elements near the bottom of the tailings and starter dam. The blanket drain is extended upgradient until the phreatic surface has been lowered adequately. Steady-state flow from this simulation is applied to a horizontal planar mesh where inflow is specified. Drain spacing and length are varied in the horizontal planar mesh until an acceptable combination is achieved. The previous evaluation assumes an extremely efficient blanket drain. In reality, a pipe drain is less efficient than the blanket drain. An actual pipe drain design can be based on comparative water well design. The slot size is based on a sieve analysis of the tailings. The length of the perforated section is based on the effective open area of the screen and an acceptable screen entrance velocity based on the hydraulic conductivity of the drainable material. Drain diameter and slope are easily determined from Manning's equation or a suitable nomograph. (Auth)(PTO)

655

Wright, R.A., West Texas State University, Canyon, TX

The Reclamation of Disturbed Arid Lands

CONF-770271; Reclamation of Disturbed Arid Lands, Proceedings of a Symposium, Denver, CO, February 20-24, 1977. University of New Mexico Press, Albuquerque, NM, 196 pp. (1978)

The papers collected here, based on a 1977 symposium of the American Association for the Advancement of Science, are representative of the amount of research

currently in progress on the reclamation of lands disturbed by mining activity in the western United States. The book is divided into three parts, reflecting the three sessions of the symposium. Part 1 is an overview of research and contains the following papers: Reestablishment of Woody Plant on Mine Spoils and Management of Mine Water Impoundments; An Overview of Forest Service Research on the Northern High Plains; Establishment of Native Plants for the Rehabilitation of Paraho Processed Oil Shale in an Arid Environment; and Restoration of Productivity to Disturbed Land in the Northern Great Plains. Part 2 consists of reclamation studies at Argonne National Laboratory and contains the following papers: Assessment of Water Quality Impacts of a Western Coal Mine; Economics of Mined Land Reclamation and Land-Use Planning in Western States; and An Analysis of the Sensitivities of Local Socioeconomic Impacts to Variations in the Types and Rates of Coal Development and Differences in Local Site Characteristics. Part 3 details reclamation research in arid regions and contains the following papers: Potentials and Predictions Concerning Reclamation of Semiarid Mined Lands; Plants and Treatment for Revegetation of Disturbed Sites in the Intermountain Area; Endomycorrhizae Enhance Shrub Growth and Survival on Mine Spoils; An Evaluation of New Mexico Humate Deposits for Restoration of Mine Spoils; and Some Applications of Hydrologic Simulation Models for Design of Surface Mine Technology. (PTO)

656

Young, J.K., L.W. Long, and J.W. Reis, Pacific Northwest Laboratories, Richland, WA

Environmental Factors Affecting Long-Term Stabilization of Radon Suppression Covers for Uranium Mill Tailings

NUREG/CR-2564; PNL-4193; 110 pp. (1982, April)

Pacific Northwest Laboratory is investigating the use of a rock armoring blanket (riprap) to mitigate wind and water erosion of an earthen radon suppression cover applied to uranium mill tailings. To help determine design stresses for the tailings piles, environmental parameters are characterized for the five active uranium-producing regions on a site-specific basis. Only conventional uranium mills that are currently operating or that are scheduled to open in the mid 1980s are considered. Available data indicate that flooding has the highest potential for disrupting a tailings pile. The arid regions of the Wyoming Basins and the Colorado Plateau are subject to brief storms of high intensity. The Texas Gulf Coast has the highest potential for extreme precipitation from hurricane-related storms. Wind data indicate average wind speeds from 3 to 6 m/s for the sites, but extremes of 40 m/s can be expected. Tornado risks range from low to moderate. The Colorado Plateau has the highest seismic potential, with maximum acceleration caused by earthquakes ranging from 0.2 to 0.4 g. Any direct effect from volcanic eruption is negligible, as all mills are located 90 km or more from an igneous or hydrothermal system. (EDB)(JMF)

657

Yuan, Y.C., and P.C. Chee, Argonne National Laboratory, Argonne, IL

Estimation of Radiological Impact from Transportation of Uranium Mill Tailings - Part II: Dispersion and Dosimetry

CONF-821209; Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp.; (pp. 165-174) (1982)

One of the tasks of the model development program being conducted at Argonne National Laboratory as part of the U.S. Department of Energy's Uranium Mill Tailings Remedial Action Program (UMTRAP) is to evaluate radiological impacts caused by transport of large quantities of radioactive tailings from inactive uranium mill tailings sites to locations for final disposal. This task is divided into three parts: (1) external radiation exposure; (2) dispersion and dosimetry; and (3) evaluation of the models. Task 1 has been previously described in another paper in this symposium. Task 2 is the formulation of a line source model to predict radiation exposure resulting from the dispersion of radon and tailings materials to the population in the vicinity of the transportation routes. Data on radiological parameters from an existing inactive uranium mill tailings site are used to demonstrate computer simulation of the model and prediction of potential radiological impacts of a hypothetical remedial operation. (Auth)(PTO)

AUTHOR INDEX

AUTHOR INDEX

Aaberg, R.L. **383**

Abe, T. **317**

Abel, K.H. **34**

Adams, G.A. **1**

Adams, J.A. **157**

Addison, S.J. **479**

Adler, J.J. **38**

Agostinelli, A. **242**

Aguilar, M.A. **2**

Akins, M.J. **212, 218**

Alder, J.C. **330**

Alexander, C.W. **116**

Alexander, H.J. **331**

Alexander, J.K. **380**

Alexander, W.A. **35**

Allen, R.P. **243, 251**

Ampelogova, N.I. **244, 248**

Anderson, B. **552**

Anderson, D.R. **384, 385**

Anderson, J. **359**

Anderson, L.R. **484**

Andreucci, P. **267**

Aquilina, D. **359**

Archer, V.E. **493**

mstrong, P.J. **272**

Arrowsmith, H.W. **245**

Arter, D.R. **199**

Atherton, R. **9**

Auler, I. **238**

Auxier, J.A. **360**

Ayres, J.A. **246**

Bach, D. **519**

Bahmann, H. **273**

Baker, E.G. **486, 487, 545**

Balaban-Irmenin, Y.V. **247**

Balukov, R.V. **244, 248**

Barefoot, E.D. **36**

Barnes, E. **588**

Barnes, M.G. **237**

Barnes, S.M. **500**

Barr, E.B. **299, 316**

Barrick, H.L. **494**

Bartley, D.L. **274**

Bates, R.C. **527**

Batten, C.L. **29**

Baudoin, J.C. **305**

Beedlow, P.A. **434, 488-490, 564, 579**

Begej, C.W. **533, 570**

Beitel, G.A. **284**

Bennett, C.R. **201**

AUTHOR INDEX

Bennett, W.S. **64**

Bentel, D. **491**

Berg, G.C. **171, 172**

Bergemann, L. **238**

Bernhardt, D.E. **361**

Berry, J.B. **401**

Bevan, J.L. **68**

Bice, D.E. **325**

Bishop, C.T. **492**

Bishop, R. **492**

Bjoergerd, A. **362**

Blair, R.D. **525**

Blaylock, B.G. **331**

Bleikamp, R.H. **626**

Blomeke, J.O. **116**

Bloomsburg, G.L. **654**

Blumberg, R. **149**

Boardman, T.J. **80, 81**

Boback, M.W. **62**

Boegly, W.J., Jr. **445**

Boggs, M.C. **393**

Bohm, B. **291**

Booth, L.F. **38**

Boothe, G.F. **101, 102**

Bourgeois, S. **621**

Bowen, W.C. **1**

Bowles, D.S. **484**

Boyns, P.K. **39, 40**

Bozec, C. **267**

Brameld, M.P. **581**

Branagan, E.F., Jr. **493**

Brandenberger, E. **273**

Braun, W. **275**

Bregani, F. **242**

Brengle, R.G. **77**

Brewer, L.W. **494, 584**

Brewster, R.H. **105**

Briggs, J.L. **271**

Bronson, F.L. **38**

Brookins, D.G. **429, 495, 496, 573**

Brosche, D. **202, 207**

Brouns, R.A. **103**

Brown, C.M. **114, 115**

Brown, J.A. **388**

Brown, J.R. **497, 498, 553**

Brown, S.E. **620**

Brush, L.H. **384, 385**

Bryant, D.N. **499**

Buclin, J.P. **332**

Buelt, J.L. **500, 544**

AUTHOR INDEX

Buhl, T.E. 375, 376

Bull, B. 150

Bureau, G. 501

Burns, R.E. 6

Burton, B.W. 7, 502

Burton, F.G. 507

Busch, L.S. 652

Busch, R.A. 627

Bush, K.J. 430, 431, 503, 504, 577

Byers, V.P. 537

Cadwell, L.L. 434, 488-490, 579

Caldwell, J. 554

Calkins, G.D. 8

Cameron, E.A. 36

Campbell, A.C. 533

Campbell, D.A. 298

Campbell, R.L. 276

Campuzano, C. 259

Canfield, R.V. 484

Cannon, E.T. 438

Card, C.J. 249

Carney, M. 201

Carroll, J.W. 104

Carter, W.L. 116, 129

uolo, A.B. 277

Cataldo, D.A. 507

Cavendish, J.H. 58

Cesare, J.A. 536

Chakravatti, J.L. 525

Champlin, J.B.F. 505

Chapman, D. 203

Charlie, W.A. 597

Chee, P.C. 379, 657

Chen, S.Y. 506

Chen, Y.M. 6

Chepurkov, G.I. 307

Cherry, J.A. 525, 589

Christ, B. 333

Christen, W. 278

Christensen, E.L. 82, 83

Church, H.W. 480

Ciminesi, F.J. 117

Clancy, J.J. 334

Clark, J.W. 84

Clarke, G.H. 356

Cleveland, J.E. 645

Cline, J.F. 328, 507-509

Coe, M.D. 645

Cohen, B.L. 510

Cohen, D.B. 499

AUTHOR INDEX

Cohen, J.J. **117**

Cokal, E.J. **478, 511, 520, 521**

Colbert, T.A. **402**

Coleman, J.A. **151**

Collings, R.K. **512, 513**

Combs, A.B. **152**

Commander, J.C. **118**

Condon, S.M. **537**

Conners, C.C. **155, 198**

Connors, D.R. **9**

Cook, A. **329**

Corica, S. **280**

Cox, E.J. **66, 67**

Crawford, D.J. **382**

Cregut, A. **205, 206, 281, 363**

Cromer, P.M. **1**

Cupo, J.V. **364**

Currier, A.J. **254**

Cwynar, J.C. **1**

Dabrowski, T.E. **365**

Dahlke, J.M. **77, 371**

Daniel, D.E. **515**

Dave, N.K. **516**

Davenport, G.C. **540**

Davis, A.C. **153**

Davis, J.B. **608**

Davis, L.A. **517**

Davis, W.P. **10, 152**

Dayal, R. **131**

Dean, K.C. **518**

Deichelbohrer, P.R. **282-284**

Delaney, I.C. **112**

Delany, J.M. **477**

Demeester, J. **348**

Denham, D.H. **239**

DePue, J. **652**

Deramaix, P. **348**

DeRemer, D. **519**

Detilleux, E. **285, 367**

Detilleux, E.J. **368**

Deutsch, W.J. **442**

Devell, L. **335**

Dickman, P.T. **117**

Dickson, H.W. **360**

Dierckx, L. **348**

Doane, R.W. **382**

Dodd, B. **85**

Dodson, M. **415**

Doesburg, J.M. **569**

Dorey, R. **554**

AUTHOR INDEX

Dornsife, W.P. 154

Dreesen, D.R. 478, 511, 520, 521

Duncan, J.M. 557, 574

Durham, R.W. 499

Eappen, K.P. 578

Eirich, A.J. 19

Elder, H.K. 336

Eldridge, J.S. 35

Elmore, M.R. 522, 545

Elswick, T.C. 10, 152

Emeanuwa, A.U. 523

Emery, J.F. 59

England, J.L. 403-412

Englert, J.P. 44

Erikson, R.L. 413, 644

Esibjan, E.M. 286

Essmann, J. 202, 207

Esterl, D.J. 546

Evans, J.C. 34

Evdokushkin, N.V. 321

Fareeduddin, S. 349

Faust, C.L. 250

Faust, R.A. 105

Feenstra, S. 525

Feinster, E.L. 45, 46

Felthauser, K. 634

Ferenbaugh, R.W. 375, 376

Fest, J.A. 9

Fetrow, L.K. 251

Ficker, C.F. 388

Finney, B.C. 116

Fisher, J.W. 611

Fleming, W.M. 638

Flot, S. 555

Fontana, P.H. 526

Fore, C.S. 105, 124

Forsstrom, H. 337

Fowler, D.E. 259

Fox, W.F. 382

Fraley, L., Jr. 106-108

Francioni, W.M. 290, 338, 339

Franklin, J.C. 527, 528

Frens, D.G. 65

Freeman, H.D. 486, 529, 545, 546, 598

Freeman, T. 431

Freund, H.U. 291, 292

Friedell, H.L. 377

Fritzsche, A.E. 47, 378

Froisland, L.J. 414

Fry, R.M. 530

AUTHOR INDEX

Fukuzawa, M. 297

Fung, R. 531

Fyfe, W.S. 497, 498

Galbraith, R.M. 435

Gallenberger, H. 230

Gano, K.A. 340, 507, 508

Garde, R. 66, 67, 82, 83, 86

Gardner, H.R. 245

Garner, J.M. 10, 152

Gates, T.E. 532, 539

Gay, G.T. 480

Gay, R.L. 211

Gee, G.W. 415, 416, 442, 486, 533, 564, 580, 624, 644

Geens, L. 285

Geichman, J.R. 10, 152

Gerasimov, N.G. 321

Gerber, D.M. 534

Gilbert, T.L. 379, 380

Gillespie, D. 162

Goddard, A.H.J. 209

Golchert, N.W. 381

Goldberg, F. 293

Goldby, H.M. 608

Goldsmith, W.A. 382

Gomez, L.S. 384, 385

Gomez, M. 535

Gordon, C.Z. 652

Gotchy, R.L. 493

Grabenstatter, K. 230

Grant, M.W. 361

Grantham, L.F. 211

Graves, A.W. 75

Gray, D.F. 334

Green-Heffern, J.M. 536

Green, M.W. 537

Groessler, P. 252

Groff, D.W. 38

Guilbeault, B.D. 125

Gureghian, A.B. 538

Gutknecht, P.J. 539

Gutschick, V.P. 7, 502

Gutwein, E.E. 218

Guvanasen, V. 56

Hadley, L.M. 540

Hagan, P.G. 253

Hall, M.D. 126

Halseth, G.A. 249

Halter, J.M. 68, 254

Hamasaki, M. 294-296

AUTHOR INDEX

Hamel, P.E. **541**

Hanchey, L.A. **542**

Hansen, W.R. **375, 376**

Harley, J.H. **543**

Harper, J.R. **86**

Harr, M.E. **647**

Harris, V.A. **15**

Hartley, J.N. **416, 442, 486, 487, 522, 544-546, 598**

Hauman, D.F. **2**

Hawley, J.E. **547**

Hayashi, K. **297**

Hayes, K.A. **381**

Haywood, F.F. **382**

Hazeiton, R.F. **69**

Heggen, R.J. **636**

Henderson, J.S. **6**

Hendricks, D.W. **548**

Hermetz, R.E. **70**

Hess, E. **210**

Hicks, R.T. **573**

Higgins, H.W. **169**

Higginson, P.R. **298**

Highland, W.R. **417**

ild, W. **285, 367**

Hilton, J.N. **588**

Hilton, L.K. **48**

Hinnefeld, S.L. **44**

Hinton, T. **549**

Hirsch, W.Z. **29**

Hodder, R.L. **550**

Hoenes, G.R. **249**

Hoffman, D.C. **572**

Hollocher, T.C. **551**

Holmgren, P. **306**

Holter, G.M. **159-161, 164**

Hoover, M.D. **299, 316, 325**

Hosoda, N. **300, 301**

Hosoda, T. **300, 301**

Hoyt, R.C. **211**

Huang, F.H. **256**

Huang, S. **35**

Hubbard, H.M. **35**

Huber, B. **370**

Huck, P.M. **552, 553**

Hudman, L.E. **418-424**

Huey, E.A. **49**

Hunter, R.B. **649**

Hutchinson, P.G. **554**

Iba, H. **268**

AUTHOR INDEX

Ibbotson, B.G. **534**

Ibrahim, S. **555**

Ichihashi, Y. **297**

Inoue, N. **302**

Irving, B.A. **71**

Ito, S. **341**

Jacoby, W.R. **1**

Janke, D.H. **50, 51**

Jayakumar, T.K. **304**

Jeantet, E. **305**

Jenkins, W.E. **633**

Jeyapalan, J.K. **556, 557**

Jiang, H. **327**

Jobst, J.E. **52-55, 558**

Johnson, A.G. **85**

Johnson, T.D. **425**

Jones, L.J. **211**

Justus, A.L. **393-398**

Kajiyoshi, M. **341**

Kalin, M. **559, 560**

Kamath, P.R. **578**

Kanatani, F. **296**

Kanehiro, B.Y. **56**

Karker, S. **306**

Kay, B.L. **561**

Kaye, C.J. **356**

Kearney, P.D. **426**

Kellar, J. **621**

Kemp, E. **417**

Kemp, L. **621**

Kennedy, W.E., Jr. **111, 383**

Kerkering, J.C. **528**

Kharbanda, J.L. Singh, L.J. **562**

Kharitonov, E.P. **307**

Khitrov, Y.A. **244**

Kibbey, A.H. **129**

Kim, Y.S. **548**

King, J.C. **18**

King, S.E. **571**

Kirk, J. **342, 371**

Kirkham, R.R. **415, 564**

Kisieleski, W.E. **565**

Kittinger, W.D. **155, 198**

Kline, W.H. **16, 87**

Klonk, W. **285**

Kluk, A.F. **24**

Klusman, R.W. **402**

Knight, G.B. **566**

Knight, M.J. **379**

Koch, D.A. **212**

AUTHOR INDEX

Kochen, R.L. **109, 112**

Koehler, P. **339**

Koehmstedt, P.L. **545, 546**

Konzek, G.J. **17**

Koyama, T. **257**

Kresse, F.C. **601**

Kretz, N.D. **426**

Krieger, F. **354**

Kronberg, B.I. **497, 498**

Krupka, K.M. **602**

Kumakura, O. **213**

Kupferman, S.L. **384, 385**

Kuriyama, O. **257**

Kurlovich, Y.V. **321**

Kurnosov, A.I. **307**

Kuroda, H. **341**

Kurtz, E.F. **97, 171, 172**

Lacy, C.S. **258**

Lafontaine, I. **348**

Lahey, T.J. **87**

Landa, E.R. **427**

LaRocque, E. **525**

Latkovich, J.M. **428**

Lattanzi, D. **240**

Laul, J.C. **384**

Lawton, H. **343**

Lazarus, G.H. **169**

Leggett, R.W. **382**

Leiter, A.J. **567**

Lepel, E.A. **34**

Lettnin, H.K.J. **354, 372**

Levins, D.M. **629**

Levy, L.H. **214**

Li, C.T. **522**

Lichfield, J.W. **18**

Lillie, A.F. **78**

Lim, T.P. **516, 589**

Lindsay, D.B. **568**

Lindsey, C.G. **569-571**

Link, B.W. **90, 158**

Long, L.W. **570, 656**

Longfellow, R.L. **572**

Longmire, P.A. **429, 496, 573**

Lorcher, G. **238**

Lucia, P.C. **574**

Ludeke, K.L. **575**

Ludwick, J.D. **215**

Lunn, D.J. **308**

Lush, D.L. **583**

Lynch, T.W. **91**

AUTHOR INDEX

Macbeth, P.J. **630**

MacKenzie, J.J. **551**

Mackey, T.S. **355**

Macphee, R.C. **272**

Madia, W.J. **65**

Maez, M.A. **520**

Magno, P.J. **441**

Makepeace, C.E. **566**

Makhnach, E.K. **321**

Marcus, D. **576**

Markos, G. **430, 431, 503, 504, 577**

Markose, P.M. **578**

Martin, J.B. **441**

Martin, W.J. **609**

Martinez, B.S. **325**

Marzec, J.M. **104**

Matthews, M.L. **432, 433**

Mauch, M.L. **598**

Mautz, E.W. **58**

Maxey, M.N. **216**

Mayer, C.A. **309**

Mayer, D.W. **434, 579, 580**

Mayes, C.B. **394-399**

McCorkell, R.H. **581**

McCoy, M.W. **69**

McDowell-Boyer, L.M. **582**

McDowell, G.S. **38**

McKee, P. **583**

McKinnery, W.N., Jr. **274**

McNair, J.M. **116**

McShane, M.C. **488, 490**

McVey, J.T. **259**

McWhorter, D.B. **595**

Megaritis, G. **339**

Merrell, G.B. **440**

Merry-Libby, P. **386**

Meyer, T.O. **527**

Meyers, S. **156**

Mikheev, A.Y. **321**

Milani, S. **9**

Miller, C.E. **19**

Miller, R.L. **20, 157, 158**

Minnema, D.M. **494, 584**

Miquel, P. **305**

Mishima, J. **442, 571, 585**

Mitchell, A.B. **258**

Mittal, H.K. **586**

Miwa, S. **310**

Moe, H.J. **15, 63, 87, 140**

Moed, B.A. **435, 444**

AUTHOR INDEX

Moffett, D. **587, 588**

Momeni, M.H. **439**

Montgomergy, C.R. **21**

Montone, H. **528**

Mooers, R. **91**

Moore, E.B. **215, 217**

Morgenstern, N.R. **586**

Mori, S. **341**

Morin, K.A. **589**

Morris P.A. **22**

Moutonnet, A. **305**

Mueller, J.J. **523**

Mueller, M.A. **111**

Mukai, S. **373**

Multamaki, G.E. **553, 590**

Mundis, R.L. **399**

Munson, L.F. **249**

Murao, Y. **294**

Murdock, L.T. **417**

Murphy, E.S. **159-161, 336**

Murphy, K.L. **553, 590**

Murray, F. **497, 498**

Musser, S.S. **218**

Nakamura, U. **297, 310**

ırasimhan, T.N. **435, 447**

Nasiatka, D.M. **591**

Nathwani, J.S. **592**

Navratil, J.D. **109**

Neely, N. **162**

Nelson, D.A. **545**

Nelson, J.D. **475, 591, 595-597**

Nelson, R.W. **442, 580**

Nemec, J.F. **163**

Neri, C. **240**

Newton, G.J. **299, 316, 325**

Ng-A-Qui, N.T **633**

Nielson, K.K. **440, 598, 599, 614, 615, 634**

Norman, C. **92**

Notz, K.J. **128, 129**

Nussbaumer, D.A. **436**

Nyerges, P.L. **38**

O'Brien, P.D. **437**

O'Neal, D.A. **117**

Oak, H.D. **164**

Oakes, T.W. **35**

Obarski, G.E. **325**

Oberholtzer, J.E. **568**

Obst, J. **354**

Oertel, G.K. **24**

Olanov, V.E. **244**

AUTHOR INDEX

Oldweiler, C.E. **633**

Opitz, B.E. **415, 533**

Orcutt, J.A. **110**

Orekhov, V.M. **244**

Osanai, M. **220**

Osterberg, C.L. **344**

Ostroumov, I.N. **321**

Overmyer, R.F. **438, 599**

Ozawa, T. **317**

Oztunali, O.I. **334**

Paithankar, A.S. **304**

Panicker, P.K. **562**

Parker, G.B. **600**

Pascali, R. **242**

Paulett, T.A. **80, 81**

Peck, S.I. **38**

Pennak, A.F. **58**

Perkins, B.A. **7, 502**

Perry, R.D. **601**

Peterson, J.M. **379, 380, 506**

Peterson, S.R. **602**

Pflugrad, K. **348**

Phillips, C.R. **603, 604**

Phillips, D.A. **93**

Pierce, E.E. **25**

Pietrzak, R.F. **131**

Pirro, J. **72**

Placek, P.L. **414**

Poff, T.A. **388**

Poindexter, D.R. **626**

Pojasek, R.B. **572**

Pokvitis, D.Z. **262**

Pollard, W. **6**

Poon, Y.C. **603, 604**

Post, R.G. **345, 346**

Powers, E.W. **132**

Predergast, J.T. **94**

Price, M.S.T. **347, 348**

Pryor, T. **6**

Rabold, H. **266**

Rafferty, P.J. **605**

Raicevic, D. **606**

Ramani, M.P.S. **562**

Rarrick, H.L. **584**

Rayno, D.R. **439, 607**

Reades, D.W. **608**

Rechard, R.P. **631**

Regan, R. **528**

Reis, J.W. **656**

Relyea, J.F. **609**

AUTHOR INDEX

Rencken, D.G. **245**

Reno, H.W. **50**

Reynolds, C.L. **7, 502**

Rich, D.C. **361, 440**

Richter, D. **349**

Riedel D.W. **610**

Riess. R. **263**

Riordan, G.A. **112**

Ritter, P.D. **316**

Ritts, J.D. **523**

Robbertze, J. **491**

Roberts, C.J. **379**

Robertson, A.M. **611**

Robertson, D.E. **34**

Robinet, M.J. **15, 63, 140**

Robinson, J.E. **379**

Robinson, P. **612, 621**

Robinson, W.P. **613**

Rodbourne, D. **359**

Rodgers, J.C. **7, 502**

Rodrigues, S. **223**

Rogers, L.E. **508**

Rogers, V.C. **440, 598, 599, 614, 615, 623, 630**

Rohlfer, D.K. **166**

Rom, W.N. **493**

Romney, E.M. **649**

Ronchetti, C. **242**

Rosenthal, P.W. **167**

Ross, P. **583**

Rothschild, H. **616**

Rottger, A.F. **264**

Rutherford, D.W. **112, 113**

Rutherford, G.K. **617**

Sabau, C. **439**

Sabun, L.B. **307**

Sachs, L. **621**

Sakakibara, J. **295**

Sakoda, K. **341**

Sandquist, G.M. **615**

Sangrey, D.A. **576**

Santana, J.J. **638**

Saunders, L.J. **356**

Sauter, N.N. **533**

Scarano, R.A. **441**

Schaich, R.W. **73**

Schaller, K.H. **224**

Schauf, F. **162**

Schiager, K.J. **618**

Schmidt, H. **435**

AUTHOR INDEX

Schneider, F. **266**

Schneider, K.A. **333**

Schober, K. **273**

Schumann, S. **291**

Schwendiman, L.C. **442, 619**

Sears, P.L. **604**

Sedlet, J. **381**

Seed, H.B. **557, 574**

Semkin, E.A **321**

Semmler, R.A. **55**

Serne, R.J. **442**

Shapiro, I.S. **318, 319**

Sharp, K.D. **484**

Shelley, W.J. **645**

Shephard, L.E. **385**

Shepherd, T.A. **591, 596, 597, 620**

Sherwood, D.R. **413, 415, 442, 533**

Shesternin, A.S. **321**

Shinohara, Y. **225**

Shinpaugh, W.H. **382**

Shirts, M.B. **414, 518**

Shoemaker, D.C. **74, 75**

Shuey, C. **621**

Silker, W.B. **442, 622, 623**

Simmons, C.S. **624**

Simpson, D.R. **59**

Singh, A. **638**

Singley, W.J. **168**

Sissingh, R.A.P. **226**

Skeaff, J.M. **627**

Skiens, W.E. **507**

Skovholt, D.J. **27**

Smail, D. **443**

Smit, R.I. **217**

Smith, A. **56, 435, 491**

Smith, A.R. **444**

Smith, C.F. **117**

Smith, D.B. **40**

Smith, D.L. **76, 96**

Smith, E.S. **626**

Smith, G.M. **356**

Smith, M. **491**

Smith, W.H. **63, 393-399**

Smith, W.J. **618**

Snipes, M.B. **325**

Snodgrass, W. **583**

Snow, D. **621**

Soderberg, R.L. **627**

Soldat, J.K. **111**

Solomon, B.D. **28**

AUTHOR INDEX

Solomon, K.A. **29**

Sontag, S.P. **77**

Sorom, E.R. **110**

Spaeth, M.E. **117**

Spalding, B.P. **628**

Speer, R.D. **169**

Stang, G. **231**

Stang, W. **238**

Stanlick, R.R. **608**

States, J.B. **340**

Steger, J.G. **7, 502**

Stelle, A.M. **104, 170**

Sterrett, R. **56**

Stevens, J.R. **112, 113**

Stewart, B.M. **654**

Stewart, W.B. **252**

Stoker, A.K. **375, 376**

Stokes, P.M. **560**

Stone, D.R. **382**

Strasma, J.D. **227**

Strong, K.P. **629**

Stucker, J.P. **29**

Sullivan, R.G. **68, 254**

Summers, C.H. **568**

ıdell, R. **652**

Sutherland, A.A. **361, 630**

Sutherland, H.J. **631**

Suzuki, S. **297**

Synofzik, R. **292**

Taboas, A.L. **64**

Takahashi, S. **297**

Takeda, K. **350**

Tamura, T. **445, 628**

Tateiwa, F. **294-296**

Taylor, M.J. **632, 633**

Teplitskii, A.L. **247**

Testemale, G. **267**

Thamer, B.J. **438, 599, 634**

Thode, E.F. **521**

Thomas, C.D., Jr. **36**

Thomas, C.W. **34**

Thomas, K.T. **635**

Thompson, J. **443**

Thompson, M.L. **97, 171, 172**

Thompson, T.K. **7, 502**

Thomson, B.M. **496, 636**

Thorpe, R. **637**

Tierney, M.S. **446**

Tikhomirov, A.V. **321**

Timmerman, C.L. **103**

AUTHOR INDEX

Tingey, J. **415**

Tipton, W.J. **60**

Tkachev, M.V. **319**

Tokunaga, T. **435, 447**

Tomidokoro, S. **297, 310**

Torma, A.E. **638**

Torrie, R. **639**

Torrisi, S.P. **78**

Travis, C.C. **582**

Trigilio, G. **351**

Trocki, L.K. **7, 502**

Tsai, S.Y.H. **379**

Tsuchiya, H. **268**

Tunaboylu, K. **330**

Turley, R.E. **448**

Uda, T. **268**

Ureda, B.F. **99, 155, 198**

Uresk, V.A. **328**

Utroska, D. **269**

Uziemblo, N.H. **644**

Valentine, A.M. **66, 67, 82, 83, 228**

Vallario, R.W. **569**

van de Steeg, G.E. **645**

van Loon, G.W. **617**

van Zyl, D. **611, 646**

van Zyl, D.J.A. **647**

Vath, J.E. **139**

Vaughan, B.E. **111, 383, 489, 509**

Velarde, J. **401**

Veluri, V.R. **63**

Venkataraman, S. **578**

Versaw, R. **443**

Veya, R. **210**

Veyera, G.E. **475**

Viecenz, H.J. **354, 372**

Vierzba, E.A. **391, 392**

Vivyurka, A.J. **516, 589**

Vocke, R.W. **380**

Voigt, A.F. **90, 100**

Voronin, L.M. **244**

Voss, C.F. **545**

Voss, M.D. **61**

Vygen, P. **333**

Wakerley, M.W. **356**

Walch, A.P. **277**

Waligora, S.J. **648**

Wallace, A. **649**

Wallo, A. **391, 392**

Walls, A.A. **25**

Walsh, J. **162**

AUTHOR INDEX

Walters, W.H. **650, 651**

Wangen, L.E. **521**

Warkentien, J.S. **652**

Washington, R.A. **528**

Watson, A.P. **582**

Watzel, G.V.P. **229-231, 323, 333**

Weeren, H.O. **355**

Weidner, R.B. **62**

Wewerka, E.M. **7, 502**

Wheeler, M.L. **7, 502**

Whicker, F.W. **476, 549, 555**

White, A.F. **435, 477**

White, I.F. **356**

White, J.D. **163**

Wickham, L.E. **50**

Wickland, C.E. **2**

Wiegand, K.R. **274**

Wilkins, D.M. **2**

Williams, D.H. **232, 233**

Williams, J.M. **478, 511, 521**

Williams, R.E. **654**

Wilson, D. **653**

Winter, G.V. **654**

Wittenbrock, N.G. **217**

Wodtke, C.H. **84**

Wogman, N.A. **442**

Wong, B.A. **299, 316, 325**

Wood, R.S. **234**

Woodsum, H.G. **1**

Woollam, P.B. **235, 241, 270**

Wright, B. **348**

Wright, R.A. **655**

Wynveen, R.A. **15, 63, 140, 393-399**

Yada, T. **297**

Yajima, M. **236**

Yamada, K. **317**

Yamashita, S. **296**

Yie, G.G. **326**

Young, J.K. **656**

Younger, A.F. **271**

Yu, H. **327**

Yu, S. **327**

Yuan, Y.C. **379, 506, 657**

Zahn, T.P. **51**

Zakharchuk, G.A. **244**

Zelle, P.W. **426**

Zellmer, J.T. **415**

Zhmotov, A.N. **307**

Zwickler, S. **357**

253/254

CORPORATE AFFILIATION INDEX

ORPORATE AFFILIATION INDEX

Acres American, Inc., Buffalo, NY 401

Aerojet Nuclear Company, Idaho Falls, ID 118

Aerojet-General Corporation, Sacramento, CA 79, 81

Aerospace Corporation, Eastern Technical Division, Control Technology Section, Washington, DC 391, 392

Agronomics, Inc., Avondale, AZ 519

ALARA, Inc., Fort Collins, CO 618

American Welding Society, New York, NY 280

Ames Laboratory, Ames, IA 61, 90, 100

Argonne National Laboratory, Argonne, IL 3, 15, 16, 63, 64, 87, 140, 380, 393, 396-399, 426, 439, 506, 546, 565, 607, 652, 657

Argonne National Laboratory, Division of Environmental Impact Studies, Argonne, IL 4, 379, 386, 538

Argonne National Laboratory, Occupational Health and Safety Division, Argonne, IL 381, 394, 395

Arizonans for a Better Environment, Phoenix, AZ 621

Arkansas Power and Light Company, Little Rock, AR 232, 233

Atomic Energy Control Board, Ottawa, Ontario, Canada 541, 563, 566, 590

Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA 78, 80, 93, 99, 104, 155, 170, 198, 211

Australian Atomic Energy Commission Research Establishment, Lucas Heights, Sutherland, Australia 530, 629

Bach (Dan) Associates, Tucson, AZ 519

Battelle Columbus Laboratories, Columbus, OH 37, 65

Battelle Institute, Frankfurt, Federal Republic of Germany 291, 292

Battelle Pacific Northwest Laboratories, Richland, WA 18, 111, 246, 254, 328, 490, 539, 622

Bayernwerk AG, Muenchen, Federal Republic of Germany 207

Beak Consultants Limited, Montreal, Quebec, Canada 563

Beak Consultants Limited, Toronto, Ontario, Canada 583

Bechtel National, Inc., Oak Ridge, TN 374

Belgonucleaire SA, Brussels, Belgium 248

Bendix Field Engineering Corporation, Grand Junction, CO 400

Bettis Atomic Power Laboratory, West Mifflin, PA 5, 9, 141-148, 153, 167, 168

Bhabha Atomic Research Centre, Bombay, India 304, 562

Bhabha Atomic Research Centre, Health Physics Division, Bombay, India 578

Bondar-Clegg and Company, Ottawa, Ontario, Canada 581

Brandeis University, Waltham, MA 551

Brigham Young University, Center for Health and Environmental Studies, Provo, UT 403-412

Brigham Young University, Department of Geography, Provo, UT 418-424

CORPORATE AFFILIATION INDEX

Brookhaven National Laboratory, Upton, NY **131**

Burns and Roe Industrial Services Corporation, Paramus, NJ **72, 357**

Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Ottawa, Ontario, Canada **512, 513**

Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Elliot Lake Laboratory, Elliot Lake, Ontario, Canada **516, 528**

Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Ottawa, Ontario, Canada **606**

Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Elliot Lake Laboratory, Elliot Lake, Ontario, Canada **616, 625**

Carnegie-Mellon University, Department of Civil Engineering, Pittsburgh, PA **576**

Central Electricity Generating Board, Berkeley Nuclear Laboratories, Berkeley, United Kingdom **235, 241, 270**

Central Research Institute of Electric Power Industry, Tokyo, Japan **213, 236**

CISE, Milan, Italy **242**

Civil Systems, Inc., San Leandro, CA **501**

Colorado School of Mines, Department of Chemistry and Geochemistry, Golden, CO **402**

Colorado State University, Department of Agricultural and Chemical Engineering, Fort Collins, CO **595**

Colorado State University, Department of Civil Engineering, Fort Collins, CO **475, 591, 620**

Colorado State University, Department of Radiology and Radiation Biology, Fort Collins, CO **106-108, 549, 555, 618**

Colorado State University, Fort Collins, CO **476, 596, 597**

Comitato Nazionale per l'Energia Nucleare, Rome, Italy **240**

Commissariat a l'Energie Atomique, Centre d'Etudes Nucleaires de Bagnols-sur-Ceze, France **205**

Commissariat a l'Energie Atomique, Centre d'Etudes Nucleaires de Fontenay-aux-Roses, France **267, 305**

Commissariat a l'Energie Atomique, Centre de Marcoule, Bagnols-sur-Ceze, France **206, 281, 363**

Commission of the European Communities, Brussels, Belgium **224, 348, 370**

Commission of the European Communities, Luxembourg **204**

Conference of Radiation Control Program Directors, Inc. **514**

Consolidated Edison of New York, Inc., New York, NY **264**

Controls for Environmental Pollution, Inc., Santa Fe, NM **523**

Converse-Ward-Davis-Dixon, San Francisco, CA **574**

Cornell University, Ithaca, NY **203**

D'Appolonia Consulting Engineers, Inc., Englewood, CO **632, 633**

Dames and Moore, Inc., Salt Lake City, UT **417**

Dames and Moore, Inc., White Plains, NY **334**

ORPORATE AFFILIATION INDEX

Davy, McKee Corporation, San Mateo, CA **401**

Dawn Mining Company, Ford, WA **443**

Denison Mines Limited, Elliot Lake, Ontario, Canada **525**

Douglas-Robertson and Associates, Inc., Golden, CO **540**

Duquesne Light Company, Shippingport, PA **41, 42**

Eberline Instrument Corporation, Santa Fe, NM **648**

EG&G Energy Measurements Group, Las Vegas, NV **39, 40, 43, 45-48, 52-55, 60, 378**

EG&G Idaho, Inc., Idaho Falls, ID **36, 50, 51, 76, 96, 119, 120, 558**

EG&G Idaho, Inc., National Low-Level Radioactive Waste Management Program, Idaho Falls, ID **121-123**

Eidgenoessisches Institut fuer Reaktorforschung, Wuerenlingen, Switzerland **290, 339**

ENEL/DPT, Settore Nucleare, Rome, Italy **242**

ENEL/DSR CRTN, Milan, Italy **242**

Environment Canada, Environmental Protection Service, Ottawa, Ontario, Canada **499, 524**

European Company for the Chemical Processing of Irradiated Fuels, Mol, Belgium **285, 367**

Flow Industries, Inc., Kent, WA **287-289**

Fluidyne Corporation, Auburn, WA **326**

Ford, Bacon and Davis Utah, Inc., Salt Lake City, UT **438, 599, 634**

Friedell, (Hymer L.), Birmingham, AL **377**

GEC Research, Inc., Rapid City, SD **430, 431, 503, 504, 577**

General Accounting Office, Washington, DC **12-14**

General Electric Company, Advanced Reactors Systems Department, Sunnyvale, CA **171, 172**

General Electric Company, Sunnyvale, CA **97**

General Public Utilities System, Reading, PA **26**

Gibbs and Hill, Inc., Denver, CO **402**

Gilbert Associates, Inc., Reading, PA **212**

Gilbert/Commonwealth, Reading, PA **218**

GKSS-Forschungszentrum Geesthact GmbH, Geesthact-Terperhude, Federal Republic of Germany **208, 354, 369, 372**

Golder Associates, Denver, CO **443**

Golder Associates, Mississauga, Ontario, Canada **525, 608**

Government Industrial Research Institute, Shikoku, Japan **294**

Grand Junction, CO **479**

Gulf Research and Development Company, Pittsburgh, PA **576**

Hanford Engineering Development Laboratory, Richland, WA **102, 199**

Harding-Lawson Associates, Novato, CA **601**

Hardy (R.M.) and Associates Limited, Edmonton, Alberta, Canada **586**

Hazen Research, Inc., Golden, CO **547**

CORPORATE AFFILIATION INDEX

Health Physics Systems, Inc., Gainesville, FL **259**

Hitachi Limited, Energy Research Laboratory, Ibaraki, Japan **220, 257, 268**

Hitachi Metals, Limited, Tokyo, Japan **255**

Interagency Radiation Research Committee, Washington, DC **543**

International Atomic Energy Agency, Division of Nuclear Fuel Cycle, Waste Management Section, Vienna, Austria **373**

International Atomic Energy Agency, Vienna, Austria **635**

International Engineering Co., Inc., San Francisco, CA **626**

Ishikawajima Plant Construction Company, Limited, Tokyo, Japan **310**

Japanese Standards Association, Tokyo, Japan **303**

Jones, Hirsch and Bull, New York, NY **150**

Kawasaki Heavy Industries Limited, Kobe, Japan **317**

Kemp (Emmerson) and Associates, Arvada, CO **417**

Kernkraftwerk Gundremmingen Betriebsgesellschaft GmbH, Gundremmingen, Federal Republic of Germany **238**

Kernkraftwerk RWE-Bayernwerk GmbH, Gundremmingen, Federal Republic of Germany **231**

Kerr-McGee Corporation, Oklahoma City, OK **645**

Kerr-McGee Nuclear Corporation, Oklahoma City, OK **645**

Kilborn Limited, Toronto, Ontario, Canada **563**

Kilborn/NUS Inc., Denver, CO **610**

Klohn Leonoff, Inc., Richmond, British Columbia, Canada **653**

Lawrence Berkeley Laboratory, Earth Sciences Division, Berkeley, CA **435, 444, 447, 477**

Lawrence Livermore Laboratory, Livermore, CA **88, 89**

Little (Arthur D.), Inc., Cambridge, MA **568**

Los Alamos National Laboratory, Los Alamos, NM **7, 66, 86, 228, 375, 376, 478, 502, 511, 520, 521**

Los Alamos Scientific Laboratory, Los Alamos, NM **82, 83**

Lovelace Biomedical and Environmental Research Institute, Inhalation and Toxicology Research Institute, Albuquerque, NM **325**

Lovelace Biomedical and Environmental Research Institute, Inhalation Toxicology Research Institute, Albuquerque, NM **299, 316**

MacLaren (James F.) Limited, Willowdale, Ontario, Canada **534**

MacLaren Engineers, Planners and Scientists, Inc., Willowdale, Ontario, Canada **492, 588**

Macphee Nuclear, Toronto, Ontario, Canada **272**

Massachusetts Audubon Society, Lincoln, MA **551**

Messerschmitt-Boelkow-Blohm GmbH, Muenchen, Federal Republic of Germany **252**

Mine Geotechnique, Bryan, TX **556**

ORPORATE AFFILIATION INDEX

Mine Safety and Health Administration, Arlington, VA **535**

Mitre Corporation, Metrek Division, McLean, VA **127**

Model Interstate Scientific and Technical Information Clearinghouse, Denver, CO **169**

Montana State University, Montana Agricultural Experiment Station, Bozeman, MT **550**

Motor-Columbus AG, Baden, Switzerland **330**

Mound Facility, Miamisburg, OH **10, 70, 152**

Municipal Environmental Research Laboratory, Cincinnati, OH **162**

Nagra, Baden, Switzerland **330**

National Institute for Occupational Safety and Health, Cincinnati, OH **274**

National Lead Company of Ohio, Cincinnati, OH **44**

National Lead Company of Ohio, Feed Materials Production Center, Cincinnati, OH **57, 58**

National Radiological Protection Board, Chilton, Didcot, Oxon, United Kingdom **356**

National Regulatory Research Institute, Columbus, OH **6**

National Research Development Corporation, United Kingdom **311**

National Technical Information Service, Springfield, VA **312-315, 593, 594**

New Mexico Department of Health and Environment, Environmental Improvement Division, Santa Fe, NM **573**

New Mexico Institute of Mining and Technology, Socorro, NM **638**

Nippon Soda Company, Limited, Tokyo, Japan **260**

NIS Nuklear-Ingenieur-Service GmbH, Frankfurt, Federal Republic of Germany **238**

NLO, Inc., Cincinnati, OH **388**

NLO, Inc., Decontamination and Decommissioning Division, Cincinnati, OH **387**

NLO, Inc., Feed Materials Production Center, Cincinnati, OH **62, 163**

Noell (G.G.) GmbH, Wuertzburg, Federal Republic of Germany **354, 372**

Nordostschweizerische Kraftwerke AG, Baden, Switzerland **210**

Northeast Utilities Services, Hartford, CT **214**

Nuclear Control Corporation, Anaheim, CA **91**

Nuclear Energy Agency, Organization for Economic Co-operation and Development, Radiation Protection and Waste Management Division, Paris, France **605**

Nuclear Energy Agency, Paris, France **261**

NUS Corporation, Rockville, MD **125**

Oak Ridge National Laboratory, Environmental Sciences Division, Oak Ridge, TN **628**

Oak Ridge National Laboratory, Health and Safety Research Division, Oak Ridge, TN **582**

Oak Ridge National Laboratory, Information Division, Oak Ridge, TN **105, 124**

Oak Ridge National Laboratory, Oak Ridge, TN **25, 35, 59, 73, 84, 116, 128-130, 139, 149, 331, 355, 360, 382, 445**

Ontario Hydro, Toronto, Ontario, Canada **226, 258, 272**

CORPORATE AFFILIATION INDEX

Oregon State University, Corvallis, OR **85**

Pacific Northwest Laboratories, Richland, WA **68, 159, 164, 415, 428, 570, 624, 656**

Pacific Northwest Laboratory, Richland, WA **17, 69, 71, 103, 160, 161, 215, 217, 237, 239, 243, 249, 251, 336, 340, 383, 413, 416, 434, 442, 486-489, 500, 507-509, 522, 529, 532, 533, 544, 545, 564, 569, 571, 579, 580, 585, 598, 600, 602, 609, 619, 623, 644, 650, 651**

Pathfinder Mines Corporation, Shirley Basin, WY **549**

Pennsylvania Department of Environmental Resources, Bureau of Radiation Programs, Harrisburg, PA **154**

Philadelphia Electric Company, Philadelphia, PA **165**

Pima Mining Company, Tucson, AZ **575**

Pollution Prevention, Limited, Crawley, Sussex, United Kingdom **348**

Power Reactor and Nuclear Fuel Development Corporation, Ibaraki, Japan **341**

Preussische Elektrizitats AG, Hannover, Federal Republic of Germany **207**

Proektno-Tekhnologicheskii Institute, Ehnergomontazhproekt, USSR **307**

Purdue University, West Lafayette, Indiana **647**

Quadrex Corporation, Richland, WA **245**

Queen's University, Kingston, Ontario, Canada **617**

Radiation Management Corporation, Northbrook, IL **38**

Rand Corporation, Santa Monica, CA **29**

Reynolds Electrical and Engineering Company, Inc., Las Vegas, NV **110, 117**

Rheinisch-Westfaelisches Elektrizitaetswerk AG, Biblis, Federal Republic of Germany **323, 333**

Rheinisch-Westfaelisches Elektrizitaetswerk AG, Essen, Federal Republic of Germany **230, 231**

Rio Algom Limited, Elliot Lake, Ontario, Canada **516, 587, 588**

Rivteknik i Skelleftea AB, Skelleftea, Sweden **306**

Rockwell Hanford Operations, Richland, WA **74, 75, 77, 101, 126, 282, 284**

Rockwell International, Energy Systems Group, Rocky Flats Plant, Golden, CO **2, 109, 112-115, 253, 271**

Rogers and Associates Engineering Corporation, Salt Lake City, UT **361, 440, 598, 614, 615, 623, 630**

Sandia National Laboratories, Albuquerque, NM **384, 385, 437, 446, 480, 494, 542, 584, 631**

Savannah River Laboratory, Aiken, SC **94**

Saxton Nuclear Experimental Corporation, Saxton, PA **21, 26**

Schenk-Filterbau GmbH, Federal Republic of Germany **265**

Science Applications, Inc., Pleasanton, CA **117**

SCS Engineers, Covington, KY **162**

Southwest Research and Information Center, Albuquerque, NM **613**

CORPORATE AFFILIATION INDEX

Staatliches Amt fuer Atomsicherheit und Strahlenschutz, Berlin, German Democratic Republic 266

Steffen Robertson and Kirsten, Inc., Denver, CO 554

Steffen Robertson and Kirsten, Inc., Vancouver, British Columbia, Canada 554

Steffen, Robertson and Kirsten, Inc., Johannesburg, South Africa 491

Steffen, Robertson and Kirsten, Inc., Tuscon, AZ 611

Steffen, Robertson and Kirsten, Inc., Vancouver, British Columbia, Canada 611

Stevens (J.P.) Company, Easthampton, MA 637

Studsvik Energiteknik AB, Nykoping, Sweden 306, 335

Svejsecentralen, Glostrup, Denmark 320

Swedish Nuclear Fuel Supply Company, Stockholm, Sweden 337

Swiss Association for Atomic Energy Lausanne, Switzerland 332

Technicatome, Saclay, France 223

Teknekron, Inc., Berkeley, CA 351

Texas A&M University, College Station, TX 557

Texas A&M University, Department of Civil Engineering, College Station, TX 556

Toshiba Corporation, Kawasaki, Kanagawa, Japan 302

Transnubel SA, Dessel, Belgium 348

Transnuklear GmbH, Hanau, Federal Republic of Germany 333

U.S. Army Engineers Waterways Experiment Station, Vicksburg, MS 276

U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Aberdeen, MD 78

U.S. Atomic Energy Commission, Directorate of Licensing, Washington, DC 30, 98

U.S. Atomic Energy Commission, Division of Reactor Licensing, Washington, DC 22, 27

U.S. Atomic Energy Commission, Grand Junction Office, Grand Junction, CO 449, 450

U.S. Bureau of Mines, Salt Lake City Metallurgy Research Center, Salt Lake City, UT 414, 518

U.S. Bureau of Mines, Spokane Mining Research Center, Spokane, WA 527

U.S. Bureau of Mines, Spokane Research Center, Spokane, WA 528, 654

U.S. Bureau of Mines, Washington, DC 627

U.S. Congress, Washington, DC 451, 452, 481

U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM 432, 453-457

U.S. Department of Energy, Albuquerque Operations Office, Public Affairs Division, Albuquerque, NM 458

U.S. Department of Energy, Albuquerque Operations Office, Uranium Mill Tailings Remedial Actions Project Office, Albuquerque, NM 433

U.S. Department of Energy, Assistant Secretary for Defense Programs, Washington, DC 459

CORPORATE AFFILIATION INDEX

U.S. Department of Energy, Assistant Secretary for Nuclear Energy, Washington, DC **173, 482**

U.S. Department of Energy, Idaho Operations Office, Idaho Falls, ID **133**

U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, TN **380, 389**

U.S. Department of Energy, Office of Defense Waste and Byproducts Management, Washington, DC **24**

U.S. Department of Energy, Office of Inspector General, Washington, DC **460**

U.S. Department of Energy, Office of Nuclear Waste Management, Washington, DC **483**

U.S. Department of Energy, Office of Terminal Waste Disposal and Remedial Action, Washington, DC **461**

U.S. Department of Energy, Richland Operations Office, Richland, WA **19, 163**

U.S. Department of Energy, Technical Information Center, Oak Ridge, TN **352, 353, 390, 640**

U.S. Department of Energy, Washington, DC **31, 148, 151, 156, 462**

U.S. Energy Research and Development Administration, Washington, DC **368**

U.S. Environmental Protection Agency, Office of Radiation Programs, Las Vegas, NV **463**

U.S. Environmental Protection Agency, Office of Radiation Programs, Washington, DC **464-468, 567**

U.S. Environmental Protection Agency, Washington, DC **469-471**

U.S. Geological Survey, Golden, CO **537**

U.S. Geological Survey, Water Resources Division, Denver, CO **427**

U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, DC **134-137**

U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, Washington, DC **641**

U.S. Nuclear Regulatory Commission, Office of State Programs, Washington, DC **234, 436**

U.S. Nuclear Regulatory Commission, Washington, DC **8, 32, 34, 138, 493**

U.S. Senate, Committee on Environment and Public Works, Washington, DC **472**

U.S. Senate, Washington, DC **473**

UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA **19, 20, 90, 132, 157, 158, 163, 174-197, 365**

Union Carbide Corporation, Linde Company, Birmingham, AL **84**

Union Industrial Research Institute, Hsinchu, Taiwan **256**

United Kingdom Atomic Energy Authority, Authority Field Processing Directorate, Didcot, Oxfordshire, United Kingdom **347**

United Kingdom Atomic Energy Authority, Authority Health and Safety Branch, Risley, Warrington, Lancashire, United Kingdom **329**

United Kingdom Atomic Energy Authority, Dounreay Nuclear Power Development Authority, Dounreay, United Kingdom **298, 342, 371**

United Kingdom Atomic Energy Authority, Winfrith, Dorset, United Kingdom **348**

CORPORATE AFFILIATION INDEX

Universal Linings, Inc., Haverford, PA **443**

University of Alberta, Department of Civil Engineering, Edmonton, Alberta, Canada **552**

University of Arizona, Department of Civil Engineering, Tucson, AZ **646**

University of Arizona, Tucson, AZ **345**

University of California at Davis, Davis, CA **581**

University of California, Laboratory of Nuclear Medicine and Radiation Biology, Los Angeles, CA **649**

University of Idaho, Moscow, ID **654**

University of Indiana, Bloomington, IN **28**

University of Minnesota, Minneapolis, MN **359**

University of Nevada, Reno, NV **441, 548**

University of New Mexico, Albuquerque, NM **573**

University of New Mexico, Department of Civil Engineering, Albuquerque, NM **496, 636**

University of New Mexico, Department of Geology, Albuquerque, NM **429, 495, 496**

University of Pittsburgh, Pittsburgh, PA **510**

University of Regina, Regina, Saskatchewan, Canada **553**

University of Texas at Austin, College of Engineering, Austin, TX **216**

University of Texas, Department of Civil Engineering, Austin, TX **515**

University of Toronto, Institute of Environmental Studies, Toronto, Ontario, Canada **560**

University of Toronto, Toronto, Ontario, Canada **559, 603, 604**

University of Utah, Salt Lake City, UT **448**

University of Washington, Chemistry Department, Seattle, WA **533**

University of Waterloo, Ontario, Canada **525, 589**

University of Western Ontario, London, Ontario, Canada **497, 498**

University of Wisconsin, Department of Agricultural Economics, Madison, WI **227**

Utah State University, Logan, UT **484, 536**

V.V. Kuibyshev Politekhnicheskij Institut, Kuibyshev, USSR **318**

Waste and Land Systems, Inc., Fort Collins, CO **517, 620**

West Texas State University, Canyon, TX **655**

Western Colorado Radiologic Associates **479**

Westinghouse Electric Corporation, Madison, PA **1, 33**

Westinghouse Electric Corporation, Nuclear Fuels Division, Pittsburgh, PA **364**

Williams (Roy E.) and Associates, Inc., Moscow, ID **654**

Windscale Nuclear Laboratories, Sellafield, Seascale, Cumbria, United Kingdom **343**

Woodward-Clyde Consultants, Denver, CO **425, 526**

Woodward-Clyde Consultants, San Francisco, CA **505**

TITLE INDEX

PERMUTED TITLE INDEX

Abandoned
Caliche-Cover for Stabilization of Abandoned Mill Tailings 495
Chemical and Radioisotope Distribution Profiles in an Abandoned Uranium Tailings Pile 516
Investigations Into Selected Ecological Aspects of the Aquatic and Terrestrial Environment of an Abandoned Uranium Mill Tailings Pond, Bancroft, Ontario 559
Development of Methods for Reclaiming Abandoned Tailings Ponds and Dams: Volume 1 601
Abandonment
Abandonment of Nuclear Power Stations at the End of Their Working Life 358
Abrasion
Cutting Concrete with Abrasion Jet 326
Abrasive
Abrasive-Jet Cutting Examples and Concepts 287
Abstracts
Plasma Welding: 1972 - June, 1982 (Citations from the International Aerospace Abstracts Data Base) 312
Laser Metal Cutting: 1966 - July 1982 (Citations from the Metals Abstracts Data Base) 315
Accelerator
An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 53
Accident
Post-Accident Cleanup and Decommissioning of a Reference Pressurized Water Reactor 161
Accidents
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 159
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 160
Accuracy
Fabricating Centers Cut with Numerical Control Accuracy 309
acetylene
Aerosols from Oxy-acetylene Gas Cutting Operations on Metal Plates: A Laboratory Study 325
Acid
Environmental Analysis of Acid/Middle Pueblo Canyon, Los Alamos, New Mexico 375
Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico 429
Evidence for the Instability of Silicate Minerals in Acid Leach Uranium Mill Tailings 504
Groundwater Leaching of Neutralized and Untreated Acid-Leached Uranium Mill Tailings 533
Acidic
Interaction of Acidic Leachate with Soil Materials at Lucky McPathfinder Mill, Gas Hills, Wyoming 413
Vegetation for Acidic and Alkaline Tailing 518
Contact of Clay Liner Materials with Acidic Tailings Solutions 602
Contact of Clay Liner Materials with Acidic Tailings Solutions: 1 - Mineral Characterization 644
Acquiring
A Simplified Method for Acquiring Meteorological Data for Siting and Licensing of Uranium Mill and Tailings Disposal Facilities 526

PERMUTED TITLE INDEX

Act

Implementation of the Uranium Mill Tailings Radiation Control Act by the States 436
Uranium Mill Tailings Radiation Control Act of 1978 451
Surface Transportation Assistance Act of 1978 - Amendment 452
Implementation of the Uranium Mill Tailings Radiation Control Act of 1978 472
Residual Radioactive Materials Act of 1978 473

Activated

Shutdown of Nuclear Power Plants - Production of Activated Material from the Region of the Reactor Core by the Example of a Shutdown Pressurized Water Reactor 339

Activation

Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station 238

Active

Regulatory Impact Analysis of Environmental Standards for Uranium Mill Tailings at Active Sites 465

Activities

Waste Management Impacts of U.S. Decommissioning Activities 24
U.S. Department of Energy Activities in Low-Level Radioactive Waste Treatment 139
Quality Assurance as a Management Tool in Decommissioning Activities 199
Plans and Activities for Decommissioning of LWR Power Plants by the German Utilities 207
Overview of Decommissioning Research and Development Activities in the European Community 370
IAEA's Activities on Decommissioning and Decontamination 373
A Survey of Radon Measurement Needs and Activities in State Radiation Control Programs 514
Modification of the Natural Radionuclide Distribution by Some Human Activities in Canada 566

Activity

Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island 271
Dismantling of a Hot Cell of High Level Activity: Method and Tools Used 305

Addresses

Uranium Mill Tailings: Congress Addresses a Long-Neglected Problem 474

Advanced

Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision 33
Literature Survey of Interior-Surface Materials for the Advanced Size Reduction Facility 271
Decommissioning of the Windscale Advanced Gas-Cooled Reactor 343

Adverse

State Policies and Requirements for Management of Uranium Mining and Milling in New Mexico: Volume 3 - Adverse Effects of Uranium Mining and Milling on the Physical Environment 446

Advocacy

Waste Management '81 - The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs and Public Communications 345

AEC

Pathways Analysis and Radiation Dose Estimates for Radioactive Residues at Formerly Utilized MED/AEC Sites 379

PERMUTED TITLE INDEX

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398

Aerial

An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972 39

An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 40

An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43

An Aerial Radiological Survey of the U.S. Department of Energy's Mound Facility, Miamisburg, Ohio - Date of Survey: July 1976 45

An Aerial Radiological Survey of United States Department of Energy Sites in Ames, Iowa, Date of Survey: May 1977 46

An Aerial Radiological Survey of Areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15 and 17 Yucca Flat, Nevada Test Site 47

An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 48

An Aerial Radiological Survey of the Argonne National Laboratory and Surrounding Area, Argonne, Illinois - Date of Survey: May 1977 52

An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 53

Aerial Radiological Surveys of Rockwell International Facilities, Canoga Park, California - Date of Surveys: June and July 1978 54

An Aerial Radiological Survey of the Watts Bar Nuclear Plant and Surrounding Area, Spring City, Tennessee 55

Aerial and Ground-Based In Situ Measurements for Evaluation and Implementation of Radioactive Site Cleanup 60

Aerial Radiation Surveys 558

Aerosols

Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Inhalation Hazards and Worker Protection 299

Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Experimental System for Collection and Characterization 316

Aerosols from Oxy-acetylene Gas Cutting Operations on Metal Plates: A Laboratory Study 325

Aerospace

Plasma Welding: 1972 - June, 1982 (Citations from the International Aerospace Abstracts Data Base) 312

Africa

Use of Geotextiles in Uranium-Gold Tailings Impoundments in South Africa 491

Ag

An Assessment of the Data for Decommissioning Calculations on Ag-108 Metastable 235

Aggressive

Cleaning Up Nuclear Facilities - An Aggressive and Unified Federal Program is Needed 14

AGN

Decommissioning of the Oregon State University AGN-201 Reactor 85

Aiken

An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 40

PERMUTED TITLE INDEX

Air

Present State of Development of Plasma-Compressed Air Cutting of Metals 286
Air Pollution in the Plasma Cutting of Steel, Stainless Steel and Aluminum 320
Evaluation of the 1943 to 1946 Liquid Effluent Discharge from the Linde Air Products Company Ceramics Plant 392

Airborne

Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations 641
Radioactive Composition of Airborne Particulates at Ambrosia Lake, New Mexico 645

Alamos

Los Alamos DP West Plutonium Facility Decontamination Project 1978-1981 66
Los Alamos DP West Plutonium Facility Decontamination Project 67
Environmental Analysis of Acid/Middle Pueblo Canyon, Los Alamos, New Mexico 375
Environmental Analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico 376

ALARA

What is ALARA 360

Algom

Survey of the Occurrence of Ra-226 in the Rio Algom Quirke I Uranium Mill, Elliot Lake 625

Aliquippa

Radiological Survey of Universal Cyclops, Inc., Titusville Plant (Formerly Vulcan Crucible Steel Company, Aliquippa, Pennsylvania), May 2-8, 1978 399

Alkaline

Vegetation for Acidic and Alkaline Tailing 518

Allocation

Classifying Decommissioning Wastes for Allocation to Appropriate Final Repositories 330

Alloy

Thermal Cutting: What To Do About High Alloy Steels 278

Alloys

Electropolishing of Nickel-Containing Austenitic Stainless Steel and Nickel-Base Alloys 255

Alternative

Preliminary Evaluation of Uranium Mill Tailings Conditioning as an Alternative Remedial Action Technology 521

Alternatives

Decommissioning Alternatives for Savannah River Plant High-Level Waste Tank 16 94
Environmental and Other Evaluations of Alternatives for Management of Defense Transuranic Waste at the Idaho National Engineering Laboratory 133
Three Mile Island: Searching for Pennsylvania Initiatives (Alternatives for Funding Cleanup) 269
Alternatives for Management of Wastes Generated by the Formerly Utilized Sites Remedial Action Program 380
Stabilization, Engineering, and Monitoring Alternatives Assessment for Improving Regulation of Uranium Recovery Operations and Waste Management 619

Aluminum

Air Pollution in the Plasma Cutting of Steel, Stainless Steel and Aluminum 320

Ambrosia

Land Use Study of the Ambrosia Lake Tailing Site 419
Report on Conditions of Uranium Mill Site and Tailings at Ambrosia Lake, New Mexico 430
Contaminant Transport from Uranium Mill Tailings in Ambrosia Lake, New Mexico 636
Radioactive Composition of Airborne Particulates at Ambrosia Lake, New Mexico 645

PERMUTED TITLE INDEX

Amendment

Saxton Nuclear Experimental Corporation's Change Request No. 50 to Technical Specification and Request for Amendment No. 8 to License No. DPR-4 21

Surface Transportation Assistance Act of 1978 - Amendment 452

Americium

Decontamination of Soil Containing Plutonium and Americium 109

Ames

An Aerial Radiological Survey of United States Department of Energy Sites in Ames, Iowa, Date of Survey: May 1977 46

Environmental Monitoring Summary for Ames Laboratory: Calendar Year 1981 61

Decommissioning of Ames Laboratory Research Reactor 90

Decommissioning the Ames Laboratory Research Reactor: A Brief Pictorial Report 100

Anaconda

Forage Uptake of Uranium Series Radionuclides in the Vicinity of the Anaconda Uranium Mill 439

Analyses

Summary of Research on Analyses of Flow Failures of Mine Tailings Impoundments 557

Analysis

Saxton Decommissioning Plan and Safety Analysis Report 26

Directions in Low-Level Radioactive Waste Management - An Analysis of Low-Level Waste Disposal Facility and Transportation Costs 122

Engineering Analysis and Costs of Product Conversion, Refabrication, Waste Treatment, and Plant Decommissioning of an Exportable Pyrochemical Process 211

Waste Management '80 - The State of Waste Disposal Technology, Mill Tailings, and Risk Analysis Models 346

Environmental Analysis of Acid/Middle Pueblo Canyon, Los Alamos, New Mexico 375

Environmental Analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico 376

Pathways Analysis and Radiation Dose Estimates for Radioactive Residues at Formerly Utilized MED/AEC Sites 379

Preliminary Radiation Dose Analysis for Reference FUSRAP Waste Sites 383

Moisture Content Analysis of Covered Uranium Mill Tailings 434

Study of the Utah Uranium-Milling Industry: Volume 1 - A Policy Analysis 448

Regulatory Impact Analysis of Environmental Standards for Uranium Mill Tailings at Active Sites 465

Computer Analysis of Seepage and Groundwater Response Beneath Tailings Impoundments 517

Multidimensional Analysis of Radon Diffusion Through Uranium Mill Tailings and Cover Systems 580

Ancient

Evidence for the Long-Term Stability of Uranium Mill Tailings: Survivability of Ancient Man-Made Earthen Structures 571

Animal

Long-Term Biobarriers to Plant and Animal Intrusions of Uranium Tailings 507

ANL

Environmental Assessment Decontamination and Decommissioning of Plutonium Fabrication Facility, Building 350 ANL-Illinois 3

Annex

Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394

PERMUTED TITLE INDEX

Annual

Beaver Valley Power Station and Shippingport Atomic Power Station - 1977 Annual Environmental Report: Radiological - Volume 2 41

Beaver Valley Power Station and Shippingport Atomic Power Station - 1978 Annual Environmental Report: Radiological - Volume 2 42

Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111

Annual Status Report on the Uranium Mill Tailings Remedial Action Program 461

Uranium Mill Tailings Remedial Action Program: Annual Status Report 462

annual

Meteorological Tower Data, Grand Junction Tailings Site, CO - Semi-annual Report, July-December, 1981 480

ANSPD

Coordinated ANSPD(NEW) and OMA Decontamination and Decommissioning (D&D) Program Plan 10

Answer

Gouging the Answer to Nuclear Dismantling Problems 294

Answers

UMTRA Questions and Answers 455

Apparatus

Laser Cutting Apparatus for Nuclear Core Fuel Subassembly 277

Improvements in Methods and Apparatus for Cutting, Welding and Surface Treating Using a Laser Beam in Conjunction with an Arc 311

Appendices

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices A-F 136

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q 137

General Electric Fuels Laboratory Decontamination and Decommissioning - Appendices 172

Applicability

Consolidation Theory and Its Applicability to the Dewatering and Covering of Uranium Mill Tailings 532

Rock Riprap Design Methods and Their Applicability to Long-Term Protection of Uranium Mill Tailings Impoundments 651

Applicable

Review of Design Approaches Applicable to Dewatering Uranium Mill Tailings Disposal Pits 539

Approaches

Review of Design Approaches Applicable to Dewatering Uranium Mill Tailings Disposal Pits 539

Appropriate

Classifying Decommissioning Wastes for Allocation to Appropriate Final Repositories 330

April

Quarterly Progress Report No. 46 for Third Quarter, CY 1968 Covering the Period of April, May, and June 1968 81

Pluto Quarterly Report No. 12, April-June 1962 89

Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Defense Program 196

PERMUTED TITLE INDEX

Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Civilian Program 197

NS Otto Hahn - Test Report No. 29 for the Period Between April 13, 1978, and February 17, 1979: Fuel Element Removal and Transport Between February 17, 1979 and November 22, 1979 208

Publication of the Safety Regulation KTA 1401 by Kerntechnischer Ausschuss - Dated April 13, 1981 222

Aquatic

Investigations Into Selected Ecological Aspects of the Aquatic and Terrestrial Environment of an Abandoned Uranium Mill Tailings Pond, Bancroft, Ontario 559

Aqueous

Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573

Aquifer

Near-Field Impact of 216-U-10 (U-Pond) Decommissioning on the Unconfined Aquifer 126

Migration of Radionuclide Chains in a Non-Homogeneous Aquifer under Transient Saturated-Unsaturated Flow Conditions 538

Contaminant Migration in a Sand Aquifer near an Inactive Uranium Tailings Impoundment, Elliot Lake, Ontario 589

Arc

SRE Underwater Plasma Arc Cutting Development Test Report 93

Application of a Plasma Arc in Decontamination of Radioactive Metallic Wastes 257

Control of Physical Agent Hazards of Arc Welding and Cutting 274

Recommended Practices for Plasma Arc Welding (Welding Workbook Data Sheets 31a, 31b) 280

The Arc Saw and Its Application to Decommissioning 282

Arc Saw Development Report 284

Study on Underwater Plasma Arc Cutting for Stainless Steel 297

A Plasma-Arc Cutting Machine 300

Plasma-Arc Cutting Methods and Plasma-Arc Cutting Machines 301

Surface Plasma-Arc Cutting of Steels 10KHSND and 10KHN1M 307

Nibbling, Laser Cutting and Plasma-Arc Cutting 308

Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310

Improvements in Methods and Apparatus for Cutting, Welding and Surface Treating Using a Laser Beam in Conjunction with an Arc 311

Processes Taking Place in Arc Plasmatron Chamber in Cutting of Metals 319

Area

An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972 39

An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 40

An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43

An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 48

An Aerial Radiological Survey of the Argonne National Laboratory and Surrounding Area, Argonne, Illinois - Date of Survey: May 1977 52

An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding

PERMUTED TITLE INDEX

Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 53
An Aerial Radiological Survey of the Watts Bar Nuclear Plant and Surrounding Area, Spring City, Tennessee 55

Areas

An Aerial Radiological Survey of Areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15 and 17 Yucca Flat, Nevada Test Site 47
Cleanup and Treatment of Radioactively Contaminated Land Including Areas Near Nuclear Facilities: A Selected Bibliography 105
Principles and Recommended Practice for Decontamination of Radioactive Areas and Equipment 329
Hydrogeochemical Investigations of Two Inactive Tailings Areas in the Elliot Lake Uranium District, Ontario, Canada 525
Environmental Consequences of the Placement of Radium-Barium Sludge in Tailings Areas 553
Placement of Radium/Barium Sludges in Tailings Areas 590

Argonne

Environmental Assessment Related to the Decontamination and Decommissioning of the Argonne National Laboratory CP-5 Research Reactor 4
An Aerial Radiological Survey of the Argonne National Laboratory and Surrounding Area, Argonne, Illinois - Date of Survey: May 1977 52

Arid

Revegetation of Disturbed Grounds in the Semi-Arid Climate of Southcentral Washington 328
The Reclamation of Disturbed Arid Lands 655

Arizona

National Uranium Resource Evaluation: Shiprock Quadrangle, Arizona, New Mexico, Colorado, and Utah 537

Armoring

Long-Term Survivability of Riprap for Armoring Uranium-Mill Tailings and Covers: A Literature Review 570

Armory

Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois 395

Arsenal

Review of Costs to Close the Frankford Arsenal 13
Decontamination of the Frankford Arsenal 78

Artificial

Revegetation Following Artificial Disturbance 106
Revegetation Following Artificial Disturbance 107
Revegetation Following Artificial Disturbance 108

Asphalt

Field Testing of Asphalt Emulsion Radon Barrier System 545
Stabilization of Uranium Mill Tailings with Asphalt Emulsion 546

Assay

Assay for Bioavailability of Uranium Mill Tailings Contaminants 520

Assemblies

Laser Cutting Equipment for Dismantling Irradiated PFR Fuel Sub-Assemblies 298

Assessment

Environmental Assessment Decontamination and Decommissioning of Plutonium Fabrication Facility, Building 350 ANL-Illinois 3

PERMUTED TITLE INDEX

Environmental Assessment Related to the Decontamination and Decommissioning of the Argonne National Laboratory CP-5 Research Reactor 4
Environmental Assessment - Decontamination and Decommissioning of the New Brunswick Laboratory, New Jersey Site 31
Residual Radioactivity Assessment in Nuclear Power Plant: Concentrations, Distribution Inventories 34
Preliminary Characterization and Assessment of the Weldon Spring Low-Level Waste Disposal Site 56
Radiological Assessment of the Decontamination and Decommissioning of a Small-Scale Fuel-Reprocessing Plant 59
Assessment of Change in Shallow Land Burial Limits for Defense Transuranic Waste 117
The 1979 State-by-State Assessment of Low-Level Radioactive Wastes Shipped to Commercial Burial Grounds 125
An Assessment of the Data for Decommissioning Calculations on Ag-108 Metastable 235
Assessment of Management Modes for Graphite Wastes from Reactor Decommissioning 356
Model Environmental Assessment for a Property-Cleanup/Interim-Storage Remedial Action at a Formerly Utilized Site 386
The Chemical Characterization and Hazard Assessment of Uranium Mill Tailings 511
Environmental Assessment of Uranium Mining in Elliot Lake, Ontario 534
Assessment of the Long Term Suitability of Present and Proposed Methods for the Management of Uranium Mill Tailings 563
Stabilization, Engineering, and Monitoring Alternatives Assessment for Improving Regulation of Uranium Recovery Operations and Waste Management 619
Reclamation of Uranium Tailings - A Critical Assessment of Current Practice 633

Assistance
Surface Transportation Assistance Act of 1978 - Amendment 452

Assistant
Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111

Associated
Project Report of Phase I Remedial Action of Properties Associated with the Former Middlesex Sampling Plant Site 387
Radiation Hazards Associated with Uranium Mill Operations 551

Associations
Macrofungi on Uranium Mill Tailings - Associations and Metal Content 560

Assurance
Quality Assurance as a Management Tool in Decommissioning Activities 199

Assuring
Assuring the Availability of Funds for Decommissioning Nuclear Facilities 234

Atlantic
Mineral Waste Resources of Canada - Mining Wastes in the Atlantic Provinces 513

Atomic
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 25, 1977-July 25, 1977 5
United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27
Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 38 30
Beaver Valley Power Station and Shippingport Atomic Power Station - 1977 Annual Environ-

PERMUTED TITLE INDEX

mental Report: Radiological - Volume 2 41
Beaver Valley Power Station and Shippingport Atomic Power Station - 1978 Annual Environmental Report: Radiological - Volume 2 42
Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 37 98
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1976-January 25, 1977 141
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program) 142
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1978-January 25, 1979 143
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1979-July 25, 1979 144
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1980-July 25, 1980 145
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1979-January 25, 1980 146
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1981-July 25, 1981 147
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1980-January 25-1981 148
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1981-January 25, 1982 153
Test Evaluation Shippingport Atomic Power Station LWBR Project (LWBR Development Program), July-August 1977 167
Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control (1965-1975) 168
Dismantling Commercial Atomic Reactor Pressure Vessels - Combined Gouging and Gas Cutting Process Used Underwater 295
Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works 391

Atomized

DFR Decommissioning: Operating Instructions for NaK Disposal by Burning in Atomized Jet 342

Attention

Equipment Decontamination with Special Attention to Solid Waste Treatment: Survey Report 246

Attenuation

Measurements and Calculations of Radon Flux Attenuation by Western U.S. Soils 440
Radon Attenuation Effectiveness and Cost Optimization of Composite Covers for Uranium Mill Tailings 615
A Radon Attenuation Test Facility 622
Factors Influencing Radon Attenuation by Tailings Covers 623

August

Test Evaluation Shippingport Atomic Power Station LWBR Project (LWBR Development Program), July-August 1977 167
Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394

Ausschuss

Publication of the Safety Regulation KTA 1401 by Kerntechnischer Ausschuss - Dated April 13, 1981 222

PERMUTED TITLE INDEX

Austenitic
Electropolishing of Nickel-Containing Austenitic Stainless Steel and Nickel-Base Alloys 255

Australia
Australia - Management of Mine and Mill Tailings 485

Authority
Puerto Rico Water Resources Authority: Docket No. 115-4 - Order Authorizing Dismantling of Facility 22
United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27

Authorizing
Puerto Rico Water Resources Authority: Docket No. 115-4 - Order Authorizing Dismantling of Facility 22

Availability
Assuring the Availability of Funds for Decommissioning Nuclear Facilities 234
Concentrations and Biological Availability of U-238 and Th-230 in the Environs of a Uranium Milling Operation 555

Avenue
Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois 395

Awards
DOE Awards Contract for Salt Lake City Cleanup 457

Axial
Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310

Backfill
Early Diagenesis of Uranium Mine Stope Backfill 496

Backfilled
Radon Emanation from Stopes Backfilled with Cemented Uranium Mill Tailings 528

Backfilling
Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573

Background
Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works 391

Bailout
Federal Bailout of Nuclear Industry a Waste of Funds 150

Balances
The Use of Stage Curves and Mass Balances in the Design of Uranium Tailings Impoundments 554

Bancroft
Investigations Into Selected Ecological Aspects of the Aquatic and Terrestrial Environment of an Abandoned Uranium Mill Tailings Pond, Bancroft, Ontario 559

Bankruptcy
Bankruptcy Potential Threatens Decommissioning Funds, Says NRC 200

Bar
An Aerial Radiological Survey of the Watts Bar Nuclear Plant and Surrounding Area, Spring City, Tennessee 55

Barium

PERMUTED TITLE INDEX

Leachability of Barium-Radium Sulphate Sludges 552
Environmental Consequences of the Placement of Radium-Barium Sludge in Tailings Areas 553
Placement of Radium/Barium Sludges in Tailings Areas 590

Barrier

Cost and Effectiveness of Radon Barrier Systems 486
Cost of Radon-Barrier Systems for Uranium Mill Tailings 487
Field Testing of Asphalt Emulsion Radon Barrier System 545
Effect of Rock Cover on Multilayer Radon Barrier Effectiveness 564

Barriers

Radon Control by Multilayer Earth Barriers: Field Tests 415
Barriers for Radon in Uranium Mines 527
Protective Barriers for Containment of Toxic Materials 531

Baryte

Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw 290

Base

Information Base for Commercial Radioactive Waste Management 127
Integrated Data Base for Spent Fuel and Radwaste: Inventories 129
Electropolishing of Nickel-Containing Austenitic Stainless Steel and Nickel-Base Alloys 255
Plasma Welding: 1972 - June, 1982 (Citations from the International Aerospace Abstracts Data Base) 312
Plasma Welding: 1970 - May 1982 (Citations from the Engineering Index Data Base) 313
Plasma Cutting: June 1970 - June 1982 (Citations from the Engineering Index Data Base) 314
Laser Metal Cutting: 1966 - July 1982 (Citations from the Metals Abstracts Data Base) 315
Data Base for Radioactive Waste Management - Review of Low-Level Radioactive Waste Disposal History 334
Uranium Ore Treatment: January, 1970-May, 1981 (Citations from the Engineering Index Data Base) 593
Uranium Mining and Milling Environmental Studies: 1970 - February, 1981 (Citations from the Engineering Index Data Base) 594

Baseline

Baseline Data and Land Use Impact of the Shiprock Uranium Tailings Site 403
Baseline Data and Land Use Impact of the Tuba City Uranium Tailings Site 404
Baseline Data and Land Use Impact of the Mexican Hat Uranium Tailings Site 405
Baseline Data and Land Use Impact of the Monument Valley Uranium Tailings Site 406
Baseline Data and Land Use Impact of the Falls City, Texas Uranium Tailings Site 407
Baseline Data and Land Use Impact of the Lakeview, Oregon Uranium Tailings Site 408
Baseline Data and Land Use Impact of the Slick Rock Uranium Tailings Sites 409
Baseline Data and Land Use Impact of the Naturita Uranium Tailings Sites 410
Baseline Data and Land Use Impact of the Lowman, Idaho Uranium Tailings Site 412

Batavia

An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 53

Battelle

Decontamination of Battelle-Columbus Laboratories' Plutonium Facility 65

Bayo

Environmental Analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico 376

PERMUTED TITLE INDEX

Beam

Improvements in Methods and Apparatus for Cutting, Welding and Surface Treating Using a Laser Beam in Conjunction with an Arc 311

Beaver

Beaver Valley Power Station and Shippingport Atomic Power Station - 1977 Annual Environmental Report: Radiological - Volume 2 41

Beaver Valley Power Station and Shippingport Atomic Power Station - 1978 Annual Environmental Report: Radiological - Volume 2 42

Behaviour

Behaviour of Polonium During Electrochemical Steel Polishing Process 248

A Qualitative Evaluation of Long-Term Processes Governing the Behaviour of Uranium Mill Tailings Placed in Deep Lakes 583

Belt

Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico 429

Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573

Beneath

Evaluation of Radionuclide and Trace Metal Migration Beneath an Inactive Tailing Impoundment 402

Chemical Transport Beneath a Uranium Mill Tailings Pile, Riverton, Wyoming 477

Computer Analysis of Seepage and Groundwater Response Beneath Tailings Impoundments 517

Benefit

A Benefit-Cost Methodology for Developing Environmental Standards for Uranium Mill Tailings Disposal 567

Benefits

Cost-Benefits of a Mobile, Trailer-Contained, Vibratory Finishing Decontamination Facility 69

Practical Technological Benefits of SRE Decommissioning 198

Beznau

Decommissioning Study for the Beznau Nuclear Power Plant (2 X 350 MW) - the Swiss Approach 210

Bi

Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310

Bibliography

Cleanup and Treatment of Radioactively Contaminated Land Including Areas Near Nuclear Facilities: A Selected Bibliography 105

Bioavailability

Assay for Bioavailability of Uranium Mill Tailings Contaminants 520

Biobarriers

Long-Term Biobarriers to Plant and Animal Intrusions of Uranium Tailings 507

Loose Rock as Biobarriers in Shallow Land Burial 508

Application of Long-Term Chemical Biobarriers for Uranium Tailings 568

Biological

Demolition and Removal of a Research Reactor Biological Shield 91

Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station 238

Biological Shields 302

Concentrations and Biological Availability of U-238 and Th-230 in the Environs of a Uranium Milling Operation 555

PERMUTED TITLE INDEX

Biology
Overview of Research in Radiation Biology and Protective Measures in the Manhattan Project During the War Years, 1942 to 1946 377
Boiling
Decommissioning a Boiling Water Reactor Nuclear Power Plant 164
Borehole
Estimates of Uranium Content and Radon Flux for Uranium Mine Dumps Based on Borehole Radioactivity Logs - Topical Report 610
Bottom
Decommissioning Peach Bottom Unit 1 - Final Report 165
Break
Dam Break Studies for Mine Tailings Impoundments 556
Breeder
Design of the Shippingport Light Water Breeder Reactor 9
Brief
Decommissioning the Ames Laboratory Research Reactor: A Brief Pictorial Report 100
Brunswick
Project Management Plan for Decontamination and Decommissioning of New Brunswick Laboratory, New Jersey 15
Environmental Assessment - Decontamination and Decommissioning of the New Brunswick Laboratory, New Jersey Site 31
Interim Radiological Site Characterization and D&D Status Report - New Brunswick Laboratory, New Jersey Site 63
Building
Environmental Assessment Decontamination and Decommissioning of Plutonium Fabrication Facility, Building 350 ANL-Illinois 3
Plan for Decontamination and Decommissioning the Building 350 Plutonium Fabrication Facility 16
Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at Oak Ridge National Laboratory 35
Pre-decontamination Gamma-Ray Surface Scans in TMI-2 Containment Building 305 Foot Elevation 36
Decontamination of the 233-S Building Loadout Hood 74
Decontamination of the 233-S Building Loadout Hood 75
Demolition of Building 12, An Old Plutonium Filter Facility 82
Demolition of Building 12, An Old Plutonium Filter Facility 83
Buildings
Criteria and Cost Estimates for Decommissioning and Decontamination of Major Plutonium Buildings at Rocky Flats Plant 2
Bulk
Conceptual Design Report: Below-Grade Bulk Waste Disposal Facility - Formerly Utilized Sites Remedial Action Program 374
Burial
Assessment of Change in Shallow Land Burial Limits for Defense Transuranic Waste 117
The 1979 State-by-State Assessment of Low-Level Radioactive Wastes Shipped to Commercial Burial Grounds 125
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 131
Habitat Requirements and Burrowing Depths of Rodents in Relation to Shallow Waste Burial Sites 340
Loose Rock as Biobarriers in Shallow Land Burial 508

PERMUTED TITLE INDEX

Burning
DFR Decommissioning: Operating Instructions for NaK Disposal by Burning in Atomized Jet 342
Burrowing
Habitat Requirements and Burrowing Depths of Rodents in Relation to Shallow Waste Burial Sites 340
Byproduct
Draft Environmental Impact Statement for Standards for the Control of Byproduct Materials from Uranium Ore Processing (40 CFR 192) 468
Calculational
Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations 641
Calculators
Use of Scientific Calculators and Pocket Computers for Evaluation of Seepage and Contaminant Transport 505
Calendar
Environmental Monitoring Summary for Ames Laboratory: Calendar Year 1981 61
Caliche
Caliche-Cover for Stabilization of Abandoned Mill Tailings 495
California
An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 48
Aerial Radiological Surveys of Rockwell International Facilities, Canoga Park, California - Date of Surveys: June and July 1978 54
Canada
Mineral Waste Resources of Canada - Mineral Wastes as Potential Fillers 512
Mineral Waste Resources of Canada - Mining Wastes in the Atlantic Provinces 513
Hydrogeochemical Investigations of Two Inactive Tailings Areas in the Elliot Lake Uranium District, Ontario, Canada 525
Modification of the Natural Radionuclide Distribution by Some Human Activities in Canada 566
Canadian
The Canadian Approach to Decommissioning 201
Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching 603
Cancer
Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado 479
Candidate
Ocean Disposal Feasibility Study: Candidate DOE (FUSRA[illegible] Soil Characterization 385
CANDU
Decontamination Experience at CANDU-PHW Reactors 2[illegible]
Evaluation of Immediate Dismantlement of CANDU Reactors at the End of Service Life 272
Canoga
Aerial Radiological Surveys of Rockwell International Facilities, Canoga Park, California - Date of Surveys: June and July 1978 54
Canonsburg
Geochemical Investigation of UMTRAP Designated Site at Canonsburg, Pennsylvania 431
Canonsburg Construction Firm Selected for Vicinity Property Cleanup Efforts 458

PERMUTED TITLE INDEX

Canyon
Environmental Analysis of Acid/Middle Pueblo Canyon, Los Alamos, New Mexico 375
Environmental Analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico 376
Carbon
Electropolishing of Carbon Steel and Stainless Steel and Its Industrial Application 256
Carolina
An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 40
Cell
Dismantling of a Hot Cell of High Level Activity: Method and Tools Used 305
Cells
Decontamination and Decommissioning of Fuel Reprocessing Cells at the Idaho Chemical Processing Plant 76
Decontamination and Partial Dismantling of the Eurochemic Plant: Part 1 - Decontamination of the Head-End Cells and Partial Dismantling of Two Dissolvers 285
Cemented
Radon Emanation from Stopes Backfilled with Cemented Uranium Mill Tailings 528
Center
An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43
Centers
Fabricating Centers Cut with Numerical Control Accuracy 309
Centralizing
Economic Comparison of Centralizing or Decentralizing Processing Facilities for Defense Transuranic Waste 115
Centrifuge
Physical Modeling of Tailings Dams Using Centrifuge Simulation Techniques 631
Ceramics
Evaluation of the 1943 to 1946 Liquid Effluent Discharge from the Linde Air Products Company Ceramics Plant 392
CFR
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Summary 134
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Main Report 135
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices A-F 136
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q 137
Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192): Draft Environmental Impact Statement 464
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 1 466
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 2 467
Draft Environmental Impact Statement for Standards for the Control of Byproduct Materials from Uranium Ore Processing (40 CFR 192) 468
Chain
Review of Parameters Describing Terrestrial Food-Chain Transport of Lead-210 and Radium-226 582
Estimated Dose to Man from Uranium Milling Via the Terrestrial Food-Chain Pathway 607

PERMUTED TITLE INDEX

Chains

Migration of Radionuclide Chains in a Non-Homogeneous Aquifer under Transient Saturated-Unsaturated Flow Conditions 538

Challenge

The Challenge of a Desert: Revegetation of Disturbed Desert Lands 649

Chamber

Processes Taking Place in Arc Plasmatron Chamber in Cutting of Metals 319

Characterization

Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at Oak Ridge National Laboratory 35

Preliminary Characterization and Assessment of the Weldon Spring Low-Level Waste Disposal Site 56

Interim Radiological Site Characterization and D&D Status Report - New Brunswick Laboratory, New Jersey Site 63

Waste Identification, Characterization and Disposal During the D and D of a Non-Reactor Nuclear Facility 140

Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Experimental System for Collection and Characterization 316

Characterization of Nuclear Fuel Cycle Facilities Requiring Decommissioning and Decontamination 361

Ocean Disposal Feasibility Study: Candidate DOE (FUSRAP) Soil Characterization 385

The Chemical Characterization and Hazard Assessment of Uranium Mill Tailings 511

Characterization and Disposal of Radioactive Effluents from Uranium Mining 587

Evaluation of Inactive Uranium Mill Tailings Sites for Liner Requirements: Characterization and Interaction of Tailings, Soil and Liner Materials 609

Contact of Clay Liner Materials with Acidic Tailings Solutions: 1 - Mineral Characterization 644

Chemical

Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32

Decontamination and Decommissioning of Fuel Reprocessing Cells at the Idaho Chemical Processing Plant 76

Radiological Survey of Kent Chemical Laboratory, The University of Chicago, Chicago, Illinois, September 7-13, 1977 397

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398

Chemical Transport Beneath a Uranium Mill Tailings Pile, Riverton, Wyoming 477

Statistical Evaluation of Contamination from Uranium Mill Tailings by Physical Transport and Chemical Migration 508

Application of Long-Term Chemical Biobarriers for Uranium Tailings 509

The Chemical Characterization and Hazard Assessment of Uranium Mill Tailings 511

Chemical and Radioisotope Distribution Profiles in an Abandoned Uranium Tailings Pile 516

Observed Reduction of Radon-222 Gas Emanation from Uranium Tailings Using a New Chemical Encapsulation Process 523

Distribution of Radium and Chemical Toxins in the Environment of a Uranium Complex 578

Chemicals

Hydroseeding and Erosion Control Chemicals 561

PERMUTED TITLE INDEX

Chemistry

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 131

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control (1965-1975) 168

Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394

Cheswick

Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision 33

Chicago

Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32

Radiological Survey of Eckhart Hall, The University of Chicago, Chicago, Illinois, September 14, 1976-March 22, 1977 393

Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394

Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois 395

Radiological Survey of Ryerson Physical Laboratory, The University of Chicago, Chicago, Illinois, September 11-25, 1976 396

Radiological Survey of Kent Chemical Laboratory, The University of Chicago, Chicago, Illinois, September 7-13, 1977 397

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398

Citations

Plasma Welding: 1972 - June, 1982 (Citations from the International Aerospace Abstracts Data Base) 312

Plasma Welding: 1970 - May 1982 (Citations from the Engineering Index Data Base) 313

Plasma Cutting: June 1970 - June 1982 (Citations from the Engineering Index Data Base) 314

Laser Metal Cutting: 1966 - July 1982 (Citations from the Metals Abstracts Data Base) 315

Uranium Ore Treatment: January, 1970-May, 1981 (Citations from the Engineering Index Data Base) 593

Uranium Mining and Milling Environmental Studies: 1970 - February, 1981 (Citations from the Engineering Index Data Base) 594

City

An Aerial Radiological Survey of the Watts Bar Nuclear Plant and Surrounding Area, Spring City, Tennessee 55

Surface and Subsurface Gamma Survey of the Kellex Site, Jersey City, New Jersey - Date of Survey: September 8-11, 1980 378

Baseline Data and Land Use Impact of the Tuba City Uranium Tailings Site 404

Baseline Data and Land Use Impact of the Falls City, Texas Uranium Tailings Site 407

Land Use Study of the Ray City Uranium Tailing Site 421

Evaluation of Interface Between Tailings and Subtailings Soil, A Case Study: Vitro Tailings, Salt Lake City, Utah 430

Instrumentation for Off-Site Remedial Action in Salt Lake City, Utah 438

DOE Awards Contract for Salt Lake City Cleanup 457

PERMUTED TITLE INDEX

Civilian

Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Civilian Program 195

Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Civilian Program 197

Classification

Waste Classification, a Proposed Methodology for Classifying Low-Level Radioactive Waste 120

Classifying

Waste Classification, a Proposed Methodology for Classifying Low-Level Radioactive Waste 120

Classifying Decommissioning Wastes for Allocation to Appropriate Final Repositories 330

Clay

Design of Impervious Clay Liners by Unsaturated Flow Principles 501

Problems in Predicting the Permeability of Compacted Clay Liners 515

Clay Liner Permeability in Low pH Environments 591

Contact of Clay Liner Materials with Acidic Tailings Solutions 602

Contact of Clay Liner Materials with Acidic Tailings Solutions: 1 - Mineral Characterization 644

Design, Construction, and Field Testing of a Heap Leach Clay Pad 646

Cleaning

Cleaning Up Nuclear Facilities - An Aggressive and Unified Federal Program is Needed 14

Cleanup

Aerial and Ground-Based In Situ Measurements for Evaluation and Implementation of Radioactive Site Cleanup 60

Cleanup and Treatment of Radioactively Contaminated Land Including Areas Near Nuclear Facilities: A Selected Bibliography 105

Post-Accident Cleanup and Decommissioning of a Reference Pressurized Water Reactor 161

Three Mile Island: Searching for Pennsylvania Initiatives (Alternatives for Funding Cleanup) 269

Model Environmental Assessment for a Property-Cleanup/Interim-Storage Remedial Action at a Formerly Utilized Site 386

Morrison-Knudsen Receives Contract for First Phase of $275 Million Uranium Mill Tailings Cleanup Project 453

DOE Awards Contract for Salt Lake City Cleanup 457

Canonsburg Construction Firm Selected for Vicinity Property Cleanup Efforts 458

Simple Field Method for Determining Compliance with EPA Land Cleanup Standards 618

Clemente

An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 48

Climate

Revegetation of Disturbed Grounds in the Semi-Arid Climate of Southcentral Washington 328

Close

Review of Costs to Close the Frankford Arsenal 13

Closed

Long-Term Monitoring of Closed Low-Level Waste and Uranium Mill Tailings Disposal Sites 630

PERMUTED TITLE INDEX

Closing
Economic Impact of Closing Zion Nuclear Facility 12
Costs of Closing the Indian Point Nuclear Power Plant 29
Closing-Down of Nuclear Power Stations in the Federal Republic of Germany 229
Closure
Criteria Needs for Siting, Licensing, Operation, Closure, Stabilization, and Decommissioning of Shallow Land Disposal Sites for Radioactive Waste 123
Closures
Comments on the Study of the Consequences of Nuclear Plant Closures 362
Collection
Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Experimental System for Collection and Characterization 316
Colorado
Stabilization of Existing Uranium Mill Tailings Piles at Uravan, Colorado 401
Restoration of Surface Vegetation on Uranium Wastes at Uravan, Colorado 414
Hydro-Geochemical Studies of Uranium Mill Tailing Piles at Riverton, Wyoming and Maybell, Colorado 435
Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado 479
National Uranium Resource Evaluation: Shiprock Quadrangle, Arizona, New Mexico, Colorado, and Utah 537
Columbus
Decontamination of Battelle-Columbus Laboratories' Plutonium Facility 65
Commercial
Directions in Low-Level Radioactive Waste Management - Low-Level Radioactive Waste Disposal: Commercial Facilities No Longer Operating 121
The 1979 State-by-State Assessment of Low-Level Radioactive Wastes Shipped to Commercial Burial Grounds 125
Information Base for Commercial Radioactive Waste Management 127
Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Commercial Program 178
Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Commercial Program 179
Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Commercial Program 182
Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Commercial Program 184
Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Commercial Program 185
Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Commercial Program 187
Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Commercial Program 188
Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Commercial Program 190
Dismantling Commercial Atomic Reactor Pressure Vessels - Combined Gouging and Gas Cutting Process Used Underwater 295
Decommissioning Commercial Nuclear Power Plants 359
Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites - Invitation for Comment 471
Commercial Nuclear Waste - Remedial Action Program 483
Health Effects of Uranium Mining and Milling for Commercial Nuclear Power 493

PERMUTED TITLE INDEX

Commercially

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 131

Commingled

Commingled Uranium-Tailings Study, Volume II - Technical Report 400

Commingled Uranium-Tailings Study: Volume 1, Plan for Stabilization and Management of Commingled Uranium-Mill Tailings 459

Commission

Status of Decommissioning Program of U.S. Nuclear Regulatory Commission 8

United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27

Decommissioning Research in the Commission of European Communities' Program on Decommissioning of Nuclear Power Plants 224

Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works 391

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report 442

Communications

Waste Management '81 - The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs and Public Communications 345

Communities

Communities' Research and Development Program on Decommissioning of Nuclear Power Plants 204

Decommissioning Research in the Commission of European Communities' Program on Decommissioning of Nuclear Power Plants 224

Monitoring Program Design Recommendations for Uranium Mining Communities 524

Community

Overview of Decommissioning Research and Development Activities in the European Community 370

State of Idaho Community Summary Report for Radiation Surveys - Lowman, Idaho 463

Compacted

Problems in Predicting the Permeability of Compacted Clay Liners 515

Comparative

Comparative Scrub Solution Tests for Decontamination of Transuranic Radionuclides from Soils 112

A Comparative Evaluation of Liner Materials for Inactive Uranium Mill Tailings Piles 500

Complex

Environmental Surveillance for the INEL Radioactive Waste Management Complex 50

Environmental Surveillance for the INEL Radioactive Waste Management Complex 51

Decontamination and Decommissioning of the EBR-1 Complex, Topical Report No. 1 - Removal of NaK from EBR-1 Storage Pit 118

Distribution of Radium and Chemical Toxins in the Environment of a Uranium Complex 578

Compliance

Simple Field Method for Determining Compliance with EPA Land Cleanup Standards 618

Components

Sectioning of Contaminated Components for Decontamination by Vibratory Finishing and

PERMUTED TITLE INDEX

Electropolishing 251
Dismantling Techniques for Reactor Components Using Explosives 291
Experience in Treatment of Components, Waste Treatment, Packaging and Shipping Related to Decommissioning 333

Composite
Radon Attenuation Effectiveness and Cost Optimization of Composite Covers for Uranium Mill Tailings 615

Composition
Radioactive Composition of Airborne Particulates at Ambrosia Lake, New Mexico 645

Compounds
Use of Phosphate Compounds to Extract Thorium-230 and Radium-226 from Uranium Ore and Tailings 547

Compressed
Present State of Development of Plasma-Compressed Air Cutting of Metals 286

Computer
Computer Analysis of Seepage and Groundwater Response Beneath Tailings Impoundments 517

Computers
Use of Scientific Calculators and Pocket Computers for Evaluation of Seepage and Contaminant Transport 505

Concentrations
Residual Radioactivity Assessment in Nuclear Power Plant: Concentrations, Distribution Inventories 34
Concentrations and Biological Availability of U-238 and Th-230 in the Environs of a Uranium Milling Operation 555

Concepts
Abrasive-Jet Cutting Examples and Concepts 287

Conceptual
Conceptual Design Report: Below-Grade Bulk Waste Disposal Facility - Formerly Utilized Sites Remedial Action Program 374

Concrete
Surface Concrete Decontamination Equipment Developed by Pacific Northwest Laboratory 68
Three Mile Island Concrete Decontamination Experience 71
Concrete Decontamination 254
Underwater Oxygen Lance - Cutting of Metals, Concrete and Stone 273
Review of Methods for Concrete Removal 276
High Pressure Water-Jet Scarification of High Density Concrete 288
System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design 289
Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw 290
Cutting Concrete with Abrasion Jet 326

Conditioning
Preliminary Evaluation of Uranium Mill Tailings Conditioning as an Alternative Remedial Action Technology 521

Configuration
Influence of Impoundment and Substratum Configuration on Seepage from Impoundments 595

PERMUTED TITLE INDEX

Congress
Uranium Mill Tailings: Congress Addresses a Long-Neglected Problem 474
Conjunction
Improvements in Methods and Apparatus for Cutting, Welding and Surface Treating Using a Laser Beam in Conjunction with an Arc 311
Consolidating
Uranium Tailings Need Consolidating 643
Consolidation
Consolidation Theory and Its Applicability to the Dewatering and Covering of Uranium Mill Tailings 532
Constituents
Leachability of Radioactive Constituents from Uranium Mine Tailings - Status Report - June 1974 to January 1977 499
Construction
The Construction of the Waste Dismantling Facility 341
Canonsburg Construction Firm Selected for Vicinity Property Cleanup Efforts 458
Handbook for the Design, Selection, and Construction of a Rock Cover for Retired Uranium Mill Tailings 600
Design, Construction, and Field Testing of a Heap Leach Clay Pad 646
Design and Construction of Tailings Dams 653
Containers
Waste Containers for Decommissioning 132
Large Transport Containers for Nuclear Reactor Decommissioning Waste 348
Containment
Pre-decontamination Gamma-Ray Surface Scans in TMI-2 Containment Building 305 Foot Elevation 36
Protective Barriers for Containment of Toxic Materials 531
Containment Systems for Uranium Mill Tailings 544
Contaminant
Use of Scientific Calculators and Pocket Computers for Evaluation of Seepage and Contaminant Transport 505
Contaminant Migration in a Sand Aquifer near an Inactive Uranium Tailings Impoundment, Elliot Lake, Ontario 589
A Generic Model of Contaminant Migration from Uranium Tailings Impoundments 620
Contaminant Transport from Uranium Mill Tailings in Ambrosia Lake, New Mexico 636
Contaminants
Assay for Bioavailability of Uranium Mill Tailings Contaminants 520
Contaminated
Decontamination of Transuranically Contaminated Metallic Waste 64
The Decommissioning of a Tritium Contaminated Laboratory 86
In Situ Vitrification of Contaminated Soil: Pilot-Scale Field Testing 103
Cleanup and Treatment of Radioactively Contaminated Land Including Areas Near Nuclear Facilities: A Selected Bibliography 105
Decommissioning of Radioactively Contaminated Facilities from a State Perspective 154
Sectioning of Contaminated Components for Decontamination by Vibratory Finishing and Electropolishing 251
Decontamination of Uranium-Contaminated Iron by Smelting 268
System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design 289
Proposal for Decommissioning of Contaminated Steel Parts from Shut Down Nuclear Power Plants 338

PERMUTED TITLE INDEX

Contamination
Surface Soil Contamination Standards for Rockwell Hanford Operations 101
Surface Soil Contamination Standards 102
Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111
Statistical Evaluation of Contamination from Uranium Mill Tailings by Physical Transport and Chemical Migration 503

Contract
Morrison-Knudsen Receives Contract for First Phase of $275 Million Uranium Mill Tailings Cleanup Project 453
DOE Awards Contract for Salt Lake City Cleanup 457

Contributions
Perspective on Potential Contributions to Reactor Decommissioning Problems Caused by Nickel-59 270

Control
Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control (1965-1975) 168
Control of Physical Agent Hazards of Arc Welding and Cutting 274
Fabricating Centers Cut with Numerical Control Accuracy 309
Radon Control by Multilayer Earth Barriers: Field Tests 415
Implementation of the Uranium Mill Tailings Radiation Control Act by the States 436
Uranium Mill Tailings Radiation Control Act of 1978 451
Draft Environmental Impact Statement for Standards for the Control of Byproduct Materials from Uranium Ore Processing (40 CFR 192) 468
Implementation of the Uranium Mill Tailings Radiation Control Act of 1978 472
A Survey of Radon Measurement Needs and Activities in State Radiation Control Programs 514
Radiation Hazards in Mining: Control, Measurement, and Medical Aspects 535
Hydroseeding and Erosion Control Chemicals 561
Sealant Tests to Control Radon Emanation in a Uranium Mine 568
Attempt to Control Tailings 612
Radionuclide Movement in Seepage and Its Control 632

Controlled
Controlled Dismantling 279
Exemption of Low-Level Decommissioning Waste from Controlled Handling and Disposal 335

Converse
Land Use Study of the Converse County Uranium Tailing Site 424

Conversion
Engineering Analysis and Costs of Product Conversion, Refabrication, Waste Treatment, and Plant Decommissioning of an Exportable Pyrochemical Process 211
Decommissioning of Unit A of the Nuclear Power Plant Gundremmingen and its Conversion to a Condition of Protective Storage 231

Cooled
Decommissioning of the Windscale Advanced Gas-Cooled Reactor 343

Coordinated
Coordinated ANSPD(NEW) and OMA Decontamination and Decommissioning (D&D) Program Plan 10

Core

PERMUTED TITLE INDEX

Laser Cutting Apparatus for Nuclear Core Fuel Subassembly 277
Shutdown of Nuclear Power Plants - Production of Activated Material from the Region of the Reactor Core by the Example of a Shutdown Pressurized Water Reactor 339

Corporation

Saxton Nuclear Experimental Corporation's Change Request No. 50 to Technical Specification and Request for Amendment No. 8 to License No. DPR-4 21
Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32
Cotter Corporation's New Tailings Pond Has a Synthetic Liner 637

Cost

Criteria and Cost Estimates for Decommissioning and Decontamination of Major Plutonium Buildings at Rocky Flats Plant 2
Cost-Benefits of a Mobile, Trailer-Contained, Vibratory Finishing Decontamination Facility 69
Nuclear Economics: Taxation, Fuel Cost, and Decommissioning 203
Preparing a Decommissioning Cost and Technology Study 212
Preliminary Nuclear Decommissioning Cost Study 226
Cost Reduction Study Completed 456
Cost and Effectiveness of Radon Barrier Systems 486
Cost of Radon-Barrier Systems for Uranium Mill Tailings 487
A Benefit-Cost Methodology for Developing Environmental Standards for Uranium Mill Tailings Disposal 567
Radon Attenuation Effectiveness and Cost Optimization of Composite Covers for Uranium Mill Tailings 615

Costs

Review of Costs to Close the Frankford Arsenal 13
Nuclear Plant Decommissioning Costs 23
Costs of Closing the Indian Point Nuclear Power Plant 29
Directions in Low-Level Radioactive Waste Management - An Analysis of Low-Level Waste Disposal Facility and Transportation Costs 122
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 159
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 160
Engineering Analysis and Costs of Product Conversion, Refabrication, Waste Treatment, and Plant Decommissioning of an Exportable Pyrochemical Process 211
Nuclear Energy: The Real Costs 219
Costs of Decommissioning Nuclear Power Plants as Reported to the Public to Date 227
Decommissioning of Nuclear Power Plants - How to Handle the Costs 233

Cottege

Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois 395

Cotter

Cotter Corporation's New Tailings Pond Has a Synthetic Liner 637

Counting

A Counting System for Field Determination of Radium-226 in Soils 584

County

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 38
Land Use Study of the Converse County Uranium Tailing Site 424
Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado 479

PERMUTED TITLE INDEX

Cover

Revegetation/Rock Cover for Stabilization of Inactive U-Tailings Sites 489

Revegetation/Rock Cover for Stabilization of Inactive Uranium Mill Tailings Disposal Sites 490

Caliche-Cover for Stabilization of Abandoned Mill Tailings 495

A Field Experiment on Tailings Reclamation: Radon Flux Versus Earthen Cover Depth 549

Effect of Rock Cover on Multilayer Radon Barrier Effectiveness 564

Multidimensional Analysis of Radon Diffusion Through Uranium Mill Tailings and Cover Systems 580

Handbook for the Design, Selection, and Construction of a Rock Cover for Retired Uranium Mill Tailings 600

Simulation of Water Flow and Retention in Earthen-Cover Materials Overlying Uranium Mill Tailings 624

Covered

Moisture Content Analysis of Covered Uranium Mill Tailings 434

Covering

Quarterly Progress Report No. 45 for Second Quarter, CY 1968 Covering the Period of January, February, and March 1968 79

Quarterly Progress Report No. 46 for Third Quarter, CY 1968 Covering the Period of April, May, and June 1968 81

Quarterly Progress Report No. 48 for First Quarter, CY 1969 Covering the Period of October, November, and December 1969 95

Consolidation Theory and Its Applicability to the Dewatering and Covering of Uranium Mill Tailings 532

Covers

A Systematic Approach to Designing Surface Covers for Uranium Mill Tailings 488

Long-Term Survivability of Riprap for Armoring Uranium-Mill Tailings and Covers: A Literature Review 570

Soil-Water Impacts from Using Vegetation and Rock Covers for Surface Stabilization of Uranium-Mill Tailings 579

Radon Attenuation Effectiveness and Cost Optimization of Composite Covers for Uranium Mill Tailings 615

Factors Influencing Radon Attenuation by Tailings Covers 623

Environmental Factors Affecting Long-Term Stabilization of Radon Suppression Covers for Uranium Mill Tailings 656

CP

Environmental Assessment Related to the Decontamination and Decommissioning of the Argonne National Laboratory CP-5 Research Reactor 4

Creep

Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310

Criteria

Criteria and Cost Estimates for Decommissioning and Decontamination of Major Plutonium Buildings at Rocky Flats Plant 2

Design Criteria of Decommissioning of Nuclear Fuel Reprocessing Plants 11

Criteria Needs for Siting, Licensing, Operation, Closure, Stabilization, and Decommissioning of Shallow Land Disposal Sites for Radioactive Waste 123

Plea for Realistic Environmental Surveillance/Decommissioning Criteria Based on Radiation Dose 239

Surface-Water Hydrologic Criteria for Uranium-Mine Tailings Impoundments in Ontario 492

PERMUTED TITLE INDEX

Critical

Reclamation of Uranium Tailings - A Critical Assessment of Current Practice 633

Crucible

Radiological Survey of Universal Cyclops, Inc., Titusville Plant (Formerly Vulcan Crucible Steel Company, Aliquippa, Pennsylvania), May 2-8, 1978 399

Curium

The Decontamination of the Curium Source Fabrication Facility 73

Current

Current Uranium Mill Licensing Issues 441

Methodology Used in Devising a New Solution to the Disposal of Hazardous Wastes Using Uranium Tailings as a Current Example 572

Reclamation of Uranium Tailings - A Critical Assessment of Current Practice 633

Curves

The Use of Stage Curves and Mass Balances in the Design of Uranium Tailings Impoundments 554

Cut

Fabricating Centers Cut with Numerical Control Accuracy 309

Cuts

Torch Cuts Off "Hot" Plates - Underwater Cutting Solves Radioactive Disposal Problem 84

Cutting

Torch Cuts Off "Hot" Plates - Underwater Cutting Solves Radioactive Disposal Problem 84

SRE Underwater Plasma Arc Cutting Development Test Report 93

Underwater Oxygen Lance - Cutting of Metals, Concrete and Stone 273

Control of Physical Agent Hazards of Arc Welding and Cutting 274

Present Position of Plasma-Torch Cutting 275

Laser Cutting Apparatus for Nuclear Core Fuel Subassembly 277

Thermal Cutting: What To Do About High Alloy Steels 278

Present State of Development of Plasma-Compressed Air Cutting of Metals 286

Abrasive-Jet Cutting Examples and Concepts 287

Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw 290

Survey of Underwater Cutting of Metals 293

Dismantling Commercial Atomic Reactor Pressure Vessels - Combined Gouging and Gas Cutting Process Used Underwater 295

Underwater Cutting of Stainless Steel Plate and Pipe for Dismantling Reactor Pressure Vessels 296

Study on Underwater Plasma Arc Cutting for Stainless Steel 297

Laser Cutting Equipment for Dismantling Irradiated PFR Fuel Sub-Assemblies 298

Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Inhalation Hazards and Worker Protection 299

A Plasma-Arc Cutting Machine 300

Plasma-Arc Cutting Methods and Plasma-Arc Cutting Machines 301

Gas Welding and Cutting Torches 303

DC Plasma Torch for Metal Cutting 304

Surface Plasma-Arc Cutting of Steels 10KHSND and 10KHN1M 307

Nibbling, Laser Cutting and Plasma-Arc Cutting 308

Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310

PERMUTED TITLE INDEX

Improvements in Methods and Apparatus for Cutting, Welding and Surface Treating Using a Laser Beam in Conjunction with an Arc 311
Plasma Cutting: June 1970 - June 1982 (Citations from the Engineering Index Data Base) 314
Laser Metal Cutting: 1966 - July 1982 (Citations from the Metals Abstracts Data Base) 315
Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Experimental System for Collection and Characterization 316
Development and Verification Test on Remote Plasma Cutting of Large Metallic Waste 317
An Evaluation of the Performance of a Plasma Torch for the Cutting of Metal 318
Processes Taking Place in Arc Plasmatron Chamber in Cutting of Metals 319
Air Pollution in the Plasma Cutting of Steel, Stainless Steel and Aluminum 320
Technology and Equipment for Gas-Laser Cutting of Sheet Steels 321
Two Views of Underwater Cutting and Welding 322
Welding and Cutting Under Water 324
Aerosols from Oxy-acetylene Gas Cutting Operations on Metal Plates: A Laboratory Study 325
Cutting Concrete with Abrasion Jet 326
A Study of Underwater Thick Plate Cutting Technology 327

CY

Quarterly Progress Report No. 45 for Second Quarter, CY 1968 Covering the Period of January, February, and March 1968 79
Quarterly Progress Report No. 46 for Third Quarter, CY 1968 Covering the Period of April, May, and June 1968 81
Quarterly Progress Report No. 48 for First Quarter, CY 1969 Covering the Period of October, November, and December 1969 95

Cyclops

Radiological Survey of Universal Cyclops, Inc., Titusville Plant (Formerly Vulcan Crucible Steel Company, Aliquippa, Pennsylvania), May 2-8, 1978 399

D

Coordinated ANSPD(NEW) and OMA Decontamination and Decommissioning (D&D) Program Plan 10
Interim Radiological Site Characterization and D&D Status Report - New Brunswick Laboratory, New Jersey Site 63
Waste Identification, Characterization and Disposal During the D and D of a Non-Reactor Nuclear Facility 140
French R and D Program on Decommissioning Tooling and Techniques 205
National/International R and D Programs on Uranium Mill Tailings 541

Dam

Sohio Western Mining Company Tailing Dam 425
Dam Break Studies for Mine Tailings Impoundments 556
Remedial Works at Dam No. 1, Elliot Lake, Ontario 608
Observational Approach to Tailings Dam Enlargement 626

Damage

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control (1965-1975) 168

Dams

Design and Performance of Tailings Dams 586
Parameters Affecting Stability of Tailings Dams 597

PERMUTED TITLE INDEX

Development of Methods for Reclaiming Abandoned Tailings Ponds and Dams: Volume 1 601
Physical Modeling of Tailings Dams Using Centrifuge Simulation Techniques 631
Modeling of Seepage Through Mine Tailings Dams 647
Design and Construction of Tailings Dams 653

Date

An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972 39
An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 40
An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43
An Aerial Radiological Survey of the U.S. Department of Energy's Mound Facility, Miamisburg, Ohio - Date of Survey: July 1976 45
An Aerial Radiological Survey of United States Department of Energy Sites in Ames, Iowa, Date of Survey: May 1977 46
An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 48
An Aerial Radiological Survey of the Argonne National Laboratory and Surrounding Area, Argonne, Illinois - Date of Survey: May 1977 52
An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 53
Aerial Radiological Surveys of Rockwell International Facilities, Canoga Park, California - Date of Surveys: June and July 1978 54
Costs of Decommissioning Nuclear Power Plants as Reported to the Public to Date 227
Surface and Subsurface Gar na Survey of the Kellex Site, Jersey City, New Jersey - Date of Survey: September 8-11, 1980 378

Dated

Publication of the Safety Regulation KTA 1401 by Kerntechnischer Ausschuss - Dated April 13, 1981 222

Daughter

Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado 479

Dawn

Dawn Mining's Tailings Expansion Project - A Case Study in the Use of HDPE Lining 443

Day

Statistics and the Statistician in Nuclear Site Decontamination and Decommissioning: Lecture Notes for a Four-Day Short Course 237

DC

DC Plasma Torch for Metal Cutting 304

Decay

Distribution of Radon and Other Radioactive Decay Products of Uranium from a Uranium Deposit into Overlying Overburden 581

December

Quarterly Progress Report No. 48 for First Quarter, CY 1969 Covering the Period of October, November, and December 1969 95
Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Defense Program 186
Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Commer-

PERMUTED TITLE INDEX

cial Program 187
Meteorological Tower Data, Grand Junction Tailings Site, CO - Semi-annual Report, July-December, 1981 480
Decentralizing
Economic Comparison of Centralizing or Decentralizing Processing Facilities for Defense Transuranic Waste 115
Decommissioned
Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station 238
Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island 241
Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw 290
Decontaminating
Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision 33
Process for Decontaminating Objects Having Radioactive Layers 252
Deep
A Qualitative Evaluation of Long-Term Processes Governing the Behaviour of Uranium Mill Tailings Placed in Deep Lakes 583
Defense
Economic Evaluation of Volume Reduction for Defense Transuranic Waste 114
Economic Comparison of Centralizing or Decentralizing Processing Facilities for Defense Transuranic Waste 115
Assessment of Change in Shallow Land Burial Limits for Defense Transuranic Waste 117
Environmental and Other Evaluations of Alternatives for Management of Defense Transuranic Waste at the Idaho National Engineering Laboratory 133
Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Defense Program 180
Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Defense Program 181
Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Defense Program 183
Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Defense Program 186
Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Defense Program 189
Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Defense Program 191
Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Defense Program 192
Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Defense Program 193
Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Defense Program 194
Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Defense Program 196
Demolition
Demolition of Building 12, An Old Plutonium Filter Facility 82
Demolition of Building 12, An Old Plutonium Filter Facility 83
Demolition and Removal of a Research Reactor Biological Shield 91
Method for Explosive Demolition of Reactor Pressure Vessel 292

PERMUTED TITLE INDEX

Demonstrating
System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design 289

Demonstration
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program) 142

Density
High Pressure Water-Jet Scarification of High Density Concrete 288

Department
Environmental Surveillance Plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York 44
An Aerial Radiological Survey of the U.S. Department of Energy's Mound Facility, Miamisburg, Ohio - Date of Survey: July 1976 45
An Aerial Radiological Survey of United States Department of Energy Sites in Ames, Iowa, Date of Survey: May 1977 46
U.S. Department of Energy Activities in Low-Level Radioactive Waste Treatment 139
Decommissioning at the U.S. Department of Energy 151
United States Department of Energy Surplus Facilities Management Program 163

Deposit
Distribution of Radon and Other Radioactive Decay Products of Uranium from a Uranium Deposit into Overlying Overburden 581

Depth
A Field Experiment on Tailings Reclamation: Radon Flux Versus Earthen Cover Depth 549

Depths
Habitat Requirements and Burrowing Depths of Rodents in Relation to Shallow Waste Burial Sites 340

Describing
Review of Parameters Describing Terrestrial Food-Chain Transport of Lead-210 and Radium-226 582

Desert
The Challenge of a Desert: Revegetation of Disturbed Desert Lands 649

Design
Design of the Shippingport Light Water Breeder Reactor 9
Design Criteria of Decommissioning of Nuclear Fuel Reprocessing Plants 11
System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design 289
Conceptual Design Report: Below-Grade Bulk Waste Disposal Facility - Formerly Utilized Sites Remedial Action Program 374
Design and Seepage Modeling Studies of Below-Grade Disposal, West Gas Hills, Wyoming 417
Design of Impervious Clay Liners by Unsaturated Flow Principles 501
Monitoring Program Design Recommendations for Uranium Mining Communities 524
Review of Design Approaches Applicable to Dewatering Uranium Mill Tailings Disposal Pits 539
The Use of Stage Curves and Mass Balances in the Design of Uranium Tailings Impoundments 554
Design and Performance of Tailings Dams 586
Handbook for the Design, Selection, and Construction of a Rock Cover for Retired Uranium Mill Tailings 600

PERMUTED TITLE INDEX

Design Guide for Metal and Nonmetal Tailings Disposal 627
Design, Construction, and Field Testing of a Heap Leach Clay Pad 646
Riprap Design Considerations for Long-Term Protection of Uranium Mill Tailings 650
Rock Riprap Design Methods and Their Applicability to Long-Term Protection of Uranium Mill Tailings Impoundments 651
Design and Construction of Tailings Dams 653
Horizontal Pipe Drain Design for Existing Mill Tailings Embankments 654

Designated
Geochemical Investigation of UMTRAP Designated Site at Canonsburg, Pennsylvania 431

Designing
A Systematic Approach to Designing Surface Covers for Uranium Mill Tailings 488

Designs
Probabilistic Modeling of Tailings Embankment Designs - Volume 1: Model Development and Verification 484
Probabilistic Modeling of Tailings Embankment Designs, Volume 2: Model Application and Verification 536

Develop
Develop Decontamination Techniques for Pressurized Water Reactors 264

Developed
Surface Concrete Decontamination Equipment Developed by Pacific Northwest Laboratory 68

Developing
Interactive Planning System for Developing Decommissioning and Decontamination Plans at Hanford 18
Developing Guidelines on Managing Radioactive Waste 349
A Benefit-Cost Methodology for Developing Environmental Standards for Uranium Mill Tailings Disposal 567

Developmental
Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310

Device
Intervention Device for Use in a Hostile Environment 267

Devising
Methodology Used in Devising a New Solution to the Disposal of Hazardous Wastes Using Uranium Tailings as a Current Example 572

Dewatering
Consolidation Theory and Its Applicability to the Dewatering and Covering of Uranium Mill Tailings 532
Review of Design Approaches Applicable to Dewatering Uranium Mill Tailings Disposal Pits 539

DFR
DFR Decommissioning: Operating Instructions for NaK Disposal by Burning in Atomized Jet 342

Diagenesis
Early Diagenesis of Uranium Mine Stope Backfill 496

Diagrams
Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573
Thermodynamic Calculations and Phase Diagrams in Evaluating Tailings-Soil-Water Interactions 577

PERMUTED TITLE INDEX

Diffusion
Multidimensional Analysis of Radon Diffusion Through Uranium Mill Tailings and Cover Systems 580
A Complete Description of Radon Diffusion in Earthen Materials 614
The Effects of Moisture on Radon Emanation Including the Effects on Diffusion 634

Dilemmas
Decommissioning: Moral Dilemmas Revisited 216

Directions
Directions in Low-Level Radioactive Waste Management - Transporting Low-Level Waste: Effects of Regional Management 119
Directions in Low-Level Radioactive Waste Management - Low-Level Radioactive Waste Disposal: Commercial Facilities No Longer Operating 121
Directions in Low-Level Radioactive Waste Management - An Analysis of Low-Level Waste Disposal Facility and Transportation Costs 122

Directory
Directory and Profile of Licensed Uranium-Recovery Facilities 652

Disassembly
Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw 290

Discharge
Evaluation of the 1943 to 1946 Liquid Effluent Discharge from the Linde Air Products Company Ceramics Plant 392

Dismantlement
Evaluation of Immediate Dismantlement of CANDU Reactors at the End of Service Life 272
Dismantlement of Nuclear Power Stations in Germany 323

Dismantling
Puerto Rico Water Resources Authority: Docket No. 115-4 - Order Authorizing Dismantling of Facility 22
Controlled Dismantling 279
Decontamination and Partial Dismantling of the Eurochemic Plant: Part 1 - Decontamination of the Head-End Cells and Partial Dismantling of Two Dissolvers 285
Dismantling Techniques for Reactor Components Using Explosives 291
Gouging the Answer to Nuclear Dismantling Problems 294
Dismantling Commercial Atomic Reactor Pressure Vessels - Combined Gouging and Gas Cutting Process Used Underwater 295
Underwater Cutting of Stainless Steel Plate and Pipe for Dismantling Reactor Pressure Vessels 296
Laser Cutting Equipment for Dismantling Irradiated PFR Fuel Sub-Assemblies 298
Dismantling of a Hot Cell of High Level Activity: Method and Tools Used 305
Dismantling of the R1 Reactor, Stockholm 306
The Construction of the Waste Dismantling Facility 341

Dispersion
Radon Release and Dispersion from an Open Pit Uranium Mine 565
Estimation of Radiological Impact from Transportation of Uranium Mill Tailings - Part II: Dispersion and Dosimetry 657

Disposal
Preliminary Characterization and Assessment of the Weldon Spring Low-Level Waste Disposal Site 56
Torch Cuts Off "Hot" Plates - Underwater Cutting Solves Radioactive Disposal

PERMUTED TITLE INDEX

Problem 84
Directions in Low-Level Radioactive Waste Management - Low-Level Radioactive Waste Disposal: Commercial Facilities No Longer Operating 121
Directions in Low-Level Radioactive Waste Management - An Analysis of Low-Level Waste Disposal Facility and Transportation Costs 122
Criteria Needs for Siting, Licensing, Operation, Closure, Stabilization, and Decommissioning of Shallow Land Disposal Sites for Radioactive Waste 123
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 131
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Summary 134
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Main Report 135
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices A-F 136
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q 137
Disposal or On-site Storage of Thorium or Uranium Wastes from Past Operations 138
Waste Identification, Characterization and Disposal During the D and D of a Non-Reactor Nuclear Facility 140
Data Base for Radioactive Waste Management - Review of Low-Level Radioactive Waste Disposal History 334
Exemption of Low-Level Decommissioning Waste from Controlled Handling and Disposal 335
DFR Decommissioning: Operating Instructions for NaK Disposal by Burning in Atomized Jet 342
Waste Management '80 - The State of Waste Disposal Technology, Mill Tailings, and Risk Analysis Models 346
Packaging, Transportation and Disposal of Nuclear Parts from Decommissioning of "N.S. Otto Hahn" 354
Conceptual Design Report: Below-Grade Bulk Waste Disposal Facility - Formerly Utilized Sites Remedial Action Program 374
Ocean FUSRAP: Feasibility of Ocean Disposal of Materials from the Formerly Utilized Sites Remedial Action Program (FUSRAP) 384
Ocean Disposal Feasibility Study: Candidate DOE (FUSRAP) Soil Characterization 385
Design and Seepage Modeling Studies of Below-Grade Disposal, West Gas Hills, Wyoming 417
Revegetation/Rock Cover for Stabilization of Inactive Uranium Mill Tailings Disposal Sites 490
A Simplified Method for Acquiring Meteorological Data for Siting and Licensing of Uranium Mill and Tailings Disposal Facilities 526
Review of Design Approaches Applicable to Dewatering Uranium Mill Tailings Disposal Pits 539
Uranium Mill Tailings Storage, Use, and Disposal Problems 548
A Benefit-Cost Methodology for Developing Environmental Standards for Uranium Mill Tailings Disposal 567
Methodology Used in Devising a New Solution to the Disposal of Hazardous Wastes Using Uranium Tailings as a Current Example 572
Characterization and Disposal of Radioactive Effluents from Uranium Mining 587
Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment 592
NEA Program on the Long-Term Aspects of Uranium Mill Tailings Management and

PERMUTED TITLE INDEX

Disposal 605
Design Guide for Metal and Nonmetal Tailings Disposal 627
Long-Term Monitoring of Closed Low-Level Waste and Uranium Mill Tailings Disposal Sites 630
A Novel Approach to Tailings Disposal 638

Disposition
HNPF Retirement Disposition of Sodium 80
KEWB Facilities Decontamination and Disposition: Final Report 99

Dissolvers
Decontamination and Partial Dismantling of the Eurochemic Plant: Part 1 - Decontamination of the Head-End Cells and Partial Dismantling of Two Dissolvers 285

Distribution
Residual Radioactivity Assessment in Nuclear Power Plant: Concentrations, Distribution Inventories 34
Chemical and Radioisotope Distribution Profiles in an Abandoned Uranium Tailings Pile 516
Modification of the Natural Radionuclide Distribution by Some Human Activities in Canada 566
Distribution of Radium and Chemical Toxins in the Environment of a Uranium Complex 578
Distribution of Radon and Other Radioactive Decay Products of Uranium from a Uranium Deposit into Overlying Overburden 581

District
Hydrogeochemical Investigations of Two Inactive Tailings Areas in the Elliot Lake Uranium District, Ontario, Canada 525

Disturbance
Revegetation Following Artificial Disturbance 106
Revegetation Following Artificial Disturbance 107
Revegetation Following Artificial Disturbance 108

Disturbed
Revegetation of Disturbed Grounds in the Semi-Arid Climate of Southcentral Washington 328
Irrigation of Disturbed Lands 519
The Chalienge of a Desert: Revegetation of Disturbed Desert Lands 649
The Reclamation of Disturbed Arid Lands 655

Division
United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27
Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision 33

Docket
Puerto Rico Water Resources Authority: Docket No. 115-4 - Order Authorizing Dismantling of Facility 22
United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27
Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32

DOE
DOE Waste Management Plans - Remedial Actions and Decontamination and Decommissioning 7

PERMUTED TITLE INDEX

Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111
DOE Nuclear Waste Management Program 156
Summary Report on NLO Remedial Projects at the DOE-Niagara Falls Storage Site 166
Ocean Disposal Feasibility Study: Candidate DOE (FUSRAP) Soil Characterization 385
Environmental Monitoring Program for the DOE Middlesex, New Jersey Site 388
Radiological Guidelines for Application to DOE's Formerly Utilized Sites Remedial Action Program 389
DOE Awards Contract for Salt Lake City Cleanup 457

Dose

Plea for Realistic Environmental Surveillance/Decommissioning Criteria Based on Radiation Dose 239
Pathways Analysis and Radiation Dose Estimates for Radioactive Residues at Formerly Utilized MED/AEC Sites 379
Preliminary Radiation Dose Analysis for Reference FUSRAP Waste Sites 383
Estimated Dose to Man from Uranium Milling Via the Terrestrial Food-Chain Pathway 607

Doses

Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations 641

Dosimetry

Estimation of Radiological Impact from Transportation of Uranium Mill Tailings - Part II: Dispersion and Dosimetry 657

Dounreay

Decommissioning of the Dounreay Fast Reactor 371

DP

Los Alamos DP West Plutonium Facility Decontamination Project 1978-1981 66
Los Alamos DP West Plutonium Facility Decontamination Project 67

DPR

Saxton Nuclear Experimental Corporation's Change Request No. 50 to Technical Specification and Request for Amendment No. 8 to License No. DPR-4 21

Draft

Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Summary 134
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste." Main Report 135
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices A-F 136
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q 137
Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192): Draft Environmental Impact Statement 464
Draft Environmental Impact Statement for Standards for the Control of Byproduct Materials from Uranium Ore Processing (40 CFR 192) 468

Drain

Horizontal Pipe Drain Design for Existing Mill Tailings Embankments 654

Dresden

An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972 39

PERMUTED TITLE INDEX

Dry
Dry Land Techniques in the Semiarid West 550
The Production and Handling of Dry Uranium and Other Tailings 611
Dumps
Estimates of Uranium Content and Radon Flux for Uranium Mine Dumps Based on Borehole Radioactivity Logs - Topical Report 610
Durability
A Review of Long-Term Rock Durability: Implications for Survivability of Riprap Used to Protect Uranium Mill Tailings 569
Early
Early Diagenesis of Uranium Mine Stope Backfill 496
Earth
Radon Control by Multilayer Earth Barriers: Field Tests 415
Earthen
A Field Experiment on Tailings Reclamation: Radon Flux Versus Earthen Cover Depth 549
Evidence for the Long-Term Stability of Uranium Mill Tailings: Survivability of Ancient Man-Made Earthen Structures 571
A Complete Description of Radon Diffusion in Earthen Materials 614
Simulation of Water Flow and Retention in Earthen-Cover Materials Overlying Uranium Mill Tailings 624
Earths
Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32
Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching 603
EBR
Decontamination and Decommissioning of the EBR-1 Complex, Topical Report No. 1 - Removal of NaK from EBR-1 Storage Pit 118
Eckhart
Radiological Survey of Eckhart Hall, The University of Chicago, Chicago, Illinois, September 14, 1976-March 22, 1977 393
Ecological
Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111
Investigations Into Selected Ecological Aspects of the Aquatic and Terrestrial Environment of an Abandoned Uranium Mill Tailings Pond, Bancroft, Ontario 559
Economic
Economic Impact of Closing Zion Nuclear Facility 12
Economic Evaluation of Volume Reduction for Defense Transuranic Waste 114
Economic Comparison of Centralizing or Decentralizing Processing Facilities for Defense Transuranic Waste 115
Economics
Nuclear Economics: Taxation, Fuel Cost, and Decommissioning 203
Effectiveness
Cost and Effectiveness of Radon Barrier Systems 486
Effect of Rock Cover on Multilayer Radon Barrier Effectiveness 564
Radon Attenuation Effectiveness and Cost Optimization of Composite Covers for Uranium Mill Tailings 615

PERMUTED TITLE INDEX

Efficient
Investigation of Highly Efficient Decontamination Solutions for Decommissioning of Pressurized Water Reactor Power Plants 266
Effluent
Evaluation of the 1943 to 1946 Liquid Effluent Discharge from the Linde Air Products Company Ceramics Plant 392
Effluents
Studies on the Treatment of Uranium Mill Effluents 562
Characterization and Disposal of Radioactive Effluents from Uranium Mining 587
Effort
The Research Effort of the Uranium Mill Tailings Remedial Actions Project 433
Efforts
Canonsburg Construction Firm Selected for Vicinity Property Cleanup Efforts 458
Eh
Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573
Electric
General Electric Fuels Laboratory Decontamination and Decommissioning 97
General Electric Fuels Laboratory Decontamination and Decommissioning 171
General Electric Fuels Laboratory Decontamination and Decommissioning - Appendices 172
Investigation of Reactor Decommissioning as a Precaution by Electric Utilities 202
Electrochemical
Electrochemical Decontamination of Metallic Surfaces 244
Behaviour of Polonium During Electrochemical Steel Polishing Process 248
Electrolyte
Electrolyte Solution for Electropolishing 265
Electrolytic
Electrolytic Decontamination of Torus Steel for Release as Salvage 245
Electropolishing
Sectioning of Contaminated Components for Decontamination by Vibratory Finishing and Electropolishing 251
Electropolishing of Nickel-Containing Austenitic Stainless Steel and Nickel-Base Alloys 255
Electropolishing of Carbon Steel and Stainless Steel and Its Industrial Application 256
Electropolishing of Stainless Steel 260
Electropolishing Goes Functional 262
Electrolyte Solution for Electropolishing 265
Elevation
Pre-decontamination Gamma-Ray Surface Scans in TMI-2 Containment Building 305 Foot Elevation 36
Elliot
Hydrogeochemical Investigations of Two Inactive Tailings Areas in the Elliot Lake Uranium District, Ontario, Canada 525
Environmental Assessment of Uranium Mining in Elliot Lake, Ontario 534
Contaminant Migration in a Sand Aquifer near an Inactive Uranium Tailings Impoundment, Elliot Lake, Ontario 589
Decontamination of Elliot Lake Uranium Tailings 606
Remedial Works at Dam No. 1, Elliot Lake, Ontario 608
Survey of the Occurrence of Ra-226 in the Rio Algom Quirke I Uranium Mill, Elliot Lake 625

PERMUTED TITLE INDEX

Elsewhere
Waste Management '81 - The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs and Public Communications 345
Emanation
Observed Reduction of Radon-222 Gas Emanation from Uranium Tailings Using a New Chemical Encapsulation Process 523
Radon Emanation from Stopes Backfilled with Cemented Uranium Mill Tailings 528
Sealant Tests to Control Radon Emanation in a Uranium Mine 568
Radon Emanation Characteristics of Uranium Mill Tailings 598
Effect of Moisture Content on Radon Emanation from Uranium Ore and Tailings 629
The Effects of Moisture on Radon Emanation Including the Effects on Diffusion 634
Embankment
Probabilistic Modeling of Tailings Embankment Designs - Volume 1: Model Development and Verification 484
Probabilistic Modeling of Tailings Embankment Designs, Volume 2: Model Application and Verification 536
Embankments
Horizontal Pipe Drain Design for Existing Mill Tailings Embankments 654
Emergency
Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111
Emissions
Health Effects of Radon Emissions from Uranium Mill Tailings 510
Emphasis
Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching 603
Leaching of Uranium Ore with Emphasis on the Fate of Radium 604
Emulsion
Field Testing of Asphalt Emulsion Radon Barrier System 545
Stabilization of Uranium Mill Tailings with Asphalt Emulsion 546
Encapsulation
Observed Reduction of Radon-222 Gas Emanation from Uranium Tailings Using a New Chemical Encapsulation Process 523
Energy
United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27
U.S. Nuclear-Energy Policy: Provisions of Funds for Decommissioning 28
Environmental Surveillance Plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York 44
An Aerial Radiological Survey of the U.S. Department of Energy's Mound Facility, Miamisburg, Ohio - Date of Survey: July 1976 45
An Aerial Radiological Survey of United States Department of Energy Sites in Ames, Iowa, Date of Survey: May 1977 46
U.S. Department of Energy Activities in Low-Level Radioactive Waste Treatment 139
Decommissioning at the U.S. Department of Energy 151
United States Department of Energy Surplus Facilities Management Program 163
Nuclear Energy: The Real Costs 219
Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works 391

PERMUTED TITLE INDEX

Enlargement
Observational Approach to Tailings Dam Enlargement 626

Enrico
Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 38 30
Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 37 98
Evaluation of Nuclear Facility Decommissioning Projects - Summary Report: Enrico Fermi-1 Reactor 158

Environment
Intervention Device for Use in a Hostile Environment 267
State Policies and Requirements for Management of Uranium Mining and Milling in New Mexico: Volume 3 - Adverse Effects of Uranium Mining and Milling on the Physical Environment 446
Investigations Into Selected Ecological Aspects of the Aquatic and Terrestrial Environment of an Abandoned Uranium Mill Tailings Pond, Bancroft, Ontario 559
Distribution of Radium and Chemical Toxins in the Environment of a Uranium Complex 578
Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment 592

Environments
Clay Liner Permeability in Low pH Environments 591

Environs
Concentrations and Biological Availability of U-238 and Th-230 in the Environs of a Uranium Milling Operation 555

EPA
EPA Issues Standards on Uranium Tailings 454
Simple Field Method for Determining Compliance with EPA Land Cleanup Standards 618

Equipment
Surface Concrete Decontamination Equipment Developed by Pacific Northwest Laboratory 68
Equipment Decontamination with Special Attention to Solid Waste Treatment: Survey Report 246
Decontamination of Equipment in Nuclear Power Plants With WWER-440 Reactors 247
Tools and Equipment: From Nuclear Waste to Reuseable Items 259
Laser Cutting Equipment for Dismantling Irradiated PFR Fuel Sub-Assemblies 298
Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310
Technology and Equipment for Gas-Laser Cutting of Sheet Steels 321
Principles and Recommended Practice for Decontamination of Radioactive Areas and Equipment 329

Erosion
Hydroseeding and Erosion Control Chemicals 561

Estimated
Estimated Dose to Man from Uranium Milling Via the Terrestrial Food-Chain Pathway 607

Estimates
Criteria and Cost Estimates for Decommissioning and Decontamination of Major Plutonium Buildings at Rocky Flats Plant 2
Pathways Analysis and Radiation Dose Estimates for Radioactive Residues at Formerly Utilized MED/AEC Sites 379

PERMUTED TITLE INDEX

Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado 479
Estimates of Uranium Content and Radon Flux for Uranium Mine Dumps Based on Borehole Radioactivity Logs - Topical Report 610

Estimating

Estimating Radiological Conditions for Decommissioning Studies 218
Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations 641

Estimation

Estimation of Radiological Impact from Transportation of Uranium Mill Tailings 506
Estimation of Radiological Impact from Transportation of Uranium Mill Tailings - Part II: Dispersion and Dosimetry 657

Eurochemic

Decontamination and Partial Dismantling of the Eurochemic Plant: Part 1 - Decontamination of the Head-End Cells and Partial Dismantling of Two Dissolvers 285
Status of the Decommissioning Program of the Eurochemic Reprocessing Plant 368

European

Decommissioning Research in the Commission of European Communities' Program on Decommissioning of Nuclear Power Plants 224
Overview of Decommissioning Research and Development Activities in the European Community 370

Evaluations

Environmental and Other Evaluations of Alternatives for Management of Defense Transuranic Waste at the Idaho National Engineering Laboratory 133

Evaporator

Final Report - Decontamination and Decommissioning of TAN Radioactive Liquid Waste Evaporator System (PM-2A) 96

Excess

Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado 479

Exemption

Exemption of Low-Level Decommissioning Waste from Controlled Handling and Disposal 335

Existing

Stabilization of Existing Uranium Mill Tailings Piles at Uravan, Colorado 401
Horizontal Pipe Drain Design for Existing Mill Tailings Embankments 654

Expansion

Dawn Mining's Tailings Expansion Project - A Case Study in the Use of HDPE Lining 443

Experience

Three Mile Island Concrete Decontamination Experience 71
Mound's Decommissioning Experience, Tooling, and Techniques 152
Decontamination Experience at CANDU-PHW Reactors 258
Waste Management Experience from the Lucens Plant Incident and Decommissioning 332
Experience in Treatment of Components, Waste Treatment, Packaging and Shipping Related to Decommissioning 333
Recent National and International Decommissioning Experience 365
Operational Experience on Radon Monitoring 648

Explosive

Method for Explosive Demolition of Reactor Pressure Vessel 292

PERMUTED TITLE INDEX

Explosives
Dismantling Techniques for Reactor Components Using Explosives 291
Exportable
Engineering Analysis and Costs of Product Conversion, Refabrication, Waste Treatment, and Plant Decommissioning of an Exportable Pyrochemical Process 211
Exposure
Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado 479
Radiation Exposure - Remedial Action 481
Extract
Use of Phosphate Compounds to Extract Thorium-230 and Radium-226 from Uranium Ore and Tailings 547
Extraction
A Historical Review of the Radium-Extraction Industry in the United States (1906-1926) 427
F
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices A-F 136
Fabricating
Fabricating Centers Cut with Numerical Control Accuracy 309
Fabrication
Environmental Assessment Decontamination and Decommissioning of Plutonium Fabrication Facility, Building 350 ANL-Illinois 3
Plan for Decontamination and Decommissioning the Building 350 Plutonium Fabrication Facility 16
The Decontamination of the Curium Source Fabrication Facility 73
Decommissioning a Plutonium Fabrication Facility 87
Facilitation
Decommissioning of Multiple-Reactor Stations: Facilitation by Sequential Decommissioning 217
Failures
Summary of Research on Analyses of Flow Failures of Mine Tailings Impoundments 557
Summary of Research on Case Histories of Flow Failures of Mine Tailings Impoundments 574
Falls
Environmental Surveillance Plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York 44
Summary Report on NLO Remedial Projects at the DOE-Niagara Falls Storage Site 166
Baseline Data and Land Use Impact of the Falls City, Texas Uranium Tailings Site 407
Land Use Study of the Falls River Uranium Site 422
Fate
Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment 592
Leaching of Uranium Ore with Emphasis on the Fate of Radium 604
Feasibility
West Valley Feasibility Study 72
System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design 289
Ocean FUSRAP: Feasibility of Ocean Disposal of Materials from the Formerly Utilized Sites Remedial Action Program (FUSRAP) 384
Ocean Disposal Feasibility Study: Candidate DOE (FUSRAP) Soil Characterization 385

PERMUTED TITLE INDEX

February

Quarterly Progress Report No. 45 for Second Quarter, CY 1968 Covering the Period of January, February, and March 1968 **79**

Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Defense Program **181**

Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Commercial Program **182**

NS Otto Hahn - Test Report No. 29 for the Period Between April 13, 1978, and February 17, 1979: Fuel Element Removal and Transport Between February 17, 1979 and November 22, 1979 **208**

Uranium Mining and Milling Environmental Studies: 1970 - February, 1981 (Citations from the Engineering Index Data Base) **594**

Federal

Cleaning Up Nuclear Facilities - An Aggressive and Unified Federal Program is Needed **14**

Federal Bailout of Nuclear Industry a Waste of Funds **150**

Closing-Down of Nuclear Power Stations in the Federal Republic of Germany **229**

Regulations and Financing for Decommissioning of Nuclear Facilities: The Federal Republic of Germany **236**

Fermi

Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 38 **30**

An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 **53**

Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 37 **98**

Evaluation of Nuclear Facility Decommissioning Projects - Summary Report: Enrico Fermi-1 Reactor **158**

Field

In Situ Vitrification of Contaminated Soil: Pilot-Scale Field Testing **103**

RMDF Leach Field Decontamination - Final Report **104**

Near-Field Impact of 216-U-10 (U-Pond) Decommissioning on the Unconfined Aquifer **126**

Radon Control by Multilayer Earth Barriers: Field Tests **415**

Uranium Mill Tailings Remedial Action (UMTRA) Joint Field Test **416**

Field Testing of Asphalt Emulsion Radon Barrier System **545**

A Field Experiment on Tailings Reclamation: Radon Flux Versus Earthen Cover Depth **549**

A Counting System for Field Determination of Radium-226 in Soils **584**

Simple Field Method for Determining Compliance with EPA Land Cleanup Standards **618**

Design, Construction, and Field Testing of a Heap Leach Clay Pad **646**

Fillers

Mineral Waste Resources of Canada - Mineral Wastes as Potential Fillers **512**

Filter

Demolition of Building 12, An Old Plutonium Filter Facility **82**

Demolition of Building 12, An Old Plutonium Filter Facility **83**

Final

Funding Nuclear Power Plant Decommissioning - Final Report **6**

Final Report - Decontamination and Decommissioning of TAN Radioactive Liquid Waste Evaporator System (PM-2A) **96**

KEWB Facilities Decontamination and Disposition: Final Report **99**

PERMUTED TITLE INDEX

RMDF Leach Field Decontamination - Final Report 104
Decommissioning Peach Bottom Unit 1 - Final Report 165
S8ER Facilities Decommissioning - Final Report 170
Classifying Decommissioning Wastes for Allocation to Appropriate Final Repositories 330
Radiological Survey of the Former Uranium Recovery Pilot and Process Sites, Gardinier, Incorporated, Tampa, Florida - Final Report 382
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 1 466
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 2 467
Final Report: Immobilization of U-Th-Ra in Mine Wastes 498

Financing

Regulations and Financing for Decommissioning of Nuclear Facilities, France 213
Regulations and Financing for Decommissioning of Nuclear Facilities: The Federal Republic of Germany 236

Fine

Stabilization of Fine Uranium Mill Tailings 576

Finishing

Cost-Benefits of a Mobile, Trailer-Contained, Vibratory Finishing Decontaminstion Facility 69
Sectioning of Contaminated Components for Decontamination by Vibratory Finishing and Electropolishing 251

Firm

Canonsburg Construction Firm Selected for Vicinity Property Cleanup Efforts 458

Flat

An Aerial Radiological Survey of Areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15 and 17 Yucca Flat, Nevada Test Site 47

Flats

Criteria and Cost Estimates for Decommissioning and Decontamination of Major Plutonium Buildings at Rocky Flats Plant 2

Florida

Radiological Survey of the Former Uranium Recovery Pilot and Process Sites, Gardinier, Incorporated, Tampa, Florida - Final Report 382

Flow

Design of Impervious Clay Liners by Unsaturated Flow Principles 501
Migration of Radionuclide Chains in a Non-Homogeneous Aquifer under Transient Saturated-Unsaturated Flow Conditions 538
Summary of Research on Analyses of Flow Failures of Mine Tailings Impoundments 557
Summary of Research on Case Histories of Flow Failures of Mine Tailings Impoundments 574
Simulation of Water Flow and Retention in Earthen-Cover Materials Overlying Uranium Mill Tailings 624

Flux

Measurements and Calculations of Radon Flux Attenuation by Western U.S. Soils 440
An Improved Radon Flux Measurement System for Uranium Tailings Pile Measurement 529
A Field Experiment on Tailings Reclamation: Radon Flux Versus Earthen Cover Depth 549
Research on Radon Flux Reduction from Uranium Mill Tailings 599
Estimates of Uranium Content and Radon Flux for Uranium Mine Dumps Based on Borehole Radioactivity Logs - Topical Report 610

'ERMUTED TITLE INDEX

Foam

The Use of Urethane Foam in the Decontamination and Decommissioning of Nuclear Facilities 70

Food

Review of Parameters Describing Terrestrial Food-Chain Transport of Lead-210 and Radium-226 582

Estimated Dose to Man from Uranium Milling Via the Terrestrial Food-Chain Pathway 607

Foot

Pre-decontamination Gamma-Ray Surface Scans in TMI-2 Containment Building 305 Foot Elevation 36

Forage

Forage Uptake of Uranium Series Radionuclides in the Vicinity of the Anaconda Uranium Mill 439

Forest

Environmental Surveillance of the Palos Park Forest Preserve 381

Former

Radiological Survey of the Former Uranium Recovery Pilot and Process Sites, Gardinier, Incorporated, Tampa, Florida - Final Report 382

Project Report of Phase I Remedial Action of Properties Associated with the Former Middlesex Sampling Plant Site 387

Framework

Decommissioning Engineering Within the Framework of the French Nuclear Structure 223

France

Regulations and Financing for Decommissioning of Nuclear Facilities, France 213

Frankford

Review of Costs to Close the Frankford Arsenal 13

Decontamination of the Frankford Arsenal 78

French

French R and D Program on Decommissioning Tooling and Techniques 205

Decommissioning Engineering Within the Framework of the French Nuclear Structure 223

Fuel

Design Criteria of Decommissioning of Nuclear Fuel Reprocessing Plants 11

Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision 33

An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43

Radiological Assessment of the Decontamination and Decommissioning of a Small-Scale Fuel-Reprocessing Plant 59

Decontamination and Decommissioning of Fuel Reprocessing Cells at the Idaho Chemical Processing Plant 76

Spent Fuel and Waste Inventories and Projections 116

Integrated Data Base for Spent Fuel and Radwaste: Inventories 129

Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics 130

Nuclear Economics: Taxation, Fuel Cost, and Decommissioning 203

NS Otto Hahn - Test Report No. 29 for the Period Between April 13, 1978, and February 17, 1979: Fuel Element Removal and Transport Between February 17, 1979 and November 22, 1979 208

PERMUTED TITLE INDEX

Decommissioning of Independent Spent Fuel Storage Installations 215
Laser Cutting Apparatus for Nuclear Core Fuel Subassembly 277
Laser Cutting Equipment for Dismantling Irradiated PFR Fuel Sub-Assemblies 298
Decommissioning a Spent Fuel Processing Facility - Low Level Waste Management 357
Characterization of Nuclear Fuel Cycle Facilities Requiring Decommissioning and Decontamination 361
Decommissioning of Nuclear Fuel Facilities 363
Decommissioning of Nuclear Fuel Facilities 364
Decommissioning of Nuclear Fuel Facilities 367
Nuclear Fuel Cycle - Uranium Mining and Uranium Milling 502

Fuels

General Electric Fuels Laboratory Decontamination and Decommissioning 97
General Electric Fuels Laboratory Decontamination and Decommissioning 171
General Electric Fuels Laboratory Decontamination and Decommissioning - Appendices 172

Fully

Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision 33

Functional

Electropolishing Goes Functional 262

Funding

Funding Nuclear Power Plant Decommissioning - Final Report 6
Three Mile Island: Searching for Pennsylvania Initiatives (Alternatives for Funding Cleanup) 269

Funds

U.S. Nuclear-Energy Policy: Provisions of Funds for Decommissioning 28
Federal Bailout of Nuclear Industry a Waste of Funds 150
Bankruptcy Potential Threatens Decommissioning Funds, Says NRC 200
Assuring the Availability of Funds for Decommissioning Nuclear Facilities 234

Furnace

Vacuum Furnace for Radioactive Waste Volume Reduction 283

FUSRAP

Preliminary Radiation Dose Analysis for Reference FUSRAP Waste Sites 383
Ocean FUSRAP: Feasibility of Ocean Disposal of Materials from the Formerly Utilized Sites Remedial Action Program (FUSRAP) 384
Ocean Disposal Feasibility Study: Candidate DOE (FUSRAP) Soil Characterization 385

Future

Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching 603

FY

Surplus Facilities Management Program - Program Plan, FY 1983-1987 175
Surplus Facilities Management Program - Program Plan, FY 1983-1987 176
Surplus Facilities Management Program - Program Plan, FY 1983-1987 177

G

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q 137

Gamma

Pre-decontamination Gamma-Ray Surface Scans in TMI-2 Containment Building 305 Foot Elevation 36

PERMUTED TITLE INDEX

Surface and Subsurface Gamma Survey of the Kellex Site, Jersey City, New Jersey - Date of Survey: September 8-11, 1980 378
Gamma Survey Measurement Techniques at UMTRAP Sites 426
Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado 479

Gardinier

Radiological Survey of the Former Uranium Recovery Pilot and Process Sites, Gardinier, Incorporated, Tampa, Florida - Final Report 382

Gas

Dismantling Commercial Atomic Reactor Pressure Vessels - Combined Gouging and Gas Cutting Process Used Underwater 295
Gas Welding and Cutting Torches 303
Technology and Equipment for Gas-Laser Cutting of Sheet Steels 321
Aerosols from Oxy-acetylene Gas Cutting Operations on Metal Plates: A Laboratory Study 325
Decommissioning of the Windscale Advanced Gas-Cooled Reactor 343
Interaction of Acidic Leachate with Soil Materials at Lucky McPathfinder Mill, Gas Hills, Wyoming 413
Design and Seepage Modeling Studies of Below-Grade Disposal, West Gas Hills, Wyoming 417
Observed Reduction of Radon-222 Gas Emanation from Uranium Tailings Using a New Chemical Encapsulation Process 523

Generated

Alternatives for Management of Wastes Generated by the Formerly Utilized Sites Remedial Action Program 380

Generating

An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 48
Decommissioning of Nuclear Generating Stations 209

Generator

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control (1965-1975) 168

Generic

A Generic Model of Contaminant Migration from Uranium Tailings Impoundments 620

Geochemical

Geochemical Investigation of UMTRAP Designated Site at Canonsburg, Pennsylvania 431
Hydro-Geochemical Studies of Uranium Mill Tailing Piles at Riverton, Wyoming and Maybell, Colorado 435
Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, New Mexico: Application of Eh-pH Diagrams 573

Geological

Report on Preliminary Geological, Hydrological and Radiological Survey at the Weldon Spring Quarry During 1976 and 1977 49

George

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398

Geotextiles

Use of Geotextiles in Uranium-Gold Tailings Impoundments in South Africa 491

PERMUTED TITLE INDEX

German
Plans and Activities for Decommissioning of LWR Power Plants by the German Utilities 207
NS Otto Hahn - The First German Nuclear Ship 369

Germany
Closing-Down of Nuclear Power Stations in the Federal Republic of Germany 229
Progress Report on Germany - Plans for Decommissioning 230
Regulations and Financing for Decommissioning of Nuclear Facilities: The Federal Republic of Germany 236
Dismantlement of Nuclear Power Stations in Germany 323

Gnome
The Gnome Site Decontamination and Decommissioning Project 110

Goes
Electropolishing Goes Functional 262

Going
Survey of On-Going and Completed Remedial Action Projects 162

Gold
Use of Geotextiles in Uranium-Gold Tailings Impoundments in South Africa 491

Gouging
Gouging the Answer to Nuclear Dismantling Problems 294
Dismantling Commercial Atomic Reactor Pressure Vessels - Combined Gouging and Gas Cutting Process Used Underwater 295

Governing
A Qualitative Evaluation of Long-Term Processes Governing the Behaviour of Uranium Mill Tailings Placed in Deep Lakes 583

Grade
Conceptual Design Report: Below-Grade Bulk Waste Disposal Facility - Formerly Utilized Sites Remedial Action Program 374
Design and Seepage Modeling Studies of Below-Grade Disposal, West Gas Hills, Wyoming 417

Grand
Unsaturated Hydraulic Parameters of Grand Junction Uranium Tailings 475
Meteorological Tower Data, Grand Junction Tailings Site, CO - Semi-annual Report, July-December, 1981 480

Grants
Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico 429
Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573

Graphite
Assessment of Management Modes for Graphite Wastes from Reactor Decommissioning 356

Grinding
Separation of Transuranic Radionuclides from Soil by Vibratory Grinding 113

Ground
Aerial and Ground-Based In Situ Measurements for Evaluation and Implementation of Radioactive Site Cleanup 60
Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573

PERMUTED TITLE INDEX

Grounds

The 1979 State-by-State Assessment of Low-Level Radioactive Wastes Shipped to Commercial Burial Grounds 125

Revegetation of Disturbed Grounds in the Semi-Arid Climate of Southcentral Washington 328

Groundwater

Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico 429

Computer Analysis of Seepage and Groundwater Response Beneath Tailings Impoundments 517

Groundwater Leaching of Neutralized and Untreated Acid-Leached Uranium Mill Tailings 533

Grouting

In Situ Grouting of Uranium Mill Tailings Piles 445

Grouting Research for Uranium Mill Tailings 628

Grove

Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois 395

Guard

Radiological Survey of the National Guerd Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois 395

Guidance

Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111

Guide

Design Guide for Metal and Nonmetal Tailings Disposal 627

Guidelines

Developing Guidelines on Managing Radioactive Waste 349

Radiological Guidelines for Application to DOE's Formerly Utilized Sites Remedial Action Program 389

Gundremmingen

Decommissioning of Unit A of the Nuclear Power Plant Gundremmingen and its Conversion to a Condition of Protective Storage 231

Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station 238

Habitat

Habitat Requirements and Burrowing Depths of Rodents in Relation to Shallow Waste Burial Sites 340

Hahn

NS Otto Hahn - Test Report No. 29 for the Period Between April 13, 1978, and February 17, 1979: Fuel Element Removal and Transport Between February 17, 1979 and November 22, 1979 208

Packaging, Transportation and Disposal of Nuclear Parts from Decommissioning of "N.S. Otto Hahn" 354

NS Otto Hahn - The First German Nuclear Ship 369

Decommissioning of NS Otto Hahn 372

Hall

Radiological Survey of Eckhart Hall, The University of Chicago, Chicago, Illinois, September 14, 1976-March 22, 1977 393

PERMUTED TITLE INDEX

Handbook
Handbook for the Design, Selection, and Construction of a Rock Cover for Retired Uranium Mill Tailings 600

Handle
Decommissioning of Nuclear Power Plants - How to Handle the Costs 233

Hanford
Interactive Planning System for Developing Decommissioning and Decontamination Plans at Hanford 18
Surface Soil Contamination Standards for Rockwell Hanford Operations 101

Has
Cotter Corporation's New Tailings Pond Has a Synthetic Liner 637

Hat
Baseline Data and Land Use Impact of the Mexican Hat Uranium Tailings Site 405

Hazard
The Chemical Characterization and Hazard Assessment of Uranium Mill Tailings 511

Hazardous
Methodology Used in Devising a New Solution to the Disposal of Hazardous Wastes Using Uranium Tailings as a Current Example 572

Hazards
Control of Physical Agent Hazards of Arc Welding and Cutting 274
Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Inhalation Hazards and Worker Protection 299
Radiation Hazards of Uranium Mining and Milling 530
Radiation Hazards in Mining: Control, Measurement, and Medical Aspects 535
Radiation Hazards Associated with Uranium Mill Operations 551

HDPE
Dawn Mining's Tailings Expansion Project - A Case Study in the Use of HDPE Lining 443

Head
Decontamination and Partial Dismantling of the Eurochemic Plant: Part 1 - Decontamination of the Head-End Cells and Partial Dismantling of Two Dissolvers 285

Health
Health Physics and Industrial Hygiene Aspects of Decontamination as a Precursor to Decommissioning 249
Health Effects of Uranium Mining and Milling for Commercial Nuclear Power 493
Health Effects of Radon Emissions from Uranium Mill Tailings 510

Heap
Design, Construction, and Field Testing of a Heap Leach Clay Pad 646

Hearings
Proposed Remedial Action Standards for Inactive Uranium Processing Sites - Instructions and Schedule for Public Hearings 470

Herbert
Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398

Hills
Interaction of Acidic Leachate with Soil Materials at Lucky McPathfinder Mill, Gas Hills, Wyoming 413
Design and Seepage Modeling Studies of Below-Grade Disposal, West Gas Hills, Wyoming 417

PERMUTED TITLE INDEX

Historical
A Historical Review of the Radium-Extraction Industry in the United States (1906-1926) 427

Histories
Summary of Research on Case Histories of Flow Failures of Mine Tailings Impoundments 574

History
Data Base for Radioactive Waste Management - Review of Low-Level Radioactive Waste Disposal History 334

HNPF
HNPF Retirement Disposition of Sodium 80

Homogeneous
Migration of Radionuclide Chains in a Non-Homogeneous Aquifer under Transient Saturated-Unsaturated Flow Conditions 538

Hood
Decontamination of the 233-S Building Loadout Hood 74
Decontamination of the 233-S Building Loadout Hood 75

Horizontal
Horizontal Logging as a Monitoring Tool 540
Horizontal Pipe Drain Design for Existing Mill Tailings Embankments 654

Hostile
Intervention Device for Use in a Hostile Environment 267

Hot
Torch Cuts Off "Hot" Plates - Underwater Cutting Solves Radioactive Disposal Problem 84
Dismantling of a Hot Cell of High Level Activity: Method and Tools Used 305

Human
Modification of the Natural Radionuclide Distribution by Some Human Activities in Canada 566

Hydraulic
Unsaturated Hydraulic Parameters of Grand Junction Uranium Tailings 475

Hydro
Hydro-Geochemical Studies of Uranium Mill Tailing Piles at Riverton, Wyoming and Maybell, Colorado 435

Hydrogeochemical
Hydrogeochemical Investigations of Two Inactive Tailings Areas in the Elliot Lake Uranium District, Ontario, Canada 525

Hydrologic
Recent Hydrologic Observations from the Riverton and Maybell Tailings Piles 447
Surface-Water Hydrologic Criteria for Uranium-Mine Tailings Impoundments in Ontario 492

Hydrological
Report on Preliminary Geological, Hydrological and Radiological Survey at the Weldon Spring Quarry During 1976 and 1977 49

Hydroseeding
Hydroseeding and Erosion Control Chemicals 561

Hygiene
Health Physics and Industrial Hygiene Aspects of Decontamination as a Precursor to Decommissioning 249

PERMUTED TITLE INDEX

IAEA

IAEA's Activities on Decommissioning and Decontamination 373

Idaho

Decontamination and Decommissioning of Fuel Reprocessing Cells at the Idaho Chemical Processing Plant 76

Environmental and Other Evaluations of Alternatives for Management of Defense Transuranic Waste at the Idaho National Engineering Laboratory 133

Baseline Data and Land Use Impact of the Lowman, Idaho Uranium Tailings Site 412

State of Idaho Community Summary Report for Radiation Surveys - Lowman, Idaho 463

Identification

Waste Identification, Characterization and Disposal During the D and D of a Non-Reactor Nuclear Facility 140

Illinois

Environmental Assessment Decontamination and Decommissioning of Plutonium Fabrication Facility, Building 350 ANL-Illinois 3

Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32

An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972 39

An Aerial Radiological Survey of the Argonne National Laboratory and Surrounding Area, Argonne, Illinois - Date of Survey: May 1977 52

An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 53

Radiological Survey of Eckhart Hall, The University of Chicago, Chicago, Illinois, September 14, 1976-March 22, 1977 393

Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394

Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois 395

Radiological Survey of Ryerson Physical Laboratory, The University of Chicago, Chicago, Illinois, September 11-25, 1976 396

Radiological Survey of Kent Chemical Laboratory, The University of Chicago, Chicago, Illinois, September 7-13, 1977 397

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398

ILW

ILW Transfer Line Decommissioning 25

Immediate

Evaluation of Immediate Dismantlement of CANDU Reactors at the End of Service Life 272

Immobilization

Immobilization of U-Th-Ra in Mine Wastes 497

Final Report: Immobilization of U-Th-Ra in Mine Wastes 498

Impact

Economic Impact of Closing Zion Nuclear Facility 12

Near-Field Impact of 216-U-10 (U-Pond) Decommissioning on the Unconfined Aquifer 126

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for

PERMUTED TITLE INDEX

Land Disposal of Radioactive Waste," Summary 134
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Main Report 135
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices A-F 136
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q 137
Baseline Data and Land Use Impact of the Shiprock Uranium Tailings Site 403
Baseline Data and Land Use Impact of the Tuba City Uranium Tailings Site 404
Baseline Data and Land Use Impact of the Mexican Hat Uranium Tailings Site 405
Baseline Data and Land Use Impact of the Monument Valley Uranium Tailings Site 406
Baseline Data and Land Use Impact of the Falls City, Texas Uranium Tailings Site 407
Baseline Data and Land Use Impact of the Lakeview, Oregon Uranium Tailings Site 408
Baseline Data and Land Use Impact of the Slick Rock Uranium Tailings Sites 409
Baseline Data and Land Use Impact of the Naturita Uranium Tailings Sites 410
Social Impact and Land Use at the Vitro Tailings Site 411
Baseline Data and Land Use Impact of the Lowman, Idaho Uranium Tailings Site 412
Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192): Draft Environmental Impact Statement 464
Regulatory Impact Analysis of Environmental Standards for Uranium Mill Tailings at Active Sites 465
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 1 466
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 2 467
Draft Environmental Impact Statement for Standards for the Control of Byproduct Materials from Uranium Ore Processing (40 CFR 192) 468
Estimation of Radiological Impact from Transportation of Uranium Mill Tailings 506
Estimation of Radiological Impact from Transportation of Uranium Mill Tailings - Part II: Dispersion and Dosimetry 657

Impacts
Waste Management Impacts of U.S. Decommissioning Activities 24
Soil-Water Impacts from Using Vegetation and Rock Covers for Surface Stabilization of Uranium-Mill Tailings 579

Impervious
Design of Impervious Clay Liners by Unsaturated Flow Principles 501

Implementation
Aerial and Ground-Based In Situ Measurements for Evaluation and Implementation of Radioactive Site Cleanup 60
Radiological Planning and Implementation for Nuclear Facility Decommissioning 228
Implementation of the Uranium Mill Tailings Radiation Control Act by the States 436
Implementation of the Uranium Mill Tailings Radiation Control Act of 1978 472

Implications
A Review of Long-Term Rock Durability: Implications for Survivability of Riprap Used to Protect Uranium Mill Tailings 569

Impoundment
Evaluation of Radionuclide and Trace Metal Migration Beneath an Inactive Tailing Impoundment 402
Contaminant Migration in a Sand Aquifer near an Inactive Uranium Tailings Impoundment, Elliot Lake, Ontario 589
Influence of Impoundment and Substratum Configuration on Seepage from Impoundments 595

PERMUTED TITLE INDEX

Impoundments
Use of Geotextiles in Uranium-Gold Tailings Impoundments in South Africa 491
Surface-Water Hydrologic Criteria for Uranium-Mine Tailings Impoundments in Ontario 492
Computer Analysis of Seepage and Groundwater Response Beneath Tailings Impoundments 517
The Use of Stage Curves and Mass Balances in the Design of Uranium Tailings Impoundments 554
Dam Break Studies for Mine Tailings Impoundments 556
Summary of Research on Analyses of Flow Failures of Mine Tailings Impoundments 557
Summary of Research on Case Histories of Flow Failures of Mine Tailings Impoundments 574
Influence of Impoundment and Substratum Configuration on Seepage from Impoundments 595
A Generic Model of Contaminant Migration from Uranium Tailings Impoundments 620
Rock Riprap Design Methods and Their Applicability to Long-Term Protection of Uranium Mill Tailings Impoundments 651

Incident
Waste Management Experience from the Lucens Plant Incident and Decommissioning 332

Independent
Decommissioning of Independent Spent Fuel Storage Installations 215

Index
Plasma Welding: 1970 - May 1982 (Citations from the Engineering Index Data Base) 313
Plasma Cutting: June 1970 - June 1982 (Citations from the Engineering Index Data Base) 314
Uranium Ore Treatment: January, 1970-May, 1981 (Citations from the Engineering Index Data Base) 593
Uranium Mining and Milling Environmental Studies: 1970 - February, 1981 (Citations from the Engineering Index Data Base) 594

Indian
Costs of Closing the Indian Point Nuclear Power Plant 29

Industrial
Health Physics and Industrial Hygiene Aspects of Decontamination as a Precursor to Decommissioning 249
Electropolishing of Carbon Steel and Stainless Steel and Its Industrial Application 256

Industry
Long-Term Problem for the Nuclear Industry 92
Federal Bailout of Nuclear Industry a Waste of Funds 150
A Historical Review of the Radium-Extraction Industry in the United States (1906-1926) 427
Study of the Utah Uranium-Milling Industry: Volume 1 - A Policy Analysis 448

INEL
Environmental Surveillance for the INEL Radioactive Waste Management Complex 50
Environmental Surveillance for the INEL Radioactive Waste Management Complex 51

Information
Transportation of Radioactive Materials: The Legislative and Regulatory Information System 124
Information Base for Commercial Radioactive Waste Management 127

Inhalation
Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Inhalation Hazards and Worker Protection 299

PERMUTED TITLE INDEX

Initiatives
Three Mile Island: Searching for Pennsylvania Initiatives (Alternatives for Funding Cleanup) 269
Instability
Evidence for the Instability of Silicate Minerals in Acid Leach Uranium Mill Tailings 504
Installations
Decommissioning of Nuclear Installations 206
Decommissioning of Independent Spent Fuel Storage Installations 215
Instructions
DFR Decommissioning: Operating Instructions for NaK Disposal by Burning in Atomized Jet 342
Proposed Remedial Action Standards for Inactive Uranium Processing Sites - Instructions and Schedule for Public Hearings 470
Instrumentation
Instrumentation for Off-Site Remedial Action in Salt Lake City, Utah 438
Integrated
Integrated Data Base for Spent Fuel and Radwaste: Inventories 129
Interaction
Interaction of Acidic Leachate with Soil Materials at Lucky McPathfinder Mill, Gas Hills, Wyoming 413
Evaluation of Inactive Uranium Mill Tailings Sites for Liner Requirements: Characterization and Interaction of Tailings, Soil and Liner Materials 609
Interactions
Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573
Thermodynamic Calculations and Phase Diagrams in Evaluating Tailings-Soil-Water Interactions 577
Interactive
Interactive Planning System for Developing Decommissioning and Decontamination Plans at Hanford 18
Interface
Evaluation of Interface Between Tailings and Subtailings Soil, A Case Study: Vitro Tailings, Salt Lake City, Utah 430
Interim
Interim Radiological Site Characterization and D&D Status Report - New Brunswick Laboratory, New Jersey Site 63
Model Environmental Assessment for a Property-Cleanup/Interim-Storage Remedial Action at a Formerly Utilized Site 386
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report 442
Interim Stabilization of Uranium Mill Tailings 522
Interior
Literature Survey of Interior-Surface Materials for the Advanced Size Reduction Facility 271
International
Aerial Radiological Surveys of Rockwell International Facilities, Canoga Park, California - Date of Surveys: June and July 1978 54
Plasma Welding: 1972 - June, 1982 (Citations from the International Aerospace Abstracts Data Base) 312
Recent National and International Decommissioning Experience 365
National/International R and D Programs on Uranium Mill Tailings 541

PERMUTED TITLE INDEX

Intervention
Intervention Device for Use in a Hostile Environment 267

Intrusions
Long-Term Biobarriers to Plant and Animal Intrusions of Uranium Tailings 507

Inventories
Residual Radioactivity Assessment in Nuclear Power Plant: Concentrations, Distribution Inventories 34
Spent Fuel and Waste Inventories and Projections 116
Radwaste Inventories and Projections: An Overview 128
Integrated Data Base for Spent Fuel and Radwaste: Inventories 129
Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics 130
Radioactive Waste Inventories and Projections 352

Inventory
Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island 241

Invitation
Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites - Invitation for Comment 471

Iowa
An Aerial Radiological Survey of United States Department of Energy Sites in Ames, Iowa, Date of Survey: May 1977 46

Iron
Decontamination of Uranium-Contaminated Iron by Smelting 268

Irradiated
Laser Cutting Equipment for Dismantling Irradiated PFR Fuel Sub-Assemblies 298
Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310

Irrigation
Irrigation of Disturbed Lands 519

Island
Three Mile Island Concrete Decontamination Experience 71
Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island 241
Three Mile Island: Searching for Pennsylvania Initiatives (Alternatives for Funding Cleanup) 269

Isolation
Waste Management '81 - The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs and Public Communications 345

Isotope
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 131

Issues
Nuclear Power Reactors: An Overview of Selected Issues 169
Current Uranium Mill Licensing Issues 441
EPA Issues Standards on Uranium Tailings 454

Items
Tools and Equipment: From Nuclear Waste to Reuseable Items 259

January
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 25, 1977-

PERMUTED TITLE INDEX

July 25, 1977 5
An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 48
Quarterly Progress Report No. 45 for Second Quarter, CY 1968 Covering the Period of January, February, and March 1968 79
Pluto Quarterly Report No. 11, January-March 1962 88
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1976-January 25, 1977 141
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program) 142
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1978-January 25, 1979 143
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1979-July 25, 1979 144
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1980-July 25, 1980 145
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1979-January 25, 1980 146
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1981-July 25, 1981 147
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1980-January 25-1981 148
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1981-January 25, 1982 153
Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Commercial Program 179
Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Defense Program 180
Uranium Mill Tailings Quarterly Report, January-March, 1982 428
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report 442
Leachability of Radioactive Constituents from Uranium Mine Tailings - Status Report - June 1974 to January 1977 499
Uranium Ore Treatment: January, 1970-May, 1981 (Citations from the Engineering Index Data Base) 593

Japan

Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310

Jersey

Project Management Plan for Decontamination and Decommissioning of New Brunswick Laboratory, New Jersey 15
Environmental Assessment - Decontamination and Decommissioning of the New Brunswick Laboratory, New Jersey Site 31
Interim Radiological Site Characterization and D&D Status Report - New Brunswick Laboratory, New Jersey Site 63
Surface and Subsurface Gamma Survey of the Kellex Site, Jersey City, New Jersey - Date of Survey: September 8-11, 1980 378
Environmental Monitoring Program for the DOE Middlesex, New Jersey Site 388

Jet

PERMUTED TITLE INDEX

Abrasive-Jet Cutting Examples and Concepts 287
High Pressure Water-Jet Scarification of High Density Concrete 288
Cutting Concrete with Abrasion Jet 326
DFR Decommissioning: Operating Instructions for NaK Disposal by Burning in Atomized Jet 342

Jets

System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design 289

Joint

Uranium Mill Tailings Remedial Action (UMTRA) Joint Field Test 416

Jones

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398

JPDR

JPDR Decommissioning Program 220

July

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 25, 1977-July 25, 1977 5
An Aerial Radiological Survey of the U.S. Department of Energy's Mound Facility, Miamisburg, Ohio - Date of Survey: July 1976 45
Aerial Radiological Surveys of Rockwell International Facilities, Canoga Park, California - Date of Surveys: June and July 1978 54
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1976-January 25, 1977 141
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program) 142
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1978-January 25, 1979 143
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1979-July 25, 1979 144
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1980-July 25, 1980 145
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1979-January 25, 1980 146
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1981-July 25, 1981 147
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1980-January 25-1981 148
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1981-January 25, 1982 153
Test Evaluation Shippingport Atomic Power Station LWBR Project (LWBR Development Program), July-August 1977 167
Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Commercial Program 190
Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Defense Program 192
Laser Metal Cutting: 1966 - July 1982 (Citations from the Metals Abstracts Data Base) 315
Meteorological Tower Data, Grand Junction Tailings Site, CO - Semi-annual Report, July-December, 1981 480

PERMUTED TITLE INDEX

Junction

Unsaturated Hydraulic Parameters of Grand Junction Uranium Tailings 475

Meteorological Tower Data, Grand Junction Tailings Site, CO - Semi-annual Report, July-December, 1981 480

June

An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 40

Aerial Radiological Surveys of Rockwell International Facilities, Canoga Park, California - Date of Surveys: June and July 1978 54

Quarterly Progress Report No. 46 for Third Quarter, CY 1968 Covering the Period of April, May, and June 1968 81

Pluto Quarterly Report No. 12, April-June 1962 89

Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Commercial Program 188

Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Defense Program 191

Plasma Welding: 1972 - June, 1982 (Citations from the International Aerospace Abstracts Data Base) 312

Plasma Cutting: June 1970 - June 1982 (Citations from the Engineering Index Data Base) 314

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398

Leachability of Radioactive Constituents from Uranium Mine Tailings - Status Report - June 1974 to January 1977 499

Kellex

Surface and Subsurface Gamma Survey of the Kellex Site, Jersey City, New Jersey - Date of Survey: September 8-11, 1980 378

Kent

Radiological Survey of Kent Chemical Laboratory, The University of Chicago, Chicago, Illinois, September 7-13, 1977 397

Kerntechnischer

Publication of the Safety Regulation KTA 1401 by Kerntechnischer Ausschuss - Dated April 13, 1981 222

Kerr

Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32

KEWB

KEWB Facilities Decontamination and Disposition: Final Report 99

Knudsen

Morrison-Knudsen Receives Contract for First Phase of $275 Million Uranium Mill Tailings Cleanup Project 453

KTA

Publication of the Safety Regulation KTA 1401 by Kerntechnischer Ausschuss - Dated April 13, 1981 222

Lab

Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394

Laboratories

PERMUTED TITLE INDEX

Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision 33
Decontamination of Battelle-Columbus Laboratories' Plutonium Facility 65

Laboratory

Environmental Assessment Related to the Decontamination and Decommissioning of the Argonne National Laboratory CP-5 Research Reactor 4
Project Management Plan for Decontamination and Decommissioning of New Brunswick Laboratory, New Jersey 15
Environmental Assessment - Decontamination and Decommissioning of the New Brunswick Laboratory, New Jersey Site 31
Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at Oak Ridge National Laboratory 35
An Aerial Radiological Survey of the Argonne National Laboratory and Surrounding Area, Argonne, Illinois - Date of Survey: May 1977 52
An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 53
Environmental Monitoring Summary for Ames Laboratory: Calendar Year 1981 61
Interim Radiological Site Characterization and D&D Status Report - New Brunswick Laboratory, New Jersey Site 63
Surface Concrete Decontamination Equipment Developed by Pacific Northwest Laboratory 68
The Decommissioning of a Tritium Contaminated Laboratory 86
Decommissioning of Ames Laboratory Research Reactor 90
General Electric Fuels Laboratory Decontamination and Decommissioning 97
Decommissioning the Ames Laboratory Research Reactor: A Brief Pictorial Report 100
Environmental and Other Evaluations of Alternatives for Management of Defense Transuranic Waste at the Idaho National Engineering Laboratory 133
General Electric Fuels Laboratory Decontamination and Decommissioning 171
General Electric Fuels Laboratory Decontamination and Decommissioning - Appendices 172
Aerosols from Oxy-acetylene Gas Cutting Operations on Metal Plates: A Laboratory Study 325
Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394
Radiological Survey of Ryerson Physical Laboratory, The University of Chicago, Chicago, Illinois, September 11-25, 1976 396
Radiological Survey of Kent Chemical Laboratory, The University of Chicago, Chicago, Illinois, September 7-13, 1977 397
Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report 442

Lake

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 38
Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works 391
Land Use Study of the Ambrosia Lake Tailing Site 419

PERMUTED TITLE INDEX

Evaluation of Interface Between Tailings and Subtailings Soil, A Case Study: Vitro Tailings, Salt Lake City, Utah 430
Instrumentation for Off-Site Remedial Action in Salt Lake City, Utah 438
Report on Conditions of Uranium Mill Site and Tailings at Ambrosia Lake, New Mexico 450
DOE Awards Contract for Salt Lake City Cleanup 457
Hydrogeochemical Investigations of Two Inactive Tailings Areas in the Elliot Lake Uranium District, Ontario, Canada 525
Environmental Assessment of Uranium Mining in Elliot Lake, Ontario 534
Contaminant Migration in a Sand Aquifer near an Inactive Uranium Tailings Impoundment, Elliot Lake, Ontario 589
Decontamination of Elliot Lake Uranium Tailings 606
Remedial Works at Dam No. 1, Elliot Lake, Ontario 608
Survey of the Occurrence of Ra-226 in the Rio Algom Quirke I Uranium Mill, Elliot Lake 625
Contaminant Transport from Uranium Mill Tailings in Ambrosia Lake, New Mexico 636
Radioactive Composition of Airborne Particulates at Ambrosia Lake, New Mexico 645

Lakes

A Qualitative Evaluation of Long-Term Processes Governing the Behaviour of Uranium Mill Tailings Placed in Deep Lakes 583

Lakeview

Baseline Data and Land Use Impact of the Lakeview, Oregon Uranium Tailings Site 408
Land Use Study of the Uranium Tailing Site at Lakeview, Oregon 423

Lance

Underwater Oxygen Lance - Cutting of Metals, Concrete and Stone 273

Land

Cleanup and Treatment of Radioactively Contaminated Land Including Areas Near Nuclear Facilities: A Selected Bibliography 105
Assessment of Change in Shallow Land Burial Limits for Defense Transuranic Waste 117
Criteria Needs for Siting, Licensing, Operation, Closure, Stabilization, and Decommissioning of Shallow Land Disposal Sites for Radioactive Waste 123
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 131
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Summary 134
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Main Report 135
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices A-F 136
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q 137
Baseline Data and Land Use Impact of the Shiprock Uranium Tailings Site 403
Baseline Data and Land Use Impact of the Tuba City Uranium Tailings Site 404
Baseline Data and Land Use Impact of the Mexican Hat Uranium Tailings Site 405
Baseline Data and Land Use Impact of the Monument Valley Uranium Tailings Site 406
Baseline Data and Land Use Impact of the Falls City, Texas Uranium Tailings Site 407
Baseline Data and Land Use Impact of the Lakeview, Oregon Uranium Tailings Site 408
Baseline Data and Land Use Impact of the Slick Rock Uranium Tailings Sites 409
Baseline Data and Land Use Impact of the Naturita Uranium Tailings Sites 410
Social Impact and Land Use at the Vitro Tailings Site 411

PERMUTED TITLE INDEX

Baseline Data and Land Use Impact of the Lowman, Idaho Uranium Tailings Site 412
Land Use Study of the Lowman Uranium Site 418
Land Use Study of the Ambrosia Lake Tailing Site 419
Land Use Study of the Riverton, Wyoming Uranium Tailings Site 420
Land Use Study of the Ray City Uranium Tailing Site 421
Land Use Study of the Falls River Uranium Site 422
Land Use Study of the Uranium Tailing Site at Lakeview, Oregon 423
Land Use Study of the Converse County Uranium Tailing Site 424
Loose Rock as Biobarriers in Shallow Land Burial 508
Dry Land Techniques in the Semiarid West 550
Simple Field Method for Determining Compliance with EPA Land Cleanup Standards 618

Landfill

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 38

Lands

Irrigation of Disturbed Lands 519
The Challenge of a Desert: Revegetation of Disturbed Desert Lands 649
The Reclamation of Disturbed Arid Lands 655

Laser

Laser Cutting Apparatus for Nuclear Core Fuel Subassembly 277
Laser Cutting Equipment for Dismantling Irradiated PFR Fuel Sub-Assemblies 298
Nibbling, Laser Cutting and Plasma-Arc Cutting 308
Improvements in Methods and Apparatus for Cutting, Welding and Surface Treating Using a Laser Beam in Conjunction with an Arc 311
Laser Metal Cutting: 1966 - July 1982 (Citations from the Metals Abstracts Data Base) 315
Technology and Equipment for Gas-Laser Cutting of Sheet Steels 321

Layers

Process for Decontaminating Objects Having Radioactive Layers 252

Leach

RMDF Leach Field Decontamination - Final Report 104
Evidence for the Instability of Silicate Minerals in Acid Leach Uranium Mill Tailings 504
Design, Construction, and Field Testing of a Heap Leach Clay Pad 646

Leachability

Leachability of Radioactive Constituents from Uranium Mine Tailings - Status Report - June 1974 to January 1977 499
Leachability of Barium-Radium Sulphate Sludges 552

Leachate

Interaction of Acidic Leachate with Soil Materials at Lucky McPathfinder Mill, Gas Hills, Wyoming 413

Leached

Groundwater Leaching of Neutralized and Untreated Acid-Leached Uranium Mill Tailings 533

Leaching

Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico 429
Groundwater Leaching of Neutralized and Untreated Acid-Leached Uranium Mill Tailings 533
Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment 592

PERMUTED TITLE INDEX

Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching 603

Leaching of Uranium Ore with Emphasis on the Fate of Radium 604

Lead

Review of Parameters Describing Terrestrial Food-Chain Transport of Lead-210 and Radium-226 582

Learned

Lessons Learned in Decommissioning the Sodium Reactor Experiment 155

Lecture

Statistics and the Statistician in Nuclear Site Decontamination and Decommissioning: Lecture Notes for a Four-Day Short Course 237

Legislative

Transportation of Radioactive Materials: The Legislative and Regulatory Information System 124

Lessons

Lessons Learned in Decommissioning the Sodium Reactor Experiment 155

Lewiston

Environmental Surveillance Plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York 44

License

Saxton Nuclear Experimental Corporation's Change Request No. 50 to Technical Specification and Request for Amendment No. 8 to License No. DPR-4 21

Licensed

Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites - Invitation for Comment 471

Directory and Profile of Licensed Uranium-Recovery Facilities 652

Licensing

United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27

Criteria Needs for Siting, Licensing, Operation, Closure, Stabilization, and Decommissioning of Shallow Land Disposal Sites for Radioactive Waste 123

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Summary 134

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Main Report 135

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices A-F 136

Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q 137

Current Uranium Mill Licensing Issues 441

A Simplified Method for Acquiring Meteorological Data for Siting and Licensing of Uranium Mill and Tailings Disposal Facilities 526

Life

Evaluation of Immediate Dismantlement of CANDU Reactors at the End of Service Life 272

Abandonment of Nuclear Power Stations at the End of Their Working Life 358

Light

Design of the Shippingport Light Water Breeder Reactor 9

Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following

PERMUTED TITLE INDEX

Postulated Accidents 159
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 160

Limits
Assessment of Change in Shallow Land Burial Limits for Defense Transuranic Waste 117

Linde
Evaluation of the 1943 to 1946 Liquid Effluent Discharge from the Linde Air Products Company Ceramics Plant 392

Line
ILW Transfer Line Decommissioning 25

Liner
A Comparative Evaluation of Liner Materials for Inactive Uranium Mill Tailings Piles 500
Clay Liner Permeability in Low pH Environments 591
Contact of Clay Liner Materials with Acidic Tailings Solutions 602
Evaluation of Inactive Uranium Mill Tailings Sites for Liner Requirements: Characterization and Interaction of Tailings, Soil and Liner Materials 609
Cotter Corporation's New Tailings Pond Has a Synthetic Liner 637
Contact of Clay Liner Materials with Acidic Tailings Solutions: 1 - Mineral Characterization 644

Liners
Design of Impervious Clay Liners by Unsaturated Flow Principles 501
Problems in Predicting the Permeability of Compacted Clay Liners 515

Lining
Dawn Mining's Tailings Expansion Project - A Case Study in the Use of HDPE Lining 443

Liquid
Final Report - Decontamination and Decommissioning of TAN Radioactive Liquid Waste Evaporator System (PM-2A) 96
Evaluation of the 1943 to 1946 Liquid Effluent Discharge from the Linde Air Products Company Ceramics Plant 392

Literature
Literature Survey of Interior-Surface Materials for the Advanced Size Reduction Facility 271
Long-Term Survivability of Riprap for Armoring Uranium-Mill Tailings and Covers: A Literature Review 570

Loadout
Decontamination of the 233-S Building Loadout Hood 74
Decontamination of the 233-S Building Loadout Hood 75

Logging
Horizontal Logging as a Monitoring Tool 540

Logs
Estimates of Uranium Content and Radon Flux for Uranium Mine Dumps Based on Borehole Radioactivity Logs - Topical Report 610

Longer
Directions in Low-Level Radioactive Waste Management - Low-Level Radioactive Waste Disposal: Commercial Facilities No Longer Operating 121

Loose
Loose Rock as Biobarriers in Shallow Land Burial 508

PERMUTED TITLE INDEX

Los

Los Alamos DP West Plutonium Facility Decontamination Project 1978-1981 66
Los Alamos DP West Plutonium Facility Decontamination Project 67
Environmental Analysis of Acid/Middle Pueblo Canyon, Los Alamos, New Mexico 375
Environmental Analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico 376

Louis

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 38

Low

Preliminary Characterization and Assessment of the Weldon Spring Low-Level Waste Disposal Site 56
Directions in Low-Level Radioactive Waste Management - Transporting Low-Level Waste: Effects of Regional Management 119
Waste Classification, a Proposed Methodology for Classifying Low-Level Radioactive Waste 120
Directions in Low-Level Radioactive Waste Management - Low-Level Radioactive Waste Disposal: Commercial Facilities No Longer Operating 121
Directions in Low-Level Radioactive Waste Management - An Analysis of Low-Level Waste Disposal Facility and Transportation Costs 122
The 1979 State-by-State Assessment of Low-Level Radioactive Wastes Shipped to Commercial Burial Grounds 125
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 131
U.S. Department of Energy Activities in Low-Level Radioactive Waste Treatment 139
Data Base for Radioactive Waste Management - Review of Low-Level Radioactive Waste Disposal History 334
Exemption of Low-Level Decommissioning Waste from Controlled Handling and Disposal 335
Volume Reduction Techniques in Low-Level Radioactive Waste Management 351
Low-Level Radioactive Waste 353
Decommissioning a Spent Fuel Processing Facility - Low Level Waste Management 357
Clay Liner Permeability in Low pH Environments 591
Long-Term Monitoring of Closed Low-Level Waste and Uranium Mill Tailings Disposal Sites 630

Lowman

Baseline Data and Land Use Impact of the Lowman, Idaho Uranium Tailings Site 412
Land Use Study of the Lowman Uranium Site 418
State of Idaho Community Summary Report for Radiation Surveys - Lowman, Idaho 463

Lucens

Waste Management Experience from the Lucens Plant Incident and Decommissioning 332

Lucky

Interaction of Acidic Leachate with Soil Materials at Lucky McPathfinder Mill, Gas Hills, Wyoming 413

LWBR

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program) 142
Test Evaluation Shippingport Atomic Power Station LWBR Project (LWBR Development Program), July-August 1977 167

LWR

Plans and Activities for Decommissioning of LWR Power Plants by the German Utilities 207

PERMUTED TITLE INDEX

Machine
A Plasma-Arc Cutting Machine 300
Machines
Plasma-Arc Cutting Methods and Plasma-Arc Cutting Machines 301
Macrofungi
Macrofungi on Uranium Mill Tailings - Associations and Metal Content 560
Magnox
Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island 241
Main
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Main Report 135
Man
Pathways to Man 543
Evidence for the Long-Term Stability of Uranium Mill Tailings: Survivability of Ancient Man-Made Earthen Structures 571
Estimated Dose to Man from Uranium Milling Via the Terrestrial Food-Chain Pathway 607
Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations 641
Managing
Developing Guidelines on Managing Radioactive Waste 349
Manhattan
Overview of Research in Radiation Biology and Protective Measures in the Manhattan Project During the War Years, 1942 to 1946 377
March
Quarterly Progress Report No. 45 for Second Quarter, CY 1968 Covering the Period of January, February, and March 1968 79
Pluto Quarterly Report No. 11, January-March 1962 88
Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Defense Program 194
Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Civilian Program 195
Radiological Survey of Eckhart Hall, The University of Chicago, Chicago, Illinois, September 14, 1976-March 22, 1977 393
Uranium Mill Tailings Quarterly Report, January-March, 1982 428
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report 442
Mass
The Use of Stage Curves and Mass Balances in the Design of Uranium Tailings Impoundments 554
Material
Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310
Shutdown of Nuclear Power Plants - Production of Activated Material from the Region of the Reactor Core by the Example of a Shutdown Pressurized Water Reactor 339
Materials
Transportation of Radioactive Materials: The Legislative and Regulatory Information System 124

PERMUTED TITLE INDEX

Literature Survey of Interior-Surface Materials for the Advanced Size Reduction Facility 271
Ocean FUSRAP: Feasibility of Ocean Disposal of Materials from the Formerly Utilized Sites Remedial Action Program (FUSRAP) 384
Interaction of Acidic Leachate with Soil Materials at Lucky McPathfinder Mill, Gas Hills, Wyoming 413
Draft Environmental Impact Statement for Standards for the Control of Byproduct Materials from Uranium Ore Processing (40 CFR 192) 468
Residual Radioactive Materials Act of 1978 473
A Comparative Evaluation of Liner Materials for Inactive Uranium Mill Tailings Piles 500
Protective Barriers for Containment of Toxic Materials 531
Contact of Clay Liner Materials with Acidic Tailings Solutions 602
Evaluation of Inactive Uranium Mill Tailings Sites for Liner Requirements: Characterization and Interaction of Tailings, Soil and Liner Materials 609
A Complete Description of Radon Diffusion in Earthen Materials 614
Simulation of Water Flow and Retention in Earthen-Cover Materials Overlying Uranium Mill Tailings 624
Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations 641
Contact of Clay Liner Materials with Acidic Tailings Solutions: 1 - Mineral Characterization 644

Maybell

Hydro-Geochemical Studies of Uranium Mill Tailing Piles at Riverton, Wyoming and Maybell, Colorado 435
Recent Radiochemistry Observations at the Riverton and Maybell Tailings Piles 444
Recent Hydrologic Observations from the Riverton and Maybell Tailings Piles 447

McGee

Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32

McPathfinder

Interaction of Acidic Leachate with Soil Materials at Lucky McPathfinder Mill, Gas Hills, Wyoming 413

Measurement

Gamma Survey Measurement Techniques at UMTRAP Sites 426
A Survey of Radon Measurement Needs and Activities in State Radiation Control Programs 514
An Improved Radon Flux Measurement System for Uranium Tailings Pile Measurement 529
Radiation Hazards in Mining: Control, Measurement, and Medical Aspects 535

Measurements

Aerial and Ground-Based In Situ Measurements for Evaluation and Implementation of Radioactive Site Cleanup 60
Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island 241
Measurements and Calculations of Radon Flux Attenuation by Western U.S. Soils 440
Radium-226 Measurements Below Uranium Mill Tailings Piles 494

Measures

Overview of Research in Radiation Biology and Protective Measures in the Manhattan Project During the War Years, 1942 to 1946 377

PERMUTED TITLE INDEX

MED

Pathways Ana'ysis and Radiation Dose Estimates for Radioactive Residues at Formerly Utilized MED/AEC Sites 379

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398

Medical

Radiation Hazards in Mining: Control, Measurement, and Medical Aspects 535

Melting

Applications of Plasma to the Refining and Melting of Metals 350

Mesa

Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado 479

Metal

Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Inhalation Hazards and Worker Protection 299

DC Plasma Torch for Metal Cutting 304

Laser Metal Cutting: 1966 - July 1982 (Citations from the Metals Abstracts Data Base) 315

Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Experimental System for Collection and Characterization 316

An Evaluation of the Performance of a Plasma Torch for the Cutting of Metal 318

Aerosols from Oxy-acetylene Gas Cutting Operations on Metal Plates: A Laboratory Study 325

Evaluation of Radionuclide and Trace Metal Migration Beneath an Inactive Tailing Impoundment 402

Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico 429

Macrofungi on Uranium Mill Tailings - Associations and Metal Content 560

Design Guide for Metal and Nonmetal Tailings Disposal 627

Metallic

Decontamination of Transuranically Contaminated Metallic Waste 64

Electrochemical Decontamination of Metallic Surfaces 244

Application of a Plasma Arc in Decontamination of Radioactive Metallic Wastes 257

Development and Verification Test on Remote Plasma Cutting of Large Metallic Waste 317

Metals

Underwater Oxygen Lance - Cutting of Metals, Concrete and Stone 273

Present State of Development of Plasma-Compressed Air Cutting of Metals 286

Survey of Underwater Cutting of Metals 293

Laser Metal Cutting: 1966 - July 1982 (Citations from the Metals Abstracts Data Base) 315

Processes Taking Place in Arc Plasmatron Chamber in Cutting of Metals 319

Applications of Plasma to the Refining and Melting of Metals 350

Metastable

An Assessment of the Data for Decommissioning Calculations on Ag-108 Metastable 235

Meteorological

Meteorological Tower Data, Grand Junction Tailings Site, CO - Semi-annual Report, July-December, 1981 480

A Simplified Method for Acquiring Meteorological Data for Siting and Licensing of Uranium Mill and Tailings Disposal Facilities 526

PERMUTED TITLE INDEX

Methodology

Waste Classification, a Proposed Methodology for Classifying Low-Level Radioactive Waste 120

Methodology for Establishing Decommissioning Priorities 174

A Benefit-Cost Methodology for Developing Environmental Standards for Uranium Mill Tailings Disposal 567

Methodology Used in Devising a New Solution to the Disposal of Hazardous Wastes Using Uranium Tailings as a Current Example 572

Mew

Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573

Mexican

Baseline Data and Land Use Impact of the Mexican Hat Uranium Tailings Site 405

Mexico

Environmental Analysis of Acid/Middle Pueblo Canyon, Los Alamos, New Mexico 375

Environmental Analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico 376

Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico 429

State Policies and Requirements for Management of Uranium Mining and Milling in New Mexico: Volume 3 - Adverse Effects of Uranium Mining and Milling on the Physical Environment 446

Report on Conditions of Uranium Mill Site and Tailings at Ambrosia Lake, New Mexico 450

National Uranium Resource Evaluation: Shiprock Quadrangle, Arizona, New Mexico, Colorado, and Utah 537

Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573

Contaminant Transport from Uranium Mill Tailings in Ambrosia Lake, New Mexico 636

Radioactive Composition of Airborne Particulates at Ambrosia Lake, New Mexico 645

Miamisburg

An Aerial Radiological Survey of the U.S. Department of Energy's Mound Facility, Miamisburg, Ohio - Date of Survey: July 1976 45

Middle

Environmental Analysis of Acid/Middle Pueblo Canyon, Los Alamos, New Mexico 375

Middlesex

Project Report of Phase I Remedial Action of Properties Associated with the Former Middlesex Sampling Plant Site 387

Environmental Monitoring Program for the DOE Middlesex, New Jersey Site 388

Migration

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 131

Evaluation of Radionuclide and Trace Metal Migration Beneath an Inactive Tailing Impoundment 402

Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico 429

Statistical Evaluation of Contamination from Uranium Mill Tailings by Physical Transport and Chemical Migration 503

Migration of Radionuclide Chains in a Non-Homogeneous Aquifer under Transient Saturated-Unsaturated Flow Conditions 538

Contaminant Migration in a Sand Aquifer near an Inactive Uranium Tailings Impoundment, Elliot Lake, Ontario 589

A Generic Model of Contaminant Migration from Uranium Tailings Impoundments 620

PERMUTED TITLE INDEX

Mile

Three Mile Island Concrete Decontamination Experience 71
Three Mile Island: Searching for Pennsylvania Initiatives (Alternatives for Funding Cleanup) 269

Milling

State Policies and Requirements for Management of Uranium Mining and Milling in New Mexico: Volume 3 - Adverse Effects of Uranium Mining and Milling on the Physical Environment 446
Study of the Utah Uranium-Milling Industry: Volume 1 - A Policy Analysis 448
Health Effects of Uranium Mining and Milling for Commercial Nuclear Power 493
Nuclear Fuel Cycle - Uranium Mining and Uranium Milling 502
Radiation Hazards of Uranium Mining and Milling 530
Concentrations and Biological Availability of U-238 and Th-230 in the Environs of a Uranium Milling Operation 555
Uranium Mining and Milling Environmental Studies: 1970 - February, 1981 (Citations from the Engineering Index Data Base) 594
Estimated Dose to Man from Uranium Milling Via the Terrestrial Food-Chain Pathway 607
Responsible Uranium Mining and Milling: An Overview 613
Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations 641

Million

Morrison-Knudsen Receives Contract for First Phase of $275 Million Uranium Mill Tailings Cleanup Project 453

Mills

Management of Wastes from Uranium Mines and Mills 635

Mine

Australia - Management of Mine and Mill Tailings 485
Surface-Water Hydrologic Criteria for Uranium-Mine Tailings Impoundments in Ontario 492
Early Diagenesis of Uranium Mine Stope Backfill 496
Immobilization of U-Th-Ra in Mine Wastes 497
Final Report: Immobilization of U-Th-Ra in Mine Wastes 498
Leachability of Radioactive Constituents from Uranium Mine Tailings - Status Report - June 1974 to January 1977 499
Dam Break Studies for Mine Tailings Impoundments 556
Summary of Research on Analyses of Flow Failures of Mine Tailings Impoundments 557
Radon Release and Dispersion from an Open Pit Uranium Mine 565
Sealant Tests to Control Radon Emanation in a Uranium Mine 568
Summary of Research on Case Histories of Flow Failures of Mine Tailings Impoundments 574
Estimates of Uranium Content and Radon Flux for Uranium Mine Dumps Based on Borehole Radioactivity Logs - Topical Report 610
Uranium Mine Tailings 616
What the Record Shows: Uranium Mine Tailings 639
Modeling of Seepage Through Mine Tailings Dams 647

Mineral

Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico 429
Removal of Radioactivity and Mineral Values from Uranium Mill Tailings 478

PERMUTED TITLE INDEX

Mineral Waste Resources of Canada - Mineral Wastes as Potential Fillers 512
Mineral Waste Resources of Canada - Mining Wastes in the Atlantic Provinces 513
Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573
Contact of Clay Liner Materials with Acidic Tailings Solutions: 1 - Mineral Characterization 644

Minerals
Evidence for the Instability of Silicate Minerals in Acid Leach Uranium Mill Tailings 504

Mines
Barriers for Radon in Uranium Mines 527
Management of Wastes from Uranium Mines and Mills 635

Minestope
Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573

Mining
Sohio Western Mining Company Tailing Dam 425
Dawn Mining's Tailings Expansion Project - A Case Study in the Use of HDPE Lining 443
State Policies and Requirements for Management of Uranium Mining and Milling in New Mexico: Volume 3 - Adverse Effects of Uranium Mining and Milling on the Physical Environment 446
Health Effects of Uranium Mining and Milling for Commercial Nuclear Power 493
Nuclear Fuel Cycle - Uranium Mining and Uranium Milling 502
Mineral Waste Resources of Canada - Mining Wastes in the Atlantic Provinces 513
Monitoring Program Design Recommendations for Uranium Mining Communities 524
Radiation Hazards of Uranium Mining and Milling 530
Environmental Assessment of Uranium Mining in Elliot Lake, Ontario 534
Radiation Hazards in Mining: Control, Measurement, and Medical Aspects 535
Characterization and Disposal of Radioactive Effluents from Uranium Mining 587
Uranium Mining and Milling Environmental Studies: 1970 - February, 1981 (Citations from the Engineering Index Data Base) 594
Responsible Uranium Mining and Milling: An Overview 613

Missouri
Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 38

Mobile
Cost-Benefits of a Mobile, Trailer-Contained, Vibratory Finishing Decontamination Facility 69

Model
Model Environmental Assessment for a Property-Cleanup/Interim-Storage Remedial Action at a Formerly Utilized Site 386
Probabilistic Modeling of Tailings Embankment Designs - Volume 1: Model Development and Verification 484
Probabilistic Modeling of Tailings Embankment Designs, Volume 2: Model Application and Verification 536
A Generic Model of Contaminant Migration from Uranium Tailings Impoundments 620

Modeling
Design and Seepage Modeling Studies of Below-Grade Disposal, West Gas Hills, Wyoming 417
Probabilistic Modeling of Tailings Embankment Designs - Volume 1: Model Development and Verification 484

PERMUTED TITLE INDEX

Probabilistic Modeling of Tailings Embankment Designs, Volume 2: Model Application and Verification 536
Physical Modeling of Tailings Dams Using Centrifuge Simulation Techniques 631
Modeling of Seepage Through Mine Tailings Dams 647

Models

Waste Management '80 - The State of Waste Disposal Technology, Mill Tailings, and Risk Analysis Models 346
Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations 641

Modes

Assessment of Management Modes for Graphite Wastes from Reactor Decommissioning 356

Moisture

Moisture Content Analysis of Covered Uranium Mill Tailings 434
Effect of Moisture Content on Radon Emanation from Uranium Ore and Tailings 629
The Effects of Moisture on Radon Emanation Including the Effects on Diffusion 634

Monitoring

Environmental Monitoring Summary for Ames Laboratory: Calendar Year 1981 61
Weldon Spring Storage Site - Environmental Monitoring Report for 1979 and 1980 62
Environmental Monitoring Program for the DOE Middlesex, New Jersey Site 388
Monitoring Program Design Recommendations for Uranium Mining Communities 524
Horizontal Logging as a Monitoring Tool 540
Stabilization, Engineering, and Monitoring Alternatives Assessment for Improving Regulation of Uranium Recovery Operations and Waste Management 619
Long-Term Monitoring of Closed Low-Level Waste and Uranium Mill Tailings Disposal Sites 630
Operational Experience on Radon Monitoring 648

Monthly

Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Commercial Program 178
Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Commercial Program 179
Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Defense Program 180
Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Defense Program 181
Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Commercial Program 182
Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Defense Program 183
Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Commercial Program 184
Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Commercial Program 185
Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Defense Program 186
Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Commercial Program 187
Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Commercial Program 188

PERMUTED TITLE INDEX

Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Defense Program 189
Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Commercial Program 190
Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Defense Program 191
Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Defense Program 192
Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Defense Program 193
Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Defense Program 194
Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Civilian Program 195
Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Defense Program 196
Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Civilian Program 197

Monument
Baseline Data and Land Use Impact of the Monument Valley Uranium Tailings Site 406

Moral
Decommissioning: Moral Dilemmas Revisited 216

Morris
An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972 39

Morrison
Morrison-Knudsen Receives Contract for First Phase of $275 Million Uranium Mill Tailings Cleanup Project 453

Mound
An Aerial Radiological Survey of the U.S. Department of Energy's Mound Facility, Miamisburg, Ohio - Date of Survey: July 1976 45
Mound's Decommissioning Experience, Tooling, and Techniques 152

Movement
Radionuclide Movement in Seepage and Its Control 632

Multidimensional
Multidimensional Analysis of Radon Diffusion Through Uranium Mill Tailings and Cover Systems 580

Multilayer
Radon Control by Multilayer Earth Barriers: Field Tests 415
Effect of Rock Cover on Multilayer Radon Barrier Effectiveness 564

Multiple
Decommissioning of Multiple-Reactor Stations: Facilitation by Sequential Decommissioning 217

MW
Decommissioning Study for the Beznau Nuclear Power Plant (2 X 350 MW) - the Swiss Approach 210

N
Packaging, Transportation and Disposal of Nuclear Parts from Decommissioning of "N.S. Otto Hahn" 354

NaK

PERMUTED TITLE INDEX

Decontamination and Decommissioning of the EBR-1 Complex, Topical Report No. 1 - Removal of NaK from EBR-1 Storage Pit 118

DFR Decommissioning: Operating Instructions for NaK Disposal by Burning in Atomized Jet 342

National

Environmental Assessment Related to the Decontamination and Decommissioning of the Argonne National Laboratory CP-5 Research Reactor 4

Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at Oak Ridge National Laboratory 35

An Aerial Radiological Survey of the Argonne National Laboratory and Surrounding Area, Argonne, Illinois - Date of Survey: May 1977 52

An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 53

Environmental and Other Evaluations of Alternatives for Management of Defense Transuranic Waste at the Idaho National Engineering Laboratory 133

Recent National and International Decommissioning Experience 365

Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois 395

National Uranium Resource Evaluation: Shiprock Quadrangle, Arizona, New Mexico, Colorado, and Utah 537

National/International R and D Programs on Uranium Mill Tailings 541

Natural

Modification of the Natural Radionuclide Distribution by Some Human Activities in Canada 566

Naturita

Baseline Data and Land Use Impact of the Naturita Uranium Tailings Sites 410

NEA

NEA Program on the Long-Term Aspects of Uranium Mill Tailings Management and Disposal 605

Needed

Cleaning Up Nuclear Facilities - An Aggressive and Unified Federal Program is Needed 14

Neglected

Uranium Mill Tailings: Congress Addresses a Long-Neglected Problem 474

Neutralized

Groundwater Leaching of Neutralized and Untreated Acid-Leached Uranium Mill Tailings 533

Neutron

Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station 238

Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island 241

Nevada

An Aerial Radiological Survey of Areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15 and 17 Yucca Flat, Nevada Test Site 47

NFS

An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43

NFSS

Environmental Surveillance Plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York 44

PERMUTED TITLE INDEX

Niagara
Environmental Surveillance Plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York 44
Summary Report on NLO Remedial Projects at the DOE-Niagara Falls Storage Site 166
Nibbling
Nibbling, Laser Cutting and Plasma-Arc Cutting 308
Nickel
Electropolishing of Nickel-Containing Austenitic Stainless Steel and Nickel-Base Alloys 255
Perspective on Potential Contributions to Reactor Decommissioning Problems Caused by Nickel-59 270
NLO
Summary Report on NLO Remedial Projects at the DOE-Niagara Falls Storage Site 166
Non
Waste Identification, Characterization and Disposal During the D and D of a Non-Reactor Nuclear Facility 140
Migration of Radionuclide Chains in a Non-Homogeneous Aquifer under Transient Saturated-Unsaturated Flow Conditions 538
Nonmetal
Design Guide for Metal and Nonmetal Tailings Disposal 627
Northwest
Surface Concrete Decontamination Equipment Developed by Pacific Northwest Laboratory 68
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report 442
Notes
Statistics and the Statistician in Nuclear Site Decontamination and Decommissioning: Lecture Notes for a Four-Day Short Course 237
Novel
A Novel Approach to Tailings Disposal 638
November
Quarterly Progress Report No. 48 for First Quarter, CY 1969 Covering the Period of October, November, and December 1969 95
Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Defense Program 183
Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Commercial Program 185
NS Otto Hahn - Test Report No. 29 for the Period Between April 13, 1978, and February 17, 1979: Fuel Element Removal and Transport Between February 17, 1979 and November 22, 1979 208
NRC
Bankruptcy Potential Threatens Decommissioning Funds, Says NRC 200
NS
NS Otto Hahn - Test Report No. 29 for the Period Between April 13, 1978, and February 17, 1979: Fuel Element Removal and Transport Between February 17, 1979 and November 22, 1979 208
NS Otto Hahn - The First German Nuclear Ship 369
Decommissioning of NS Otto Hahn 372
Numerical
Fabricating Centers Cut with Numerical Control Accuracy 309

PERMUTED TITLE INDEX

Oak

Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at Oak Ridge National Laboratory 35

Objects

Process for Decontaminating Objects Having Radioactive Layers 252

Observational

Observational Approach to Tailings Dam Enlargement 626

Ocean

Why Not in the Ocean? 344

Ocean FUSRAP: Feasibility of Ocean Disposal of Materials from the Formerly Utilized Sites Remedial Action Program (FUSRAP) 384

Ocean Disposal Feasibility Study: Candidate DOE (FUSRAP) Soil Characterization 385

October

Quarterly Progress Report No. 48 for First Quarter, CY 1969 Covering the Period of October, November, and December 1969 95

Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Defense Program 183

Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Commercial Program 185

Radioecological Investigations of Uranium-Mill-Tailings Systems: Second Technical Progress Report, October 1, 1980-September 30, 1981 476

Office

Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111

Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Commercial Program 178

Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Commercial Program 179

Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Defense Program 180

Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Defense Program 181

Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Commercial Program 182

Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Defense Program 183

Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Commercial Program 184

Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Commercial Program 185

Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Defense Program 186

Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Commercial Program 187

Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Commercial Program 188

Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Defense Program 189

Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Commercial

PERMUTED TITLE INDEX

Program 190
Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Defense Program 191
Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Defense Program 192
Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Defense Program 193
Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Defense Program 194
Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Civilian Program 195
Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Defense Program 196
Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Civilian Program 197

Ohio
An Aerial Radiological Survey of the U.S. Department of Energy's Mound Facility, Miamisburg, Ohio - Date of Survey: July 1976 45

OMA
Coordinated ANSPD(NEW) and OMA Decontamination and Decommissioning (D&D) Program Plan 10

Onofre
An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 48

Ontario
Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works 391
Surface-Water Hydrologic Criteria for Uranium-Mine Tailings Impoundments in Ontario 492
Hydrogeochemical Investigations of Two Inactive Tailings Areas in the Elliot Lake Uranium District, Ontario, Canada 525
Environmental Assessment of Uranium Mining in Elliot Lake, Ontario 534
Investigations Into Selected Ecological Aspects of the Aquatic and Terrestrial Environment of an Abandoned Uranium Mill Tailings Pond, Bancroft, Ontario 559
Contaminant Migration in a Sand Aquifer near an Inactive Uranium Tailings Impoundment, Elliot Lake, Ontario 589
Remedial Works at Dam No. 1, Elliot Lake, Ontario 608

Onto
Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310

Open
Radon Release and Dispersion from an Open Pit Uranium Mine 565

Operated
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 131

Operating
Directions in Low-Level Radioactive Waste Management - Low-Level Radioactive Waste Disposal: Commercial Facilities No Longer Operating 121
DFR Decommissioning: Operating Instructions for NaK Disposal by Burning in Atomized Jet 342

PERMUTED TITLE INDEX

Operation
Criteria Needs for Siting, Licensing, Operation, Closure, Stabilization, and Decommissioning of Shallow Land Disposal Sites for Radioactive Waste 123
Concentrations and Biological Availability of U-238 and Th-230 in the Environs of a Uranium Milling Operation 555
Operational
Operational Experience on Radon Monitoring 648
Operations
Surface Soil Contamination Standards for Rockwell Hanford Operations 101
Disposal or On-site Storage of Thorium or Uranium Wastes from Past Operations 138
Development of Improved Technology for Decommissioning Operations 243
Aerosols from Oxy-acetylene Gas Cutting Operations on Metal Plates: A Laboratory Study 325
Radiation Hazards Associated with Uranium Mill Operations 551
Stabilization, Engineering, and Monitoring Alternatives Assessment for Improving Regulation of Uranium Recovery Operations and Waste Management 619
Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations 641
Optimization
Radon Attenuation Effectiveness and Cost Optimization of Composite Covers for Uranium Mill Tailings 615
Order
Puerto Rico Water Resources Authority: Docket No. 115-4 - Order Authorizing Dismantling of Facility 22
Ordnance
Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works 391
Ore
Draft Environmental Impact Statement for Standards for the Control of Byproduct Materials from Uranium Ore Processing (40 CFR 192) 468
Use of Phosphate Compounds to Extract Thorium-230 and Radium-226 from Uranium Ore and Tailings 547
Uranium Ore Treatment: January, 1970-May, 1981 (Citations from the Engineering Index Data Base) 593
Leaching of Uranium Ore with Emphasis on the Fate of Radium 604
Effect of Moisture Content on Radon Emanation from Uranium Ore and Tailings 629
Oregon
Decommissioning of the Oregon State University AGN-201 Reactor 85
Baseline Data and Land Use Impact of the Lakeview, Oregon Uranium Tailings Site 408
Land Use Study of the Uranium Tailing Site at Lakeview, Oregon 423
Ores
Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching 603
Otto
NS Otto Hahn - Test Report No. 29 for the Period Between April 13, 1978, and February 17, 1979: Fuel Element Removal and Transport Between February 17, 1979 and November 22, 1979 208
Packaging, Transportation and Disposal of Nuclear Parts from Decommissioning of "N.S. Otto Hahn" 354
NS Otto Hahn - The First German Nuclear Ship 369
Decommissioning of NS Otto Hahn 372

PERMUTED TITLE INDEX

Outline
Outline of Survey Concerning Decommissioning of Nuclear Facilities, (2) 221
Overburden
Distribution of Radon and Other Radioactive Decay Products of Uranium from a Uranium Deposit into Overlying Overburden 581
Overlying
Distribution of Radon and Other Radioactive Decay Products of Uranium from a Uranium Deposit into Overlying Overburden 581
Simulation of Water Flow and Retention in Earthen-Cover Materials Overlying Uranium Mill Tailings 624
Overview
Radwaste Inventories and Projections: An Overview 128
Nuclear Power Reactors: An Overview of Selected Issues 169
Overview of Decommissioning Research and Development Activities in the European Community 370
Overview of Research in Radiation Biology and Protective Measures in the Manhattan Project During the War Years, 1942 to 1946 377
Long-Term Stabilization of Uranium Mill Tailings Pile Surface, Project Overview 585
Responsible Uranium Mining and Milling: An Overview 613
Oxy
Aerosols from Oxy-acetylene Gas Cutting Operations on Metal Plates: A Laboratory Study 325
Oxygen
Underwater Oxygen Lance - Cutting of Metals, Concrete and Stone 273
Pacific
Surface Concrete Decontamination Equipment Developed by Pacific Northwest Laboratory 68
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report 442
Packaging
Experience in Treatment of Components, Waste Treatment, Packaging and Shipping Related to Decommissioning 333
Transportation and Packaging 347
Packaging, Transportation and Disposal of Nuclear Parts from Decommissioning of "N.S. Otto Hahn" 354
Pad
Design, Construction, and Field Testing of a Heap Leach Clay Pad 646
Palos
Environmental Surveillance of the Palos Park Forest Preserve 381
Parameters
Unsaturated Hydraulic Parameters of Grand Junction Uranium Tailings 475
Review of Parameters Describing Terrestrial Food-Chain Transport of Lead-210 and Radium-226 582
Parameters Affecting Stability of Tailings Dams 597
Park
Aerial Radiological Surveys of Rockwell International Facilities, Canoga Park, California - Date of Surveys: June and July 1978 54
Environmental Surveillance of the Palos Park Forest Preserve 381
Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois 395

PERMUTED TITLE INDEX

Particulates
Radioactive Composition of Airborne Particulates at Ambrosia Lake, New Mexico 645

Past
Disposal or On-site Storage of Thorium or Uranium Wastes from Past Operations 138

Pathway
Estimated Dose to Man from Uranium Milling Via the Terrestrial Food-Chain Pathway 607

Pathways
Pathways Analysis and Radiation Dose Estimates for Radioactive Residues at Formerly Utilized MED/AEC Sites 379
Pathways to Man 543

Peach
Decommissioning Peach Bottom Unit 1 - Final Report 165

Pennsylvania
Three Mile Island: Searching for Pennsylvania Initiatives (Alternatives for Funding Cleanup) 269
Radiological Survey of Universal Cyclops, Inc., Titusville Plant (Formerly Vulcan Crucible Steel Company, Aliquippa, Pennsylvania), May 2-8, 1978 399
Geochemical Investigation of UMTRAP Designated Site at Canonsburg, Pennsylvania 431

Permeability
Problems in Predicting the Permeability of Compacted Clay Liners 515
Clay Liner Permeability in Low pH Environments 591

Perspective
Decommissioning of Radioactively Contaminated Facilities from a State Perspective 154
Utility Perspective of Nuclear Facility Decommissioning 214
Perspective on Potential Contributions to Reactor Decommissioning Problems Caused by Nickel-59 270

PFR
Laser Cutting Equipment for Dismantling Irradiated PFR Fuel Sub-Assemblies 298

pH
Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573
Clay Liner Permeability in Low pH Environments 591

Phase
Project Report of Phase I Remedial Action of Properties Associated with the Former Middlesex Sampling Plant Site 387
Summary Report - Phase 1 Study of Inactive Uranium Mill Sites and Tailings Piles 449
Morrison-Knudsen Receives Contract for First Phase of $275 Million Uranium Mill Tailings Cleanup Project 453
Thermodynamic Calculations and Phase Diagrams in Evaluating Tailings-Soil-Water Interactions 577

Phosphate
Use of Phosphate Compounds to Extract Thorium-230 and Radium-226 from Uranium Ore and Tailings 547

PHW
Decontamination Experience at CANDU-PHW Reactors 258

Physical
Control of Physical Agent Hazards of Arc Welding and Cutting 274

PERMUTED TITLE INDEX

Radiological Survey of Ryerson Physical Laboratory, The University of Chicago, Chicago, Illinois, September 11-25, 1976 **396**
State Policies and Requirements for Management of Uranium Mining and Milling in New Mexico: Volume 3 - Adverse Effects of Uranium Mining and Milling on the Physical Environment **446**
Statistical Evaluation of Contamination from Uranium Mill Tailings by Physical Transport and Chemical Migration **503**
Physical Modeling of Tailings Dams Using Centrifuge Simulation Techniques **631**

Physics
Health Physics and Industrial Hygiene Aspects of Decontamination as a Precursor to Decommissioning **249**

Pictorial
Decommissioning the Ames Laboratory Research Reactor: A Brief Pictorial Report **100**

Pieces
Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw **290**

Pile
Chemical Transport Beneath a Uranium Mill Tailings Pile, Riverton, Wyoming **477**
Chemical and Radioisotope Distribution Profiles in an Abandoned Uranium Tailings Pile **516**
An Improved Radon Flux Measurement System for Uranium Tailings Pile Measurement **529**
Long-Term Stabilization of Uranium Mill Tailings Pile Surface, Project Overview **585**

Piles
Stabilization of Existing Uranium Mill Tailings Piles at Uravan, Colorado **401**
Hydro-Geochemical Studies of Uranium Mill Tailing Piles at Riverton, Wyoming and Maybell, Colorado **435**
Recent Radiochemistry Observations at the Riverton and Maybell Tailings Piles **444**
In Situ Grouting of Uranium Mill Tailings Piles **445**
Recent Hydrologic Observations from the Riverton and Maybell Tailings Piles **447**
Summary Report - Phase 1 Study of Inactive Uranium Mill Sites and Tailings Piles **449**
Radium-226 Measurements Below Uranium Mill Tailings Piles **494**
A Comparative Evaluation of Liner Materials for Inactive Uranium Mill Tailings Piles **500**

Pilot
In Situ Vitrification of Contaminated Soil: Pilot-Scale Field Testing **103**
Radiological Survey of the Former Uranium Recovery Pilot and Process Sites, Gardinier, Incorporated, Tampa, Florida - Final Report **382**

Pipe
Underwater Cutting of Stainless Steel Plate and Pipe for Dismantling Reactor Pressure Vessels **296**
Horizontal Pipe Drain Design for Existing Mill Tailings Embankments **654**

Piqua
Piqua Nuclear Power Facility Radiological Surveillance Program **37**

Pit
Decontamination and Decommissioning of the EBR-1 Complex, Topical Report No. 1 - Removal of NaK from EBR-1 Storage Pit **118**
Radon Release and Dispersion from an Open Pit Uranium Mine **565**

Pits
Review of Design Approaches Applicable to Dewatering Uranium Mill Tailings Disposal Pits **539**

PERMUTED TITLE INDEX

Placement

Environmental Consequences of the Placement of Radium-Barium Sludge in Tailings Areas 553

Placement of Radium/Barium Sludges in Tailings Areas 590

Plan

Coordinated ANSPD(NEW) and OMA Decontamination and Decommissioning (D&D) Program Plan 10

Project Management Plan for Decontamination and Decommissioning of New Brunswick Laboratory, New Jersey 15

Plan for Decontamination and Decommissioning the Building 350 Plutonium Fabrication Facility 16

Saxton Decommissioning Plan and Safety Analysis Report 26

Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision 33

Environmental Surveillance Plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York 44

Surplus Facilities Management Program - Program Plan, FY 1983-1987 175

Surplus Facilities Management Program - Program Plan, FY 1983-1987 176

Surplus Facilities Management Program - Program Plan, FY 1983-1987 177

Commingled Uranium-Tailings Study: Volume 1, Plan for Stabilization and Management of Commingled Uranium-Mill Tailings 459

Planning

Interactive Planning System for Developing Decommissioning and Decontamination Plans at Hanford 18

Engineering and Planning for the Shippingport Station Decommissioning Project 19

Radiological Planning and Implementation for Nuclear Facility Decommissioning 228

Utility Planning for Decommissioning 232

Plans

DOE Waste Management Plans - Remedial Actions and Decontamination and Decommissioning 7

Interactive Planning System for Developing Decommissioning and Decontamination Plans at Hanford 18

Plans and Activities for Decommissioning of LWR Power Plants by the German Utilities 207

Progress Report on Germany - Plans for Decommissioning 230

Plasma

SRE Underwater Plasma Arc Cutting Development Test Report 93

Application of a Plasma Arc in Decontamination of Radioactive Metallic Wastes 257

Present Position of Plasma-Torch Cutting 275

Recommended Practices for Plasma Arc Welding (Welding Workbook Data Sheets 31a, 31b) 280

Present State of Development of Plasma-Compressed Air Cutting of Metals 286

Study on Underwater Plasma Arc Cutting for Stainless Steel 297

A Plasma-Arc Cutting Machine 300

Plasma-Arc Cutting Methods and Plasma-Arc Cutting Machines 301

DC Plasma Torch for Metal Cutting 304

Surface Plasma-Arc Cutting of Steels 10KHSND and 10KHN1M 307

Nibbling, Laser Cutting and Plasma-Arc Cutting 308

Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310

PERMUTED TITLE INDEX

Plasma Welding: 1972 - June, 1982 (Citations from the International Aerospace Abstracts Data Base) 312
Plasma Welding: 1970 - May 1982 (Citations from the Engineering Index Data Base) 313
Plasma Cutting: June 1970 - June 1982 (Citations from the Engineering Index Data Base) 314
Development and Verification Test on Remote Plasma Cutting of Large Metallic Waste 317
An Evaluation of the Performance of a Plasma Torch for the Cutting of Metal 318
Air Pollution in the Plasma Cutting of Steel, Stainless Steel and Aluminum 320
Applications of Plasma to the Refining and Melting of Metals 350

Plasmatron

Processes Taking Place in Arc Plasmatron Chamber in Cutting of Metals 319

Plate

Underwater Cutting of Stainless Steel Plate and Pipe for Dismantling Reactor Pressure Vessels 296
A Study of Underwater Thick Plate Cutting Technology 327

Plates

Torch Cuts Off "Hot" Plates - Underwater Cutting Solves Radioactive Disposal Problem 84
Aerosols from Oxy-acetylene Gas Cutting Operations on Metal Plates: A Laboratory Study 325

Plea

Plea for Realistic Environmental Surveillance/Decommissioning Criteria Based on Radiation Dose 239

Pluto

Pluto Quarterly Report No. 11, January-March 1962 88
Pluto Quarterly Report No. 12, April-June 1962 89

Plutonium

Criteria and Cost Estimates for Decommissioning and Decontamination of Major Plutonium Buildings at Rocky Flats Plant 2
Environmental Assessment Decontamination and Decommissioning of Plutonium Fabrication Facility, Building 350 ANL-Illinois 3
Plan for Decontamination and Decommissioning the Building 350 Plutonium Fabrication Facility 16
Decontamination of Battelle-Columbus Laboratories' Plutonium Facility 65
Los Alamos DP West Plutonium Facility Decontamination Project 1978-1981 66
Los Alamos DP West Plutonium Facility Decontamination Project 67
Demolition of Building 12, An Old Plutonium Filter Facility 82
Demolition of Building 12, An Old Plutonium Filter Facility 83
Decommissioning a Plutonium Fabrication Facility 87
Decontamination of Soil Containing Plutonium and Americium 109

PM

Final Report - Decontamination and Decommissioning of TAN Radioactive Liquid Waste Evaporator System (PM-2A) 96

Pocket

Use of Scientific Calculators and Pocket Computers for Evaluation of Seepage and Contaminant Transport 505

Policies

State Policies and Requirements for Management of Uranium Mining and Milling in New Mexico: Volume 3 - Adverse Effects of Uranium Mining and Milling on the Physical Environment 446

PERMUTED TITLE INDEX

Policy
U.S. Nuclear-Energy Policy: Provisions of Funds for Decommissioning 28
Study of the Utah Uranium-Milling Industry: Volume 1 - A Policy Analysis 448
Polishing
Behaviour of Polonium During Electrochemical Steel Polishing Process 248
Pollution
Air Pollution in the Plasma Cutting of Steel, Stainless Steel and Aluminum 320
Polonium
Behaviour of Polonium During Electrochemical Steel Polishing Process 248
Pond
Near-Field Impact of 216-U-10 (U-Pond) Decommissioning on the Unconfined Aquifer 126
Investigations Into Selected Ecological Aspects of the Aquatic and Terrestrial Environment of an Abandoned Uranium Mill Tailings Pond, Bancroft, Ontario 559
Cotter Corporation's New Tailings Pond Has a Synthetic Liner 637
Ponds
Radium-226 Removal by Precipitation and Sedimentation in Settling Ponds 588
Development of Methods for Reclaiming Abandoned Tailings Ponds and Dams: Volume 1 601
Portion
Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works 391
Position
Present Position of Plasma-Torch Cutting 275
Possibilities
Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching 603
Post
Post-Accident Cleanup and Decommissioning of a Reference Pressurized Water Reactor 161
Postulated
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 159
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 160
Potential
Bankruptcy Potential Threatens Decommissioning Funds, Says NRC 200
Perspective on Potential Contributions to Reactor Decommissioning Problems Caused by Nickel-59 270
Mineral Waste Resources of Canada - Mineral Wastes as Potential Fillers 512
Power
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 25, 1977-July 25, 1977 5
Funding Nuclear Power Plant Decommissioning - Final Report 6
Costs of Closing the Indian Point Nuclear Power Plant 29
Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 38 30
Residual Radioactivity Assessment in Nuclear Power Plant: Concentrations, Distribution Inventories 34
Piqua Nuclear Power Facility Radiological Surveillance Program 37

PERMUTED TITLE INDEX

An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972 39

Beaver Valley Power Station and Shippingport Atomic Power Station - 1977 Annual Environmental Report: Radiological - Volume 2 41

Beaver Valley Power Station and Shippingport Atomic Power Station - 1978 Annual Environmental Report: Radiological - Volume 2 42

Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 37 98

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1976-January 25, 1977 141

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program) 142

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1978-January 25, 1979 143

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1979-July 25, 1979 144

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1980-July 25, 1980 145

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1979-January 25, 1980 146

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1981-July 25, 1981 147

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1980-January 25-1981 148

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1981-January 25, 1982 153

Decommissioning a Boiling Water Reactor Nuclear Power Plant 164

Test Evaluation Shippingport Atomic Power Station LWBR Project (LWBR Development Program), July-August 1977 167

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control (1965-1975) 168

Nuclear Power Reactors: An Overview of Selected Issues 169

Communities' Research and Development Program on Decommissioning of Nuclear Power Plants 204

Plans and Activities for Decommissioning of LWR Power Plants by the German Utilities 207

Decommissioning Study for the Beznau Nuclear Power Plant (2 X 350 MW) - the Swiss Approach 210

Decommissioning Research in the Commission of European Communities' Program on Decommissioning of Nuclear Power Plants 224

Costs of Decommissioning Nuclear Power Plants as Reported to the Public to Date 227

Closing-Down of Nuclear Power Stations in the Federal Republic of Germany 229

Decommissioning of Unit A of the Nuclear Power Plant Gundremmingen and its Conversion to a Condition of Protective Storage 231

Decommissioning of Nuclear Power Plants - How to Handle the Costs 233

Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station 238

Radiological Aspects of Decommissioning Nuclear Power Plants 240

Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island 241

Decontamination of Equipment in Nuclear Power Plants With WWER-440 Reactors 247

Decontamination in Nuclear Power Stations 263

Investigation of Highly Efficient Decontamination Solutions for Decommissioning of Pressur-

PERMUTED TITLE INDEX

ized Water Reactor Power Plants 266
Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw 290
Dismantlement of Nuclear Power Stations in Germany 323
Proposal for Decommissioning of Contaminated Steel Parts from Shut Down Nuclear Power Plants 338
Shutdown of Nuclear Power Plants - Production of Activated Material from the Region of the Reactor Core by the Example of a Shutdown Pressurized Water Reactor 339
Abandonment of Nuclear Power Stations at the End of Their Working Life 358
Decommissioning Commercial Nuclear Power Plants 359
Decommissioning of Nuclear Power Plants 366
Health Effects of Uranium Mining and Milling for Commercial Nuclear Power 493

Practice
Principles and Recommended Practice for Decontamination of Radioactive Areas and Equipment 329
Reclamation of Uranium Tailings - A Critical Assessment of Current Practice 633

Practices
Recommended Practices for Plasma Arc Welding (Welding Workbook Data Sheets 31a, 31b) 280

Pre
Pre-decontamination Gamma-Ray Surface Scans in TMI-2 Containment Building 305 Foot Elevation 36

Precaution
Investigation of Reactor Decommissioning as a Precaution by Electric Utilities 202

Precipitation
Radium-226 Removal by Precipitation and Sedimentation in Settling Ponds 588

Precursor
Health Physics and Industrial Hygiene Aspects of Decontamination as a Precursor to Decommissioning 249

Predicting
Problems in Predicting the Permeability of Compacted Clay Liners 515

Preliminary
Report on Preliminary Geological, Hydrological and Radiological Survey at the Weldon Spring Quarry During 1976 and 1977 49
Preliminary Characterization and Assessment of the Weldon Spring Low-Level Waste Disposal Site 56
Preliminary Nuclear Decommissioning Cost Study 226
Preliminary Radiation Dose Analysis for Reference FUSRAP Waste Sites 383
Preliminary Evaluation of Uranium Mill Tailings Conditioning as an Alternative Remedial Action Technology 521

Preparedness
Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111

Preparing
Preparing a Decommissioning Cost and Technology Study 212

Preserve
Environmental Surveillance of the Palos Park Forest Preserve 381

Pressure
Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned

PERMUTED TITLE INDEX

Gundremmingen Unit A Nuclear Power Station 238
High Pressure Water-Jet Scarification of High Density Concrete 288
Method for Explosive Demolition of Reactor Pressure Vessel 292
Dismantling Commercial Atomic Reactor Pressure Vessels - Combined Gouging and Gas Cutting Process Used Underwater 295
Underwater Cutting of Stainless Steel Plate and Pipe for Dismantling Reactor Pressure Vessels 296

Pressurized
Post-Accident Cleanup and Decommissioning of a Reference Pressurized Water Reactor 161
Develop Decontamination Techniques for Pressurized Water Reactors 264
Investigation of Highly Efficient Decontamination Solutions for Decommissioning of Pressurized Water Reactor Power Plants 266
Shutdown of Nuclear Power Plants - Production of Activated Material from the Region of the Reactor Core by the Example of a Shutdown Pressurized Water Reactor 339

Primary
Removal of Sodium for the Sodium Reactor Experiment Primary System 77

Priorities
Methodology for Establishing Decommissioning Priorities 174

Probabilistic
Probabilistic Modeling of Tailings Embankment Designs - Volume 1: Model Development and Verification 484
Probabilistic Modeling of Tailings Embankment Designs, Volume 2: Model Application and Verification 536

Products
Evaluation of the 1943 to 1946 Liquid Effluent Discharge from the Linde Air Products Company Ceramics Plant 392
Distribution of Radon and Other Radioactive Decay Products of Uranium from a Uranium Deposit into Overlying Overburden 581

Profile
Directory and Profile of Licensed Uranium-Recovery Facilities 652

Profiles
Chemical and Radioisotope Distribution Profiles in an Abandoned Uranium Tailings Pile 516

Programs
Waste Management '81 - The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs and Public Communications 345
A Survey of Radon Measurement Needs and Activities in State Radiation Control Programs 514
National/International R and D Programs on Uranium Mill Tailings 541

Progress
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 25, 1977-July 25, 1977 5
Quarterly Progress Report No. 45 for Second Quarter, CY 1968 Covering the Period of January, February, and March 1968 79
Quarterly Progress Report No. 46 for Third Quarter, CY 1968 Covering the Period of April, May, and June 1968 81
Quarterly Progress Report No. 48 for First Quarter, CY 1969 Covering the Period of October, November, and December 1969 95
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1976-

PERMUTED TITLE INDEX

January 25, 1977 141
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program) 142
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1978-January 25, 1979 143
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1979-July 25, 1979 144
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1980-July 25, 1980 145
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1979-January 25, 1980 146
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1981-July 25, 1981 147
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1980-January 25-1981 148
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1981-January 25, 1982 153
Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Commercial Program 178
Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Commercial Program 179
Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Defense Program 180
Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Defense Program 181
Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Commercial Program 182
Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Defense Program 183
Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Commercial Program 184
Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Commercial Program 185
Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Defense Program 186
Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Commercial Program 187
Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Commercial Program 188
Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Defense Program 189
Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Commercial Program 190
Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Defense Program 191
Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Defense Program 192
Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Defense Program 193
Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Defense Program 194
Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Civilian

PERMUTED TITLE INDEX

Program 195
Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Defense Program 196
Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Civilian Program 197
Progress Report on Germany - Plans for Decommissioning 230
The UMTRAP Technology Development Program: A Progress Report 437
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report 442
Radioecological Investigations of Uranium-Mill-Tailings Systems: Second Technical Progress Report, October 1, 1980-September 30, 1981 476

Project

Project Management Plan for Decontamination and Decommissioning of New Brunswick Laboratory, New Jersey 15
Engineering and Planning for the Shippingport Station Decommissioning Project 19
Los Alamos DP West Plutonium Facility Decontamination Project 1978-1981 66
Los Alamos DP West Plutonium Facility Decontamination Project 67
The Gnome Site Decontamination and Decommissioning Project 110
Test Evaluation Shippingport Atomic Power Station LWBR Project (LWBR Development Program), July-August 1977 167
Overview of Research in Radiation Biology and Protective Measures in the Manhattan Project During the War Years, 1942 to 1946 377
Project Report of Phase I Remedial Action of Properties Associated with the Former Middlesex Sampling Plant Site 387
The Status of the Uranium Mill Tailings Remedial Actions Project (UMTRAP) 432
The Research Effort of the Uranium Mill Tailings Remedial Actions Project 433
Dawn Mining's Tailings Expansion Project - A Case Study in the Use of HDPE Lining 443
Morrison-Knudsen Receives Contract for First Phase of $275 Million Uranium Mill Tailings Cleanup Project 453
Long-Term Stabilization of Uranium Mill Tailings Pile Surface, Project Overview 585

Projections

Spent Fuel and Waste Inventories and Projections 116
Radwaste Inventories and Projections: An Overview 128
Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics 130
Radioactive Waste Inventories and Projections 352

Projects

Evaluation of Nuclear Facility Decommissioning Projects Program 20
Evaluation of Nuclear Facility Decommissioning Projects 157
Evaluation of Nuclear Facility Decommissioning Projects - Summary Report: Enrico Fermi-1 Reactor 158
Survey of On-Going and Completed Remedial Action Projects 162
Summary Report on NLO Remedial Projects at the DOE-Niagara Falls Storage Site 166

Property

Model Environmental Assessment for a Property-Cleanup/Interim-Storage Remedial Action at a Formerly Utilized Site 386
Canonsburg Construction Firm Selected for Vicinity Property Cleanup Efforts 458

Proposal

Proposal for Decommissioning of Contaminated Steel Parts from Shut Down Nuclear Power Plants 338

PERMUTED TITLE INDEX

Protect

A Review of Long-Term Rock Durability: Implications for Survivability of Riprap Used to Protect Uranium Mill Tailings 569

Protection

Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111

Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Inhalation Hazards and Worker Protection 299

Riprap Design Considerations for Long-Term Protection of Uranium Mill Tailings 650

Rock Riprap Design Methods and Their Applicability to Long-Term Protection of Uranium Mill Tailings Impoundments 651

Protective

Decommissioning of Unit A of the Nuclear Power Plant Gundremmingen and its Conversion to a Condition of Protective Storage 231

Overview of Research in Radiation Biology and Protective Measures in the Manhattan Project During the War Years, 1942 to 1946 377

Protective Barriers for Containment of Toxic Materials 531

Provinces

Mineral Waste Resources of Canada - Mining Wastes in the Atlantic Provinces 513

Provisions

U.S. Nuclear-Energy Policy: Provisions of Funds for Decommissioning 28

Public

Costs of Decommissioning Nuclear Power Plants as Reported to the Public to Date 227

Waste Management '81 - The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs and Public Communications 345

Proposed Remedial Action Standards for Inactive Uranium Processing Sites - Instructions and Schedule for Public Hearings 470

Publication

Publication of the Safety Regulation KTA 1401 by Kerntechnischer Ausschuss - Dated April 13, 1981 222

Pueblo

Environmental Analysis of Acid/Middle Pueblo Canyon, Los Alamos, New Mexico 375

Puerto

Puerto Rico Water Resources Authority: Docket No. 115-4 - Order Authorizing Dismantling of Facility 22

United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27

PWR

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 25, 1977-July 25, 1977 5

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1976-January 25, 1977 141

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program) 142

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1978-January 25, 1979 143

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1979-July 25, 1979 144

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1980-

PERMUTED TITLE INDEX

July 25, 1980 **145**
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1979-January 25, 1980 **146**
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1981-July 25, 1981 **147**
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1980-January 25-1981 **148**
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1981-January 25, 1982 **153**

Pyrochemical
Engineering Analysis and Costs of Product Conversion, Refabrication, Waste Treatment, and Plant Decommissioning of an Exportable Pyrochemical Process **211**

Q
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q **137**

Quadrangle
National Uranium Resource Evaluation: Shiprock Quadrangle, Arizona, New Mexico, Colorado, and Utah **537**

Qualitative
A Qualitative Evaluation of Long-Term Processes Governing the Behaviour of Uranium Mill Tailings Placed in Deep Lakes **583**

Quality
Quality Assurance as a Management Tool in Decommissioning Activities **199**

Quarry
Report on Preliminary Geological, Hydrological and Radiological Survey at the Weldon Spring Quarry During 1976 and 1977 **49**
Weldon Spring Decommissioning Study - Quarry Supplement **57**

Quarter
Quarterly Progress Report No. 45 for Second Quarter, CY 1968 Covering the Period of January, February, and March 1968 **79**
Quarterly Progress Report No. 46 for Third Quarter, CY 1968 Covering the Period of April, May, and June 1968 **81**
Quarterly Progress Report No. 48 for First Quarter, CY 1969 Covering the Period of October, November, and December 1969 **95**

Quarterly
Quarterly Progress Report No. 45 for Second Quarter, CY 1968 Covering the Period of January, February, and March 1968 **79**
Quarterly Progress Report No. 46 for Third Quarter, CY 1968 Covering the Period of April, May, and June 1968 **81**
Pluto Quarterly Report No. 11, January-March 1962 **88**
Pluto Quarterly Report No. 12, April-June 1962 **89**
Quarterly Progress Report No. 48 for First Quarter, CY 1969 Covering the Period of October, November, and December 1969 **95**
Uranium Mill Tailings Quarterly Report, January-March, 1982 **428**
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report **442**

Questions
UMTRA Questions and Answers **455**

Quirke
Survey of the Occurrence of Ra-226 in the Rio Algom Quirke I Uranium Mill, Elliot Lake **625**

PERMUTED TITLE INDEX

R

French R and D Program on Decommissioning Tooling and Techniques 205
National/International R and D Programs on Uranium Mill Tailings 541

Ra

Immobilization of U-Th-Ra in Mine Wastes 497
Final Report: Immobilization of U-Th-Ra in Mine Wastes 498
Survey of the Occurrence of Ra-226 in the Rio Algom Quirke I Uranium Mill, Elliot Lake 625

Radiation

Plea for Realistic Environmental Surveillance/Decommissioning Criteria Based on Radiation Dose 239
Overview of Research in Radiation Biology and Protective Measures in the Manhattan Project During the War Years, 1942 to 1946 377
Pathways Analysis and Radiation Dose Estimates for Radioactive Residues at Formerly Utilized MED/AEC Sites 379
Preliminary Radiation Dose Analysis for Reference FUSRAP Waste Sites 383
Implementation of the Uranium Mill Tailings Radiation Control Act by the States 436
Uranium Mill Tailings Radiation Control Act of 1978 451
State of Idaho Community Summary Report for Radiation Surveys - Lowman, Idaho 463
Implementation of the Uranium Mill Tailings Radiation Control Act of 1978 472
Radiation Exposure - Remedial Action 481
A Survey of Radon Measurement Needs and Activities in State Radiation Control Programs 514
Radiation Hazards of Uranium Mining and Milling 530
Radiation Hazards in Mining: Control, Measurement, and Medical Aspects 535
Radiation Hazards Associated with Uranium Mill Operations 551
Aerial Radiation Surveys 558
Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations 641

Radioactive

Environmental Surveillance for the INEL Radioactive Waste Management Complex 50
Environmental Surveillance for the INEL Radioactive Waste Management Complex 51
Aerial and Ground-Based In Situ Measurements for Evaluation and Implementation of Radioactive Site Cleanup 60
Torch Cuts Off "Hot" Plates - Underwater Cutting Solves Radioactive Disposal Problem 84
Final Report - Decontamination and Decommissioning of TAN Radioactive Liquid Waste Evaporator System (PM-2A) 96
Directions in Low-Level Radioactive Waste Management - Transporting Low-Level Waste: Effects of Regional Management 119
Waste Classification, a Proposed Methodology for Classifying Low-Level Radioactive Waste 120
Directions in Low-Level Radioactive Waste Management - Low-Level Radioactive Waste Disposal: Commercial Facilities No Longer Operating 121
Directions in Low-Level Radioactive Waste Management - An Analysis of Low-Level Waste Disposal Facility and Transportation Costs 122
Criteria Needs for Siting, Licensing, Operation, Closure, Stabilization, and Decommissioning of Shallow Land Disposal Sites for Radioactive Waste 123
Transportation of Radioactive Materials: The Legislative and Regulatory Information System 124

PERMUTED TITLE INDEX

The 1979 State-by-State Assessment of Low-Level Radioactive Wastes Shipped to Commercial Burial Grounds 125
Information Base for Commercial Radioactive Waste Management 127
Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics 130
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 131
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Summary 134
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Main Report 135
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices A-F 136
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q 137
U.S. Department of Energy Activities in Low-Level Radioactive Waste Treatment 139
Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island 241
Process for Decontaminating Objects Having Radioactive Layers 252
Application of a Plasma Arc in Decontamination of Radioactive Metallic Wastes 257
Vacuum Furnace for Radioactive Waste Volume Reduction 283
Principles and Recommended Practice for Decontamination of Radioactive Areas and Equipment 329
Radioactive Wastes 331
Data Base for Radioactive Waste Management - Review of Low-Level Radioactive Waste Disposal History 334
Developing Guidelines on Managing Radioactive Waste 349
Volume Reduction Techniques in Low-Level Radioactive Waste Management 351
Radioactive Waste Inventories and Projections 352
Low-Level Radioactive Waste 353
Pathways Analysis and Radiation Dose Estimates for Radioactive Residues at Formerly Utilized MED/AEC Sites 379
Residual Radioactive Materials Act of 1978 473
Leachability of Radioactive Constituents from Uranium Mine Tailings - Status Report - June 1974 to January 1977 499
Distribution of Radon and Other Radioactive Decay Products of Uranium from a Uranium Deposit into Overlying Overburden 581
Characterization and Disposal of Radioactive Effluents from Uranium Mining 587
Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations 641
Radioactive Composition of Airborne Particulates at Ambrosia Lake, New Mexico 645

Radioactively
Cleanup and Treatment of Radioactively Contaminated Land Including Areas Near Nuclear Facilities: A Selected Bibliography 105
Decommissioning of Radioactively Contaminated Facilities from a State Perspective 154

Radioactivity
Residual Radioactivity Assessment in Nuclear Power Plant: Concentrations, Distribution Inventories 34
Removal of Radioactivity and Mineral Values from Uranium Mill Tailings 478
Estimates of Uranium Content and Radon Flux for Uranium Mine Dumps Based on Borehole Radioactivity Logs - Topical Report 610

PERMUTED TITLE INDEX

Radiochemistry

Recent Radiochemistry Observations at the Riverton and Maybell Tailings Piles 444

Radioecological

Radioecological Investigations of Uranium-Mill-Tailings Systems: Second Technical Progress Report, October 1, 1980-September 30, 1981 476

Radioisotope

Chemical and Radioisotope Distribution Profiles in an Abandoned Uranium Tailings Pile 516

Radiological

Piqua Nuclear Power Facility Radiological Surveillance Program 37

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 38

An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972 39

An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 40

Beaver Valley Power Station and Shippingport Atomic Power Station - 1977 Annual Environmental Report: Radiological - Volume 2 41

Beaver Valley Power Station and Shippingport Atomic Power Station - 1978 Annual Environmental Report: Radiological - Volume 2 42

An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43

An Aerial Radiological Survey of the U.S. Department of Energy's Mound Facility, Miamisburg, Ohio - Date of Survey: July 1976 45

An Aerial Radiological Survey of United States Department of Energy Sites in Ames, Iowa, Date of Survey: May 1977 46

An Aerial Radiological Survey of Areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15 and 17 Yucca Flat, Nevada Test Site 47

An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 48

Report on Preliminary Geological, Hydrological and Radiological Survey at the Weldon Spring Quarry During 1976 and 1977 49

An Aerial Radiological Survey of the Argonne National Laboratory and Surrounding Area, Argonne, Illinois - Date of Survey: May 1977 52

An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 53

Aerial Radiological Surveys of Rockwell International Facilities, Canoga Park, California - Date of Surveys: June and July 1978 54

An Aerial Radiological Survey of the Watts Bar Nuclear Plant and Surrounding Area, Spring City, Tennessee 55

Radiological Assessment of the Decontamination and Decommissioning of a Small-Scale Fuel-Reprocessing Plant 59

Interim Radiological Site Characterization and D&D Status Report - New Brunswick Laboratory, New Jersey Site 63

Estimating Radiological Conditions for Decommissioning Studies 218

Radiological Planning and Implementation for Nuclear Facility Decommissioning 228

Radiological Aspects of Decommissioning Nuclear Power Plants 240

Radiological Survey of the Former Uranium Recovery Pilot and Process Sites, Gardinier, Incorporated, Tampa, Florida - Final Report 382

Radiological Guidelines for Application to DOE's Formerly Utilized Sites Remedial Action Program 389

PERMUTED TITLE INDEX

Radiological Survey of Eckhart Hall, The University of Chicago, Chicago, Illinois, September 14, 1976-March 22, 1977 **393**
Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 **394**
Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois **395**
Radiological Survey of Ryerson Physical Laboratory, The University of Chicago, Chicago, Illinois, September 11-25, 1976 **396**
Radiological Survey of Kent Chemical Laboratory, The University of Chicago, Chicago, Illinois, September 7-13, 1977 **397**
Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 **398**
Radiological Survey of Universal Cyclops, Inc., Titusville Plant (Formerly Vulcan Crucible Steel Company, Aliquippa, Pennsylvania), May 2-8, 1978 **399**
Estimation of Radiological Impact from Transportation of Uranium Mill Tailings **506**
Estimation of Radiological Impact from Transportation of Uranium Mill Tailings - Part II: Dispersion and Dosimetry **657**

Radionuclide

Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at Oak Ridge National Laboratory **35**
Evaluation of Radionuclide and Trace Metal Migration Beneath an Inactive Tailing Impoundment **402**
Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico **429**
Migration of Radionuclide Chains in a Non-Homogeneous Aquifer under Transient Saturated-Unsaturated Flow Conditions **538**
Modification of the Natural Radionuclide Distribution by Some Human Activities in Canada **566**
Radionuclide Movement in Seepage and Its Control **632**

Radionuclides

Comparative Scrub Solution Tests for Decontamination of Transuranic Radionuclides from Soils **112**
Separation of Transuranic Radionuclides from Soil by Vibratory Grinding **113**
Forage Uptake of Uranium Series Radionuclides in the Vicinity of the Anaconda Uranium Mill **439**

Radium

A Historical Review of the Radium-Extraction Industry in the United States (1906-1926) **427**
Radium-226 Measurements Below Uranium Mill Tailings Piles **494**
Use of Phosphate Compounds to Extract Thorium-230 and Radium-226 from Uranium Ore and Tailings **547**
Leachability of Barium-Radium Sulphate Sludges **552**
Environmental Consequences of the Placement of Radium-Barium Sludge in Tailings Areas **553**
Distribution of Radium and Chemical Toxins in the Environment of a Uranium Complex **578**
Review of Parameters Describing Terrestrial Food-Chain Transport of Lead-210 and Radium-226 **582**

PERMUTED TITLE INDEX

A Counting System for Field Determination of Radium-226 in Soils 584
Radium-226 Removal by Precipitation and Sedimentation in Settling Ponds 588
Placement of Radium/Barium Sludges in Tailings Areas 590
Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment 592
Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching 603
Leaching of Uranium Ore with Emphasis on the Fate of Radium 604

Radon
Radon Control by Multilayer Earth Barriers: Field Tests 415
Measurements and Calculations of Radon Flux Attenuation by Western U.S. Soils 440
Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado 479
Cost and Effectiveness of Radon Barrier Systems 486
Cost of Radon-Barrier Systems for Uranium Mill Tailings 487
Health Effects of Radon Emissions from Uranium Mill Tailings 510
A Survey of Radon Measurement Needs and Activities in State Radiation Control Programs 514
Observed Reduction of Radon-222 Gas Emanation from Uranium Tailings Using a New Chemical Encapsulation Process 523
Barriers for Radon in Uranium Mines 527
Radon Emanation from Stopes Backfilled with Cemented Uranium Mill Tailings 528
An Improved Radon Flux Measurement System for Uranium Tailings Pile Measurement 529
Uranium Mill Tailings and Radon 542
Field Testing of Asphalt Emulsion Radon Barrier System 545
A Field Experiment on Tailings Reclamation: Radon Flux Versus Earthen Cover Depth 549
Effect of Rock Cover on Multilayer Radon Barrier Effectiveness 564
Radon Release and Dispersion from an Open Pit Uranium Mine 565
Sealant Tests to Control Radon Emanation in a Uranium Mine 568
Multidimensional Analysis of Radon Diffusion Through Uranium Mill Tailings and Cover Systems 580
Distribution of Radon and Other Radioactive Decay Products of Uranium from a Uranium Deposit into Overlying Overburden 581
Radon Emanation Characteristics of Uranium Mill Tailings 598
Research on Radon Flux Reduction from Uranium Mill Tailings 599
Estimates of Uranium Content and Radon Flux for Uranium Mine Dumps Based on Borehole Radioactivity Logs - Topical Report 610
A Complete Description of Radon Diffusion in Earthen Materials 614
Radon Attenuation Effectiveness and Cost Optimization of Composite Covers for Uranium Mill Tailings 615
A Radon Attenuation Test Facility 622
Factors Influencing Radon Attenuation by Tailings Covers 623
Effect of Moisture Content on Radon Emanation from Uranium Ore and Tailings 629
The Effects of Moisture on Radon Emanation Including the Effects on Diffusion 634
Operational Experience on Radon Monitoring 648
Environmental Factors Affecting Long-Term Stabilization of Radon Suppression Covers for Uranium Mill Tailings 656

PERMUTED TITLE INDEX

Radwaste

Radwaste Inventories and Projections: An Overview 128
Integrated Data Base for Spent Fuel and Radwaste: Inventories 129

Rare

Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32
Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching 603

Ray

Pre-decontamination Gamma-Ray Surface Scans in TMI-2 Containment Building 305 Foot Elevation 36
Land Use Study of the Ray City Uranium Tailing Site 421

Reactor

Environmental Assessment Related to the Decontamination and Decommissioning of the Argonne National Laboratory CP-5 Research Reactor 4
Design of the Shippingport Light Water Breeder Reactor 9
United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27
Removal of Sodium for the Sodium Reactor Experiment Primary System 77
Decommissioning of the Oregon State University AGN-201 Reactor 85
Decommissioning of Ames Laboratory Research Reactor 90
Demolition and Removal of a Research Reactor Biological Shield 91
Decommissioning the Ames Laboratory Research Reactor: A Brief Pictorial Report 100
Waste Identification, Characterization and Disposal During the D and D of a Non-Reactor Nuclear Facility 140
Lessons Learned in Decommissioning the Sodium Reactor Experiment 155
Evaluation of Nuclear Facility Decommissioning Projects - Summary Report: Enrico Fermi-1 Reactor 158
Post-Accident Cleanup and Decommissioning of a Reference Pressurized Water Reactor 161
Decommissioning a Boiling Water Reactor Nuclear Power Plant 164
Investigation of Reactor Decommissioning as a Precaution by Electric Utilities 202
Decommissioning of Multiple-Reactor Stations: Facilitation by Sequential Decommissioning 217
Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station 238
Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island 241
Investigation of Highly Efficient Decontamination Solutions for Decommissioning of Pressurized Water Reactor Power Plants 266
Perspective on Potential Contributions to Reactor Decommissioning Problems Caused by Nickel-59 276
Dismantling Techniques for Reactor Components Using Explosives 291
Method for Explosive Demolition of Reactor Pressure Vessel 292
Dismantling Commercial Atomic Reactor Pressure Vessels - Combined Gouging and Gas Cutting Process Used Underwater 295
Underwater Cutting of Stainless Steel Plate and Pipe for Dismantling Reactor Pressure Vessels 296
Dismantling of the R1 Reactor, Stockholm 306

PERMUTED TITLE INDEX

Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310
Shutdown of Nuclear Power Plants - Production of Activated Material from the Region of the Reactor Core by the Example of a Shutdown Pressurized Water Reactor 339
Decommissioning of the Windscale Advanced Gas-Cooled Reactor 343
Large Transport Containers for Nuclear Reactor Decommissioning Waste 348
Assessment of Management Modes for Graphite Wastes from Reactor Decommissioning 356
Decommissioning of the Dounreay Fast Reactor 371

Reactors
Decommissioning Reference Nuclear Research and Test Reactors 17
Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision 33
Decommissioning Reactors 149
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 159
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 160
Nuclear Power Reactors: An Overview of Selected Issues 169
Decommissioning of Nuclear Reactors 225
Decontamination of Equipment in Nuclear Power Plants With WWER-440 Reactors 247
Decontamination Experience at CANDU-PHW Reactors 258
Develop Decontamination Techniques for Pressurized Water Reactors 264
Evaluation of Immediate Dismantlement of CANDU Reactors at the End of Service Life 272

Real
Nuclear Energy: The Real Costs 219

Realistic
Plea for Realistic Environmental Surveillance/Decommissioning Criteria Based on Radiation Dose 239

Receives
Morrison-Knudsen Receives Contract for First Phase of $275 Million Uranium Mill Tailings Cleanup Project 453

Reclaiming
Development of Methods for Reclaiming Abandoned Tailings Ponds and Dams: Volume 1 601

Reclamation
A Field Experiment on Tailings Reclamation: Radon Flux Versus Earthen Cover Depth 549
Tailing Reclamation 575
Reclamation of Uranium Tailings - A Critical Assessment of Current Practice 633
The Reclamation of Disturbed Arid Lands 655

Recommendations
Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works 391
Monitoring Program Design Recommendations for Uranium Mining Communities 524

Recommended
Recommended Practices for Plasma Arc Welding (Welding Workbook Data Sheets 31a, 31b) 280
Principles and Recommended Practice for Decontamination of Radioactive Areas and Equipment 329

PERMUTED TITLE INDEX

Record
What the Record Shows: Uranium Mine Tailings 639
Reduction
Economic Evaluation of Volume Reduction for Defense Transuranic Waste 114
Literature Survey of Interior-Surface Materials for the Advanced Size Reduction Facility 271
Vacuum Furnace for Radioactive Waste Volume Reduction 283
Volume Reduction Techniques in Low-Level Radioactive Waste Management 351
Cost Reduction Study Completed 456
Observed Reduction of Radon-222 Gas Emanation from Uranium Tailings Using a New Chemical Encapsulation Process 523
Research on Radon Flux Reduction from Uranium Mill Tailings 599
Refabrication
Engineering Analysis and Costs of Product Conversion, Refabrication, Waste Treatment, and Plant Decommissioning of an Exportable Pyrochemical Process 211
Refining
Applications of Plasma to the Refining and Melting of Metals 350
Region
Shutdown of Nuclear Power Plants - Production of Activated Material from the Region of the Reactor Core by the Example of a Shutdown Pressurized Water Reactor 339
Regional
Directions in Low-Level Radioactive Waste Management - Transporting Low-Level Waste: Effects of Regional Management 119
Regulation
Publication of the Safety Regulation KTA 1401 by Kerntechnischer Ausschuss - Dated April 13, 1981 222
Stabilization, Engineering, and Monitoring Alternatives Assessment for Improving Regulation of Uranium Recovery Operations and Waste Management 619
Regulations
Regulations and Financing for Decommissioning of Nuclear Facilities, France 213
Regulations and Financing for Decommissioning of Nuclear Facilities: The Federal Republic of Germany 236
Regulatory
Status of Decommissioning Program of U.S. Nuclear Regulatory Commission 8
Transportation of Radioactive Materials: The Legislative and Regulatory Information System 124
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report 442
Regulatory Impact Analysis of Environmental Standards for Uranium Mill Tailings at Active Sites 465
Reinforced
Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw 290
Release
Electrolytic Decontamination of Torus Steel for Release as Salvage 245
Radon Release and Dispersion from an Open Pit Uranium Mine 565
Remedial
DOE Waste Management Plans - Remedial Actions and Decontamination and Decommissioning 7

PERMUTED TITLE INDEX

Survey of On-Going and Completed Remedial Action Projects 162
Summary Report on NLO Remedial Projects at the DOE-Niagara Falls Storage Site 166
Remedial Actions 173
Conceptual Design Report: Below-Grade Bulk Waste Disposal Facility - Formerly Utilized Sites Remedial Action Program 374
Alternatives for Management of Wastes Generated by the Formerly Utilized Sites Remedial Action Program 380
Ocean FUSRAP: Feasibility of Ocean Disposal of Materials from the Formerly Utilized Sites Remedial Action Program (FUSRAP) 384
Model Environmental Assessment for a Property-Cleanup/Interim-Storage Remedial Action at a Formerly Utilized Site 386
Project Report of Phase I Remedial Action of Properties Associated with the Former Middlesex Sampling Plant Site 387
Radiological Guidelines for Application to DOE's Formerly Utilized Sites Remedial Action Program 389
Formerly Utilized Sites: Remedial Action 390
Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398
Uranium Mill Tailings Remedial Action (UMTRA) Joint Field Test 416
The Status of the Uranium Mill Tailings Remedial Actions Project (UMTRAP) 432
The Research Effort of the Uranium Mill Tailings Remedial Actions Project 433
Instrumentation for Off-Site Remedial Action in Salt Lake City, Utah 438
The Management of the Uranium Mill Tailings Remedial Action Program 460
Annual Status Report on the Uranium Mill Tailings Remedial Action Program 461
Uranium Mill Tailings Remedial Action Program: Annual Status Report 462
Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192): Draft Environmental Impact Statement 464
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 1 466
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 2 467
Standards for Remedial Actions at Inactive Uranium Processing Sites 469
Proposed Remedial Action Standards for Inactive Uranium Processing Sites - Instructions and Schedule for Public Hearings 470
Radiation Exposure - Remedial Action 481
Remedial Action Program 482
Commercial Nuclear Waste - Remedial Action Program 483
Preliminary Evaluation of Uranium Mill Tailings Conditioning as an Alternative Remedial Action Technology 521
Remedial Works at Dam No. 1, Elliot Lake, Ontario 608

Remote

Development and Verification Test on Remote Plasma Cutting of Large Metallic Waste 317

Remove

System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design 289

Reported

Costs of Decommissioning Nuclear Power Plants as Reported to the Public to Date 227

Repositories

Classifying Decommissioning Wastes for Allocation to Appropriate Final Repositories 330

PERMUTED TITLE INDEX

Reprocessing

Design Criteria of Decommissioning of Nuclear Fuel Reprocessing Plants 11

Radiological Assessment of the Decontamination and Decommissioning of a Small-Scale Fuel-Reprocessing Plant 59

Decontamination and Decommissioning of Fuel Reprocessing Cells at the Idaho Chemical Processing Plant 76

Status of the Decommissioning Program of the Eurochemic Reprocessing Plant 368

Republic

Closing-Down of Nuclear Power Stations in the Federal Republic of Germany 229

Regulations and Financing for Decommissioning of Nuclear Facilities: The Federal Republic of Germany 236

Request

Saxton Nuclear Experimental Corporation's Change Request No. 50 to Technical Specification and Request for Amendment No. 8 to License No. DPR-4 21

Research

Environmental Assessment Related to the Decontamination and Decommissioning of the Argonne National Laboratory CP-5 Research Reactor 4

Decommissioning Reference Nuclear Research and Test Reactors 17

Decommissioning of Ames Laboratory Research Reactor 90

Demolition and Removal of a Research Reactor Biological Shield 91

Decommissioning the Ames Laboratory Research Reactor: A Brief Pictorial Report 100

Communities' Research and Development Program on Decommissioning of Nuclear Power Plants 204

Decommissioning Research in the Commission of European Communities' Program on Decommissioning of Nuclear Power Plants 224

Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw 290

Overview of Decommissioning Research and Development Activities in the European Community 370

Overview of Research in Radiation Biology and Protective Measures in the Manhattan Project During the War Years, 1942 to 1946 377

The Research Effort of the Uranium Mill Tailings Remedial Actions Project 433

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report 442

Summary of Research on Analyses of Flow Failures of Mine Tailings Impoundments 557

Summary of Research on Case Histories of Flow Failures of Mine Tailings Impoundments 574

Research on Radon Flux Reduction from Uranium Mill Tailings 599

Grouting Research for Uranium Mill Tailings 628

Residual

Residual Radioactivity Assessment in Nuclear Power Plant: Concentrations, Distribution Inventories 34

Residual Radioactive Materials Act of 1978 473

Residues

Pathways Analysis and Radiation Dose Estimates for Radioactive Residues at Formerly Utilized MED/AEC Sites 379

Resource

National Uranium Resource Evaluation: Shiprock Quadrangle, Arizona, New Mexico, Colorado, and Utah 537

PERMUTED TITLE INDEX

Resources
Puerto Rico Water Resources Authority: Docket No. 115-4 - Order Authorizing Dismantling of Facility 22
United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27
Mineral Waste Resources of Canada - Mineral Wastes as Potential Fillers 512
Mineral Waste Resources of Canada - Mining Wastes in the Atlantic Provinces 513

Response
Computer Analysis of Seepage and Groundwater Response Beneath Tailings Impoundments 517

Responsible
Responsible Uranium Mining and Milling: An Overview 613

Restoration
Restoration of Surface Vegetation on Uranium Wastes at Uravan, Colorado 414

Resurvey
Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works 391

Resuspension
Waste Sludge Resuspension and Transfer: Development Program 355

Retention
Simulation of Water Flow and Retention in Earthen-Cover Materials Overlying Uranium Mill Tailings 624

Retired
Handbook for the Design, Selection, and Construction of a Rock Cover for Retired Uranium Mill Tailings 600

Retirement
HNPF Retirement Disposition of Sodium 80

Reuseable
Tools and Equipment: From Nuclear Waste to Reuseable Items 259

Revegetation
Revegetation Following Artificial Disturbance 106
Revegetation Following Artificial Disturbance 107
Revegetation Following Artificial Disturbance 108
Revegetation of Disturbed Grounds in the Semi-Arid Climate of Southcentral Washington 328
Revegetation/Rock Cover for Stabilization of Inactive U-Tailings Sites 489
Revegetation/Rock Cover for Stabilization of Inactive Uranium Mill Tailings Disposal Sites 490
The Challenge of a Desert: Revegetation of Disturbed Desert Lands 649

Review
Review of Costs to Close the Frankford Arsenal 13
Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111
Review of Processes for the Decontamination of Transuranic Wastes 253
Review of Methods for Concrete Removal 276
Data Base for Radioactive Waste Management - Review of Low-Level Radioactive Waste Disposal History 334
A Historical Review of the Radium-Extraction Industry in the United States (1906-1926) 427

PERMUTED TITLE INDEX

Review of Design Approaches Applicable to Dewatering Uranium Mill Tailings Disposal Pits 539

A Review of Long-Term Rock Durability: Implications for Survivability of Riprap Used to Protect Uranium Mill Tailings 569

Long-Term Survivability of Riprap for Armoring Uranium-Mill Tailings and Covers: A Literature Review 570

Review of Parameters Describing Terrestrial Food-Chain Transport of Lead-210 and Radium-226 582

Revision

Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision 33

Revisited

Decommissioning: Moral Dilemmas Revisited 216

Ricketts

Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394

Rico

Puerto Rico Water Resources Authority: Docket No. 115-4 - Order Authorizing Dismantling of Facility 22

United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27

Ridge

Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at Oak Ridge National Laboratory 35

Rio

Survey of the Occurrence of Ra-226 in the Rio Algom Quirke I Uranium Mill, Elliot Lake 625

Riprap

A Review of Long-Term Rock Durability: Implications for Survivability of Riprap Used to Protect Uranium Mill Tailings 569

Long-Term Survivability of Riprap for Armoring Uranium-Mill Tailings and Covers: A Literature Review 570

Riprap Design Considerations for Long-Term Protection of Uranium Mill Tailings 650

Rock Riprap Design Methods and Their Applicability to Long-Term Protection of Uranium Mill Tailings Impoundments 651

Risk

Waste Management '80 - The State of Waste Disposal Technology, Mill Tailings, and Risk Analysis Models 346

Excess Cancer Risk Estimates from Exposure to Gamma and Radon Daughter Levels in Mesa County, Colorado 479

River

An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 40

Decommissioning Alternatives for Savannah River Plant High-Level Waste Tank 16 94

Land Use Study of the Falls River Uranium Site 422

Riverton

Land Use Study of the Riverton, Wyoming Uranium Tailings Site 420

Hydro-Geochemical Studies of Uranium Mill Tailing Piles at Riverton, Wyoming and Maybell, Colorado 435

PERMUTED TITLE INDEX

Recent Radiochemistry Observations at the Riverton and Maybell Tailings Piles 444
Recent Hydrologic Observations from the Riverton and Maybell Tailings Piles 447
Chemical Transport Beneath a Uranium Mill Tailings Pile, Riverton, Wyoming 477

RMDF

RMDF Leach Field Decontamination - Final Report 104

Rock

Baseline Data and Land Use Impact of the Slick Rock Uranium Tailings Sites 409
Revegetation/Rock Cover for Stabilization of Inactive U-Tailings Sites 489
Revegetation/Rock Cover for Stabilization of Inactive Uranium Mill Tailings Disposal Sites 490
Loose Rock as Biobarriers in Shallow Land Burial 503
Effect of Rock Cover on Multilayer Radon Barrier Effectiveness 564
A Review of Long-Term Rock Durability: Implications for Survivability of Riprap Used to Protect Uranium Mill Tailings 569
Soil-Water Impacts from Using Vegetation and Rock Covers for Surface Stabilization of Uranium-Mill Tailings 579
Handbook for the Design, Selection, and Construction of a Rock Cover for Retired Uranium Mill Tailings 600
Rock Riprap Design Methods and Their Applicability to Long-Term Protection of Uranium Mill Tailings Impoundments 651

Rockwell

Aerial Radiological Surveys of Rockwell International Facilities, Canoga Park, California - Date of Surveys: June and July 1978 54
Surface Soil Contamination Standards for Rockwell Hanford Operations 101

Rocky

Criteria and Cost Estimates for Decommissioning and Decontamination of Major Plutonium Buildings at Rocky Flats Plant 2

Rodents

Habitat Requirements and Burrowing Depths of Rodents in Relation to Shallow Waste Burial Sites 340

Ryerson

Radiological Survey of Ryerson Physical Laboratory, The University of Chicago, Chicago, Illinois, September 11-25, 1976 396

R1

Dismantling of the R1 Reactor, Stockholm 306

Safety

Saxton Decommissioning Plan and Safety Analysis Report 26
United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27
Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 159
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 160
Publication of the Safety Regulation KTA 1401 by Kerntechnischer Ausschuss - Dated April 13, 1981 222

Salt

Evaluation of Interface Between Tailings and Subtailings Soil, A Case Study: Vitro Tailings,

PERMUTED TITLE INDEX

Salt Lake City, Utah 430
Instrumentation for Off-Site Remedial Action in Salt Lake City, Utah 438
DOE Awards Contract for Salt Lake City Cleanup 457

Salvage
Electrolytic Decontamination of Torus Steel for Release as Salvage 245

Sampling
Project Report of Phase I Remedial Action of Properties Associated with the Former Middlesex Sampling Plant Site 387

San
An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 48

Sand
Contaminant Migration in a Sand Aquifer near an Inactive Uranium Tailings Impoundment, Elliot Lake, Ontario 589

Saturated
Migration of Radionuclide Chains in a Non-Homogeneous Aquifer under Transient Saturated-Unsaturated Flow Conditions 538

Savannah
An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 40
Decommissioning Alternatives for Savannah River Plant High-Level Waste Tank 16 94

Saw
The Arc Saw and Its Application to Decommissioning 282
Arc Saw Development Report 284
Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw 290

Saxton
Saxton Nuclear Experimental Corporation's Change Request No. 50 to Technical Specification and Request for Amendment No. 8 to License No. DPR-4 21
Saxton Decommissioning Plan and Safety Analysis Report 26

Says
Bankruptcy Potential Threatens Decommissioning Funds, Says NRC 200

Scale
Radiological Assessment of the Decontamination and Decommissioning of a Small-Scale Fuel-Reprocessing Plant 59
In Situ Vitrification of Contaminated Soil: Pilot-Scale Field Testing 103

Scans
Pre-decontamination Gamma-Ray Surface Scans in TMI-2 Containment Building 305 Foot Elevation 36

Scarification
High Pressure Water-Jet Scarification of High Density Concrete 288

Schedule
Proposed Remedial Action Standards for Inactive Uranium Processing Sites - Instructions and Schedule for Public Hearings 470

Sciences
Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111

Scientific
Use of Scientific Calculators and Pocket Computers for Evaluation of Seepage and Contaminant Transport 505

PERMUTED TITLE INDEX

Scrub

Comparative Scrub Solution Tests for Decontamination of Transuranic Radionuclides from Soils 112

Sealant

Sealant Tests to Control Radon Emanation in a Uranium Mine 568

Searching

Three Mile Island: Searching for Pennsylvania Initiatives (Alternatives for Funding Cleanup) 269

Secretary

Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences 111

Sectioning

Sectioning of Contaminated Components for Decontamination by Vibratory Finishing and Electropolishing 251

Sedimentation

Radium-226 Removal by Precipitation and Sedimentation in Settling Ponds 588

Seepage

Design and Seepage Modeling Studies of Below-Grade Disposal, West Gas Hills, Wyoming 417

Use of Scientific Calculators and Pocket Computers for Evaluation of Seepage and Contaminant Transport 505

Computer Analysis of Seepage and Groundwater Response Beneath Tailings Impoundments 517

Influence of Impoundment and Substratum Configuration on Seepage from Impoundments 595

Radionuclide Movement in Seepage and Its Control 632

Modeling of Seepage Through Mine Tailings Dams 647

Selected

Cleanup and Treatment of Radioactively Contaminated Land Including Areas Near Nuclear Facilities: A Selected Bibliography 105

Nuclear Power Reactors: An Overview of Selected Issues 169

Canonsburg Construction Firm Selected for Vicinity Property Cleanup Efforts 458

Investigations Into Selected Ecological Aspects of the Aquatic and Terrestrial Environment of an Abandoned Uranium Mill Tailings Pond, Bancroft, Ontario 559

Selection

Handbook for the Design, Selection, and Construction of a Rock Cover for Retired Uranium Mill Tailings 600

Semi

Revegetation of Disturbed Grounds in the Semi-Arid Climate of Southcentral Washington 328

Meteorological Tower Data, Grand Junction Tailings Site, CO - Semi-annual Report, July-December, 1981 480

Semiarid

Dry Land Techniques in the Semiarid West 550

Separation

Separation of Transuranic Radionuclides from Soil by Vibratory Grinding 113

September

An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972 39

PERMUTED TITLE INDEX

An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43
Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Commercial Program 178
Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Defense Program 189
Surface and Subsurface Gamma Survey of the Kellex Site, Jersey City, New Jersey - Date of Survey: September 8-11, 1980 378
Radiological Survey of Eckhart Hall, The University of Chicago, Chicago, Illinois, September 14, 1976-March 22, 1977 393
Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394
Radiological Survey of Ryerson Physical Laboratory, The University of Chicago, Chicago, Illinois, September 11-25, 1976 396
Radiological Survey of Kent Chemical Laboratory, The University of Chicago, Chicago, Illinois, September 7-13, 1977 397
Radioecological Investigations of Uranium-Mill-Tailings Systems: Second Technical Progress Report, October 1, 1980-September 30, 1981 476

Sequential
Decommissioning of Multiple-Reactor Stations: Facilitation by Sequential Decommissioning 217

Series
Forage Uptake of Uranium Series Radionuclides in the Vicinity of the Anaconda Uranium Mill 439

Service
Evaluation of Immediate Dismantlement of CANDU Reactors at the End of Service Life 272

Services
An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43

Settling
Radium-226 Removal by Precipitation and Sedimentation in Settling Ponds 588

Shallow
Assessment of Change in Shallow Land Burial Limits for Defense Transuranic Waste 117
Criteria Needs for Siting, Licensing, Operation, Closure, Stabilization, and Decommissioning of Shallow Land Disposal Sites for Radioactive Waste 123
Habitat Requirements and Burrowing Depths of Rodents in Relation to Shallow Waste Burial Sites 340
Loose Rock as Biobarriers in Shallow Land Burial 508

Sheet
Technology and Equipment for Gas-Laser Cutting of Sheet Steels 321

Sheets
Recommended Practices for Plasma Arc Welding (Welding Workbook Data Sheets 31a, 31b) 280

Shield
Demolition and Removal of a Research Reactor Biological Shield 91
Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station 238

Shields
Biological Shields 302

PERMUTED TITLE INDEX

Ship
NS Otto Hahn - The First German Nuclear Ship 369
Shipped
The 1979 State-by-State Assessment of Low-Level Radioactive Wastes Shipped to Commercial Burial Grounds 125
Shipping
Experience in Treatment of Components, Waste Treatment, Packaging and Shipping Related to Decommissioning 333
Shippingport
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 25, 1977-July 25, 1977 5
Design of the Shippingport Light Water Breeder Reactor 9
Engineering and Planning for the Shippingport Station Decommissioning Project 19
Beaver Valley Power Station and Shippingport Atomic Power Station - 1977 Annual Environmental Report: Radiological - Volume 2 41
Beaver Valley Power Station and Shippingport Atomic Power Station - 1978 Annual Environmental Report: Radiological - Volume 2 42
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1976-January 25, 1977 141
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program) 142
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1978-January 25, 1979 143
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1979-July 25, 1979 144
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1980-July 25, 1980 145
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1979-January 25, 1980 146
Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1981-July 25, 1981 147
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1980-January 25-1981 148
Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1981-January 25, 1982 153
Test Evaluation Shippingport Atomic Power Station LWBR Project (LWBR Development Program), July-August 1977 167
Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control (1965-1975) 168
Shiprock
Baseline Data and Land Use Impact of the Shiprock Uranium Tailings Site 403
National Uranium Resource Evaluation: Shiprock Quadrangle, Arizona, New Mexico, Colorado, and Utah 537
Shows
What the Record Shows: Uranium Mine Tailings 639
Shut
Proposal for Decommissioning of Contaminated Steel Parts from Shut Down Nuclear Power Plants 338
Shutdown
Shutdown of Nuclear Power Plants - Production of Activated Material from the Region of the Reactor Core by the Example of a Shutdown Pressurized Water Reactor 339

PERMUTED TITLE INDEX

Silicate
Evidence for the Instability of Silicate Minerals in Acid Leach Uranium Mill Tailings **504**
Simulation
Simulation of Water Flow and Retention in Earthen-Cover Materials Overlying Uranium Mill Tailings **624**
Physical Modeling of Tailings Dams Using Centrifuge Simulation Techniques **631**
Siting
Criteria Needs for Siting, Licensing, Operation, Closure, Stabilization, and Decommissioning of Shallow Land Disposal Sites for Radioactive Waste **123**
A Simplified Method for Acquiring Meteorological Data for Siting and Licensing of Uranium Mill and Tailings Disposal Facilities **526**
Situ
Aerial and Ground-Based In Situ Measurements for Evaluation and Implementation of Radioactive Site Cleanup **60**
In Situ Vitrification of Contaminated Soil: Pilot-Scale Field Testing **103**
In Situ Grouting of Uranium Mill Tailings Piles **445**
Slick
Baseline Data and Land Use Impact of the Slick Rock Uranium Tailings Sites **409**
Sludge
Waste Sludge Resuspension and Transfer: Development Program **355**
Environmental Consequences of the Placement of Radium-Barium Sludge in Tailings Areas **553**
Sludges
Leachability of Barium-Radium Sulphate Sludges **552**
Placement of Radium/Barium Sludges in Tailings Areas **590**
Smelting
Decontamination of Uranium-Contaminated Iron by Smelting **268**
Social
Social Impact and Land Use at the Vitro Tailings Site **411**
Sodium
Removal of Sodium for the Sodium Reactor Experiment Primary System **77**
HNPF Retirement Disposition of Sodium **80**
Lessons Learned in Decommissioning the Sodium Reactor Experiment **155**
Sohio
Sohio Western Mining Company Tailing Dam **425**
Soil
Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at Oak Ridge National Laboratory **35**
Surface Soil Contamination Standards for Rockwell Hanford Operations **101**
Surface Soil Contamination Standards **102**
In Situ Vitrification of Contaminated Soil: Pilot-Scale Field Testing **103**
Decontamination of Soil Containing Plutonium and Americium **109**
Review of Soil Contamination Guidance - Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences **111**
Separation of Transuranic Radionuclides from Soil by Vibratory Grinding **113**
Ocean Disposal Feasibility Study: Candidate DOE (FUSRAP) Soil Characterization **385**
Interaction of Acidic Leachate with Soil Materials at Lucky McPathfinder Mill, Gas Hills, Wyoming **413**
Evaluation of Interface Between Tailings and Subtailings Soil, A Case Study: Vitro Tailings,

PERMUTED TITLE INDEX

Salt Lake City, Utah 430
Thermodynamic Calculations and Phase Diagrams in Evaluating Tailings-Soil-Water Interactions 577
Soil-Water Impacts from Using Vegetation and Rock Covers for Surface Stabilization of Uranium-Mill Tailings 579
Evaluation of Inactive Uranium Mill Tailings Sites for Liner Requirements: Characterization and Interaction of Tailings, Soil and Liner Materials 609

Soils
Comparative Scrub Solution Tests for Decontamination of Transuranic Radionuclides from Soils 112
Measurements and Calculations of Radon Flux Attenuation by Western U.S. Soils 440
A Counting System for Field Determination of Radium-226 in Soils 584
Tailings and Soils 617

Solid
Equipment Decontamination with Special Attention to Solid Waste Treatment: Survey Report 246

Solution
Comparative Scrub Solution Tests for Decontamination of Transuranic Radionuclides from Soils 112
Electrolyte Solution for Electropolishing 265
Methodology Used in Devising a New Solution to the Disposal of Hazardous Wastes Using Uranium Tailings as a Current Example 572

Solutions
Investigation of Highly Efficient Decontamination Solutions for Decommissioning of Pressurized Water Reactor Power Plants 266
Contact of Clay Liner Materials with Acidic Tailings Solutions 602
Contact of Clay Liner Materials with Acidic Tailings Solutions: 1 - Mineral Characterization 644

Solves
Torch Cuts Off "Hot" Plates - Underwater Cutting Solves Radioactive Disposal Problem 84

Source
The Decontamination of the Curium Source Fabrication Facility 73

South
An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 40
Use of Geotextiles in Uranium-Gold Tailings Impoundments in South Africa 491

Southcentral
Revegetation of Disturbed Grounds in the Semi-Arid Climate of Southcentral Washington 328

Specification
Saxton Nuclear Experimental Corporation's Change Request No. 50 to Technical Specification and Request for Amendment No. 8 to License No. DPR-4 21

Specifications
Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 38 30
Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 37 98

Spent
Spent Fuel and Waste Inventories and Projections 116
Integrated Data Base for Spent Fuel and Radwaste: Inventories 129
Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics 130
Decommissioning of Independent Spent Fuel Storage Installations 215
Decommissioning a Spent Fuel Processing Facility - Low Level Waste Management 357

PERMUTED TITLE INDEX

Sponsored

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory: Quarterly Progress Report, January-March, 1982, Interim Report 442

Spring

Report on Preliminary Geological, Hydrological and Radiological Survey at the Weldon Spring Quarry During 1976 and 1977 49

An Aerial Radiological Survey of the Watts Bar Nuclear Plant and Surrounding Area, Spring City, Tennessee 55

Preliminary Characterization and Assessment of the Weldon Spring Low-Level Waste Disposal Site 56

Weldon Spring Decommissioning Study - Quarry Supplement 57

Weldon Spring Decommissioning Study 58

Weldon Spring Storage Site - Environmental Monitoring Report for 1979 and 1980 62

SRE

SRE Underwater Plasma Arc Cutting Development Test Report 93

Practical Technological Benefits of SRE Decommissioning 198

St

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 38

Stability

Evidence for the Long-Term Stability of Uranium Mill Tailings: Survivability of Ancient Man-Made Earthen Structures 571

Parameters Affecting Stability of Tailings Dams 597

Stabilization

Criteria Needs for Siting, Licensing, Operation, Closure, Stabilization, and Decommissioning of Shallow Land Disposal Sites for Radioactive Waste 123

Stabilization of Existing Uranium Mill Tailings Piles at Uravan, Colorado 401

Commingled Uranium-Tailings Study: Volume 1, Plan for Stabilization and Management of Commingled Uranium-Mill Tailings 459

Revegetation/Rock Cover for Stabilization of Inactive U-Tailings Sites 489

Revegetation/Rock Cover for Stabilization of Inactive Uranium Mill Tailings Disposal Sites 490

Caliche-Cover for Stabilization of Abandoned Mill Tailings 495

Interim Stabilization of Uranium Mill Tailings 522

Stabilization of Uranium Mill Tailings with Asphalt Emulsion 546

Stabilization of Fine Uranium Mill Tailings 576

Soil-Water Impacts from Using Vegetation and Rock Covers for Surface Stabilization of Uranium-Mill Tailings 579

Long-Term Stabilization of Uranium Mill Tai[illegible] Pile Surface, Project Overview 585

Stabilization, Engineering, and Monitoring Alt[illegible]ves Assessment for Improving Regulation of Uranium Recovery Operations and Waste [illegible]agement 619

Environmental Factors Affecting Long-Term Stabilization of Radon Suppression Covers for Uranium Mill Tailings 656

Stage

The Use of Stage Curves and Mass Balances in the Design of Uranium Tailings Impoundments 554

Stainless

Stainless Steel 250

Electropolishing of Nickel-Containing Austenitic Stainless Steel and Nickel-Base Alloys 255

PERMUTED TITLE INDEX

Electropolishing of Carbon Steel and Stainless Steel and Its Industrial Application 256
Electropolishing of Stainless Steel 260
Underwater Cutting of Stainless Steel Plate and Pipe for Dismantling Reactor Pressure Vessels 296
Study on Underwater Plasma Arc Cutting for Stainless Steel 297
Air Pollution in the Plasma Cutting of Steel, Stainless Steel and Aluminum 320

Standards

Surface Soil Contamination Standards for Rockwell Hanford Operations 101
Surface Soil Contamination Standards 102
EPA Issues Standards on Uranium Tailings 454
Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192): Draft Environmental Impact Statement 464
Regulatory Impact Analysis of Environmental Standards for Uranium Mill Tailings at Active Sites 465
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 1 466
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 2 467
Draft Environmental Impact Statement for Standards for the Control of Byproduct Materials from Uranium Ore Processing (40 CFR 192) 468
Standards for Remedial Actions at Inactive Uranium Processing Sites 469
Proposed Remedial Action Standards for Inactive Uranium Processing Sites - Instructions and Schedule for Public Hearings 470
Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites - Invitation for Comment 471
A Benefit-Cost Methodology for Developing Environmental Standards for Uranium Mill Tailings Disposal 567
Simple Field Method for Determining Compliance with EPA Land Cleanup Standards 618

Stands

Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394

Statement

Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Summary 134
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Main Report 135
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices A-F 136
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Appendices G-Q 137
Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192): Draft Environmental Impact Statement 464
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 1 466
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 2 467
Draft Environmental Impact Statement for Standards for the Control of Byproduct Materials from Uranium Ore Processing (40 CFR 192) 468

PERMUTED TITLE INDEX

Station

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 25, 1977-July 25, 1977 **5**

Engineering and Planning for the Shippingport Station Decommissioning Project **19**

Beaver Valley Power Station and Shippingport Atomic Power Station - 1977 Annual Environmental Report: Radiological - Volume 2 **41**

Beaver Valley Power Station and Shippingport Atomic Power Station - 1978 Annual Environmental Report: Radiological - Volume 2 **42**

An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 **48**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1976-January 25, 1977 **141**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program) **142**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1978-January 25, 1979 **143**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1979-July 25, 1979 **144**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1980-July 25, 1980 **145**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1979-January 25, 1980 **146**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1981-July 25, 1981 **147**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1980-January 25-1981 **148**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1981-January 25, 1982 **153**

Test Evaluation Shippingport Atomic Power Station LWBR Project (LWBR Development Program), July-August 1977 **167**

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control (1965-1975) **168**

Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station **238**

Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island **241**

Stations

Decommissioning of Nuclear Generating Stations **209**

Decommissioning of Multiple-Reactor Stations: Facilitation by Sequential Decommissioning **217**

Closing-Down of Nuclear Power Stations in the Federal Republic of Germany **229**

Decontamination in Nuclear Power Stations **263**

Dismantlement of Nuclear Power Stations in Germany **323**

Abandonment of Nuclear Power Stations at the End of Their Working Life **358**

Statistical

Statistical Evaluation of Contamination from Uranium Mill Tailings by Physical Transport and Chemical Migration **503**

Statistician

Statistics and the Statistician in Nuclear Site Decontamination and Decommissioning: Lecture Notes for a Four-Day Short Course **237**

PERMUTED TITLE INDEX

Statistics

Statistics and the Statistician in Nuclear Site Decontamination and Decommissioning: Lecture Notes for a Four-Day Short Course 237

Status

Status of Decommissioning Program of U.S. Nuclear Regulatory Commission 8

Interim Radiological Site Characterization and D&D Status Report - New Brunswick Laboratory, New Jersey Site 63

Status of the Decommissioning Program of the Eurochemic Reprocessing Plant 368

The Status of the Uranium Mill Tailings Remedial Actions Project (UMTRAP) 432

Annual Status Report on the Uranium Mill Tailings Remedial Action Program 461

Uranium Mill Tailings Remedial Action Program: Annual Status Report 462

Leachability of Radioactive Constituents from Uranium Mine Tailings - Status Report - June 1974 to January 1977 499

Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching 603

Steam

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control (1965-1975) 168

Steel

Vigorous Decontamination Tests of Steel Samples 242

Electrolytic Decontamination of Torus Steel for Release as Salvage 245

Behaviour of Polonium During Electrochemical Steel Polishing Process 248

Stainless Steel 250

Electropolishing of Nickel-Containing Austenitic Stainless Steel and Nickel-Base Alloys 255

Electropolishing of Carbon Steel and Stainless Steel and Its Industrial Application 256

Electropolishing of Stainless Steel 260

Underwater Cutting of Stainless Steel Plate and Pipe for Dismantling Reactor Pressure Vessels 296

Study on Underwater Plasma Arc Cutting for Stainless Steel 297

Air Pollution in the Plasma Cutting of Steel, Stainless Steel and Aluminum 320

Proposal for Decommissioning of Contaminated Steel Parts from Shut Down Nuclear Power Plants 338

Radiological Survey of Universal Cyclops, Inc., Titusville Plant (Formerly Vulcan Crucible Steel Company, Aliquippa, Pennsylvania), May 2-8, 1978 399

Steels

Thermal Cutting: What To Do About High Alloy Steels 278

Surface Plasma-Arc Cutting of Steels 10KHSND and 10KHN1M 307

Technology and Equipment for Gas-Laser Cutting of Sheet Steels 321

Stockholm

Dismantling of the R1 Reactor, Stockholm 306

Stone

Underwater Oxygen Lance - Cutting of Metals, Concrete and Stone 273

Stope

Early Diagenesis of Uranium Mine Stope Backfill 496

Stopes

Radon Emanation from Stopes Backfilled with Cemented Uranium Mill Tailings 528

Storage

Environmental Surveillance Plan for the Department of Energy's Niagara Falls Storage Site

PERMUTED TITLE INDEX

(NFSS), Lewiston, New York 44
Weldon Spring Storage Site - Environmental Monitoring Report for 1979 and 1980 62
Decontamination and Decommissioning of the EBR-1 Complex, Topical Report No. 1 - Removal of NaK from EBR-1 Storage Pit 118
Disposal or On-site Storage of Thorium or Uranium Wastes from Past Operations 138
Summary Report on NLO Remedial Projects at the DOE-Niagara Falls Storage Site 166
Decommissioning of Independent Spent Fuel Storage Installations 215
Decommissioning of Unit A of the Nuclear Power Plant Gundremmingen and its Conversion to a Condition of Protective Storage 231
Model Environmental Assessment for a Property-Cleanup/Interim-Storage Remedial Action at a Formerly Utilized Site 386
Uranium Mill Tailings Storage, Use, and Disposal Problems 548

Street
Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois 395

Structure
Decommissioning Engineering Within the Framework of the French Nuclear Structure 223
Radioactive Inventory of a Decommissioned Magnox Power Station Structure: (1) Measurements of Neutron Induced Activity in Samples from the Reactor Island 241

Structures
Evidence for the Long-Term Stability of Uranium Mill Tailings: Survivability of Ancient Man-Made Earthen Structures 571

Sub
Laser Cutting Equipment for Dismantling Irradiated PFR Fuel Sub-Assemblies 298

Subassembly
Laser Cutting Apparatus for Nuclear Core Fuel Subassembly 277

Substratum
Influence of Impoundment and Substratum Configuration on Seepage from Impoundments 595

Subsurface
Radionuclide Characterization of Subsurface Soil on the Site of Building 3505 at Oak Ridge National Laboratory 35
Surface and Subsurface Gamma Survey of the Kellex Site, Jersey City, New Jersey - Date of Survey: September 8-11, 1980 378

Subtailings
Evaluation of Interface Between Tailings and Subtailings Soil, A Case Study: Vitro Tailings, Salt Lake City, Utah 430

Suitability
Assessment of the Long Term Suitability of Present and Proposed Methods for the Management of Uranium Mill Tailings 563

Sulphate
Leachability of Barium-Radium Sulphate Sludges 552

Summary
Environmental Monitoring Summary for Ames Laboratory: Calendar Year 1981 61
Draft Environmental Impact Statement on 10 CFR Part 61 "Licensing Requirements for Land Disposal of Radioactive Waste," Summary 134
Evaluation of Nuclear Facility Decommissioning Projects - Summary Report: Enrico Fermi-1 Reactor 158
Summary Report on NLO Remedial Projects at the DOE-Niagara Falls Storage Site 166

PERMUTED TITLE INDEX

Summary Report - Phase 1 Study of Inactive Uranium Mill Sites and Tailings Piles 449
State of Idaho Community Summary Report for Radiation Surveys - Lowman, Idaho 463
Summary of Research on Analyses of Flow Failures of Mine Tailings Impoundments 557
Summary of Research on Case Histories of Flow Failures of Mine Tailings Impoundments 574

Suppression

Environmental Factors Affecting Long-Term Stabilization of Radon Suppression Covers for Uranium Mill Tailings 656

Surface

Pre-decontamination Gamma-Ray Surface Scans in TMI-2 Containment Building 305 Foot Elevation 36
Surface Concrete Decontamination Equipment Developed by Pacific Northwest Laboratory 68
Surface Soil Contamination Standards for Rockwell Hanford Operations 101
Surface Soil Contamination Standards 102
Literature Survey of Interior-Surface Materials for the Advanced Size Reduction Facility 271
Surface Plasma-Arc Cutting of Steels 10KHSND and 10KHN1M 307
Improvements in Methods and Apparatus for Cutting, Welding and Surface Treating Using a Laser Beam in Conjunction with an Arc 311
Surface and Subsurface Gamma Survey of the Kellex Site, Jersey City, New Jersey - Date of Survey: September 8-11, 1980 378
Restoration of Surface Vegetation on Uranium Wastes at Uravan, Colorado 414
Surface Transportation Assistance Act of 1978 - Amendment 452
A Systematic Approach to Designing Surface Covers for Uranium Mill Tailings 488
Surface-Water Hydrologic Criteria for Uranium-Mine Tailings Impoundments in Ontario 492
Soil-Water Impacts from Using Vegetation and Rock Covers for Surface Stabilization of Uranium-Mill Tailings 579
Long-Term Stabilization of Uranium Mill Tailings Pile Surface, Project Overview 585

Surfaces

Electrochemical Decontamination of Metallic Surfaces 244
System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design 289

Surplus

United States Department of Energy Surplus Facilities Management Program 163
Surplus Facilities Management Program - Program Plan, FY 1983-1987 175
Surplus Facilities Management Program - Program Plan, FY 1983-1987 176
Surplus Facilities Management Program - Program Plan, FY 1983-1987 177
Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Commercial Program 178
Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Commercial Program 179
Office of Surplus Facilities Management Monthly Progress Report, January 1983 - Defense Program 180
Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Defense Program 181
Office of Surplus Facilities Management Monthly Progress Report, February 1983 - Commercial Program 182
Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 -

PERMUTED TITLE INDEX

Defense Program 183
Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Commercial Program 184
Office of Surplus Facilities Management Monthly Progress Report, October/November 1982 - Commercial Program 185
Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Defense Program 186
Office of Surplus Facilities Management Monthly Progress Report, December 1982 - Commercial Program 187
Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Commercial Program 188
Office of Surplus Facilities Management Monthly Progress Report, September 1982 - Defense Program 189
Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Commercial Program 190
Office of Surplus Facilities Management Monthly Progress Report, June 1982 - Defense Program 191
Office of Surplus Facilities Management Monthly Progress Report, July 1982 - Defense Program 192
Office of Surplus Facilities Management Monthly Progress Report, May 1982 - Defense Program 193
Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Defense Program 194
Office of Surplus Facilities Management Monthly Progress Report, March 1983 - Civilian Program 195
Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Defense Program 196
Office of Surplus Facilities Management Monthly Progress Report, April 1983 - Civilian Program 197

Surrounding

An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972 39
An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 40
An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43
An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 48
An Aerial Radiological Survey of the Argonne National Laboratory and Surrounding Area, Argonne, Illinois - Date of Survey: May 1977 52
An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 53
An Aerial Radiological Survey of the Watts Bar Nuclear Plant and Surrounding Area, Spring City, Tennessee 55

Surveillance

Piqua Nuclear Power Facility Radiological Surveillance Program 37
Environmental Surveillance Plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York 44
Environmental Surveillance for the INEL Radioactive Waste Management Complex 50
Environmental Surveillance for the INEL Radioactive Waste Management Complex 51
Plea for Realistic Environmental Surveillance/Decommissioning Criteria Based on Radiation Dose 239
Environmental Surveillance of the Palos Park Forest Preserve 381

PERMUTED TITLE INDEX

Survey

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri **38**

An Aerial Radiological Survey of the Area Surrounding the Dresden Nuclear Power Plant, Morris, Illinois - Date of Survey: September 1972 **39**

An Aerial Radiological Survey of the Savannah River Plant and Surrounding Area, Aiken, South Carolina - Date of Survey: June 1979 **40**

An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 **43**

An Aerial Radiological Survey of the U.S. Department of Energy's Mound Facility, Miamisburg, Ohio - Date of Survey: July 1976 **45**

An Aerial Radiological Survey of United States Department of Energy Sites in Ames, Iowa, Date of Survey: May 1977 **46**

An Aerial Radiological Survey of Areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15 and 17 Yucca Flat, Nevada Test Site **47**

An Aerial Radiological Survey of the San Onofre Nuclear Generating Station and Surrounding Area, San Clemente, California - Date of Survey: January 9-17, 1980 **48**

Report on Preliminary Geological, Hydrological and Radiological Survey at the Weldon Spring Quarry During 1976 and 1977 **49**

An Aerial Radiological Survey of the Argonne National Laboratory and Surrounding Area, Argonne, Illinois - Date of Survey: May 1977 **52**

An Aerial Radiological Survey of the Fermi National Accelerator Laboratory and Surrounding Area, Batavia, Illinois - Date of Survey: May 12-14, 1977 **53**

An Aerial Radiological Survey of the Watts Bar Nuclear Plant and Surrounding Area, Spring City, Tennessee **55**

Survey of On-Going and Completed Remedial Action Projects **162**

Outline of Survey Concerning Decommissioning of Nuclear Facilities, (2) **221**

Equipment Decontamination with Special Attention to Solid Waste Treatment: Survey Report **246**

Literature Survey of Interior-Surface Materials for the Advanced Size Reduction Facility **271**

Survey of Underwater Cutting of Metals **293**

Surface and Subsurface Gamma Survey of the Kellex Site, Jersey City, New Jersey - Date of Survey: September 8-11, 1980 **378**

Radiological Survey of the Former Uranium Recovery Pilot and Process Sites, Gardinier, Incorporated, Tampa, Florida - Final Report **382**

Radiological Survey of Eckhart Hall, The University of Chicago, Chicago, Illinois, September 14, 1976-March 22, 1977 **393**

Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 **394**

Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois **395**

Radiological Survey of Ryerson Physical Laboratory, The University of Chicago, Chicago, Illinois, September 11-25, 1976 **396**

Radiological Survey of Kent Chemical Laboratory, The University of Chicago, Chicago, Illinois, September 7-13, 1977 **397**

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 **398**

Radiological Survey of Universal Cyclops, Inc., Titusville Plant (Formerly Vulcan Crucible Steel Company, Aliquippa, Pennsylvania), May 2-8, 1978 **399**

PERMUTED TITLE INDEX

Gamma Survey Measurement Techniques at UMTRAP Sites **426**
A Survey of Radon Measurement Needs and Activities in State Radiation Control Programs **514**
Survey of the Occurrence of Ra-226 in the Rio Algom Quirke I Uranium Mill, Elliot Lake **625**

Surveys
Aerial Radiological Surveys of Rockwell International Facilities, Canoga Park, California - Date of Surveys: June and July 1978 **54**
State of Idaho Community Summary Report for Radiation Surveys - Lowman, Idaho **463**
Aerial Radiation Surveys **558**

Survivability
A Review of Long-Term Rock Durability: Implications for Survivability of Riprap Used to Protect Uranium Mill Tailings **569**
Long-Term Survivability of Riprap for Armoring Uranium-Mill Tailings and Covers: A Literature Review **570**
Evidence for the Long-Term Stability of Uranium Mill Tailings: Survivability of Ancient Man-Made Earthen Structures **571**

Swedish
Management of Decommissioning Waste from the Swedish Nuclear Program **337**

Swiss
Decommissioning Study for the Beznau Nuclear Power Plant (2 X 350 MW) - the Swiss Approach **210**

Synthetic
Cotter Corporation's New Tailings Pond Has a Synthetic Liner **637**

System
Interactive Planning System for Developing Decommissioning and Decontamination Plans at Hanford **18**
Removal of Sodium for the Sodium Reactor Experiment Primary System **77**
Final Report - Decontamination and Decommissioning of TAN Radioactive Liquid Waste Evaporator System (PM-2A) **96**
Transportation of Radioactive Materials: The Legislative and Regulatory Information System **124**
System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design **289**
Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Experimental System for Collection and Characterization **316**
An Improved Radon Flux Measurement System for Uranium Tailings Pile Measurement **529**
Field Testing of Asphalt Emulsion Radon Barrier System **545**
A Counting System for Field Determination of Radium-226 in Soils **584**

Systematic
A Systematic Approach to Designing Surface Covers for Uranium Mill Tailings **488**

Systems
Radioecological Investigations of Uranium-Mill-Tailings Systems: Second Technical Progress Report, October 1, 1980-September 30, 1981 **476**
Cost and Effectiveness of Radon Barrier Systems **486**
Cost of Radon-Barrier Systems for Uranium Mill Tailings **487**
Containment Systems for Uranium Mill Tailings **544**
Multidimensional Analysis of Radon Diffusion Through Uranium Mill Tailings and Cover Systems **580**

PERMUTED TITLE INDEX

S8ER

S8ER Facilities Decommissioning - Final Report **170**

TA

Environmental Analysis of the Bayo Canyon (TA-10) Site, Los Alamos, New Mexico **376**

Tailing

Evaluation of Radionuclide and Trace Metal Migration Beneath an Inactive Tailing Impoundment **402**

Land Use Study of the Ambrosia Lake Tailing Site **419**

Land Use Study of the Ray City Uranium Tailing Site **421**

Land Use Study of the Uranium Tailing Site at Lakeview, Oregon **423**

Land Use Study of the Converse County Uranium Tailing Site **424**

Sohio Western Mining Company Tailing Dam **425**

Hydro-Geochemical Studies of Uranium Mill Tailing Piles at Riverton, Wyoming and Maybell, Colorado **435**

Vegetation for Acidic and Alkaline Tailing **518**

Tailing Reclamation **575**

Tampa

Radiological Survey of the Former Uranium Recovery Pilot and Process Sites, Gardinier, Incorporated, Tampa, Florida - Final Report **382**

TAN

Final Report - Decontamination and Decommissioning of TAN Radioactive Liquid Waste Evaporator System (PM-2A) **96**

Tank

Decommissioning Alternatives for Savannah River Plant High-Level Waste Tank 16 **94**

Task

System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design **289**

Taxation

Nuclear Economics: Taxation, Fuel Cost, and Decommissioning **203**

Technical

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 25, 1977-July 25, 1977 **5**

Saxton Nuclear Experimental Corporation's Change Request No. 50 to Technical Specification and Request for Amendment No. 8 to License No. DPR-4 **21**

Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 38 **30**

Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 37 **98**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1976-January 25, 1977 **141**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1978-July 25, 1978 (LWBR Demonstration Program) **142**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1978-January 25, 1979 **143**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1979-July 25, 1979 **144**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1980-July 25, 1980 **145**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1979-January 25, 1980 **146**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, January 26, 1981-July 25, 1981 **147**

PERMUTED TITLE INDEX

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1980-January 25-1981 **148**

Shippingport Atomic Power Station (PWR) - Technical Progress Report, July 26, 1981-January 25, 1982 **153**

Commingled Uranium-Tailings Study, Volume II - Technical Report **400**

Radioecological Investigations of Uranium-Mill-Tailings Systems: Second Technical Progress Report, October 1, 1980-September 30, 1981 **476**

Technological

Practical Technological Benefits of SRE Decommissioning **198**

Technology

Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents **159**

Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents **160**

Preparing a Decommissioning Cost and Technology Study **212**

Development of Improved Technology for Decommissioning Operations **243**

Technology and Equipment for Gas-Laser Cutting of Sheet Steels **321**

A Study of Underwater Thick Plate Cutting Technology **327**

Waste Management '80 - The State of Waste Disposal Technology, Mill Tailings, and Risk Analysis Models **346**

The UMTRAP Technology Development Program: A Progress Report **437**

Preliminary Evaluation of Uranium Mill Tailings Conditioning as an Alternative Remedial Action Technology **521**

Tennessee

An Aerial Radiological Survey of the Watts Bar Nuclear Plant and Surrounding Area, Spring City, Tennessee **55**

Term

Long-Term Problem for the Nuclear Industry **92**

Long-Term Biobarriers to Plant and Animal Intrusions of Uranium Tailings **507**

Application of Long-Term Chemical Biobarriers for Uranium Tailings **509**

Assessment of the Long Term Suitability of Present and Proposed Methods for the Management of Uranium Mill Tailings **563**

A Review of Long-Term Rock Durability: Implications for Survivability of Riprap Used to Protect Uranium Mill Tailings **569**

Long-Term Survivability of Riprap for Armoring Uranium-Mill Tailings and Covers: A Literature Review **570**

Evidence for the Long-Term Stability of Uranium Mill Tailings: Survivability of Ancient Man-Made Earthen Structures **571**

A Qualitative Evaluation of Long-Term Processes Governing the Behaviour of Uranium Mill Tailings Placed in Deep Lakes **583**

Long-Term Stabilization of Uranium Mill Tailings Pile Surface, Project Overview **595**

NEA Program on the Long-Term Aspects of Uranium Mill Tailings Management and Disposal **605**

Long-Term Monitoring of Closed Low-Level Waste and Uranium Mill Tailings Disposal Sites **630**

Riprap Design Considerations for Long-Term Protection of Uranium Mill Tailings **650**

Rock Riprap Design Methods and Their Applicability to Long-Term Protection of Uranium Mill Tailings Impoundments **651**

Environmental Factors Affecting Long-Term Stabilization of Radon Suppression Covers for Uranium Mill Tailings **656**

PERMUTED TITLE INDEX

Terrestrial
Investigations Into Selected Ecological Aspects of the Aquatic and Terrestrial Environment of an Abandoned Uranium Mill Tailings Pond, Bancroft, Ontario 559
Review of Parameters Describing Terrestrial Food-Chain Transport of Lead-210 and Radium-226 582
Estimated Dose to Man from Uranium Milling Via the Terrestrial Food-Chain Pathway 607

Texas
Baseline Data and Land Use Impact of the Falls City, Texas Uranium Tailings Site 407

Th
Immobilization of U-Th-Ra in Mine Wastes 497
Final Report: Immobilization of U-Th-Ra in Mine Wastes 498
Concentrations and Biological Availability of U-238 and Th-230 in the Environs of a Uranium Milling Operation 555

Theory
Consolidation Theory and Its Applicability to the Dewatering and Covering of Uranium Mill Tailings 532

Thermal
Thermal Cutting: What To Do About High Alloy Steels 278

Thermodynamic
Thermodynamic Calculations and Phase Diagrams in Evaluating Tailings-Soil-Water Interactions 577

Thick
A Study of Underwater Thick Plate Cutting Technology 327

Third
Quarterly Progress Report No. 46 for Third Quarter, CY 1968 Covering the Period of April, May, and June 1968 81

Thorium
Disposal or On-site Storage of Thorium or Uranium Wastes from Past Operations 138
Environmental Standards for Uranium and Thorium Mill Tailings at Licensed Commercial Processing Sites - Invitation for Comment 471
Use of Phosphate Compounds to Extract Thorium-230 and Radium-226 from Uranium Ore and Tailings 547
Status and Future Possibilities for the Recovery of Uranium, Thorium, and Rare Earths from Canadian Ores, with Emphasis on the Problem of Radium: Ores, Special Problems, and Leaching 603

Threatens
Bankruptcy Potential Threatens Decommissioning Funds, Says NRC 200

Titusville
Radiological Survey of Universal Cyclops, Inc., Titusville Plant (Formerly Vulcan Crucible Steel Company, Aliquippa, Pennsylvania), May 2-8, 1978 399

TMI
Pre-decontamination Gamma-Ray Surface Scans in TMI-2 Containment Building 305 Foot Elevation 36

Tool
Quality Assurance as a Management Tool in Decommissioning Activities 199
Horizontal Logging as a Monitoring Tool 540

Tooling
Mound's Decommissioning Experience, Tooling, and Techniques 152
French R and D Program on Decommissioning Tooling and Techniques 205

PERMUTED TITLE INDEX

Tools

Tools and Equipment: From Nuclear Waste to Reuseable Items 259

Dismantling of a Hot Cell of High Level Activity: Method and Tools Used 305

Topical

Decontamination and Decommissioning of the EBR-1 Complex, Topical Report No. 1 - Removal of NaK from EBR-1 Storage Pit 118

Estimates of Uranium Content and Radon Flux for Uranium Mine Dumps Based on Borehole Radioactivity Logs - Topical Report 610

Torch

Torch Cuts Off "Hot" Plates - Underwater Cutting Solves Radioactive Disposal Problem 84

Present Position of Plasma-Torch Cutting 275

DC Plasma Torch for Metal Cutting 304

An Evaluation of the Performance of a Plasma Torch for the Cutting of Metal 318

Torches

Gas Welding and Cutting Torches 303

Torus

Electrolytic Decontamination of Torus Steel for Release as Salvage 245

Tower

Meteorological Tower Data, Grand Junction Tailings Site, CO - Semi-annual Report, July-December, 1981 480

Toxic

Protective Barriers for Containment of Toxic Materials 531

Toxins

Distribution of Radium and Chemical Toxins in the Environment of a Uranium Complex 578

Trace

Evaluation of Radionuclide and Trace Metal Migration Beneath an Inactive Tailing Impoundment 402

Trace Metal, Major Element, and Radionuclide Migration in Groundwater from an Acid Leaching Uranium Tailings in the Grants Mineral Belt, New Mexico 429

Trailer

Cost-Benefits of a Mobile, Trailer-Contained, Vibratory Finishing Decontamination Facility 69

Transfer

ILW Transfer Line Decommissioning 25

Waste Sludge Resuspension and Transfer: Development Program 355

Transient

Migration of Radionuclide Chains in a Non-Homogeneous Aquifer under Transient Saturated-Unsaturated Flow Conditions 536

Transport

NS Otto Hahn - Test Report No. 29 for the Period Between April 12, 1978, and February 17, 1979: Fuel Element Removal and Transport Between February 17, 1979 and November 22, 1979 208

Large Transport Containers for Nuclear Reactor Decommissioning Waste 348

Chemical Transport Beneath a Uranium Mill Tailings Pile, Riverton, Wyoming 477

Statistical Evaluation of Contamination from Uranium Mill Tailings by Physical Transport and Chemical Migration 503

Use of Scientific Calculators and Pocket Computers for Evaluation of Seepage and Contaminant Transport 505

PERMUTED TITLE INDEX

Review of Parameters Describing Terrestrial Food-Chain Transport of Lead-210 and Radium-226 582
Contaminant Transport from Uranium Mill Tailings in Ambrosia Lake, New Mexico 636

Transportation

Directions in Low-Level Radioactive Waste Management - An Analysis of Low-Level Waste Disposal Facility and Transportation Costs 122
Transportation of Radioactive Materials: The Legislative and Regulatory Information System 124
Transportation and Packaging 347
Packaging, Transportation and Disposal of Nuclear Parts from Decommissioning of "N.S. Otto Hahn" 354
Surface Transportation Assistance Act of 1978 - Amendment 452
Estimation of Radiological Impact from Transportation of Uranium Mill Tailings 506
Estimation of Radiological Impact from Transportation of Uranium Mill Tailings - Part II: Dispersion and Dosimetry 657

Transporting

Directions in Low-Level Radioactive Waste Management - Transporting Low-Level Waste: Effects of Regional Management 119

Transuranic

Comparative Scrub Solution Tests for Decontamination of Transuranic Radionuclides from Soils 112
Separation of Transuranic Radionuclides from Soil by Vibratory Grinding 113
Economic Evaluation of Volume Reduction for Defense Transuranic Waste 114
Economic Comparison of Centralizing or Decentralizing Processing Facilities for Defense Transuranic Waste 115
Assessment of Change in Shallow Land Burial Limits for Defense Transuranic Waste 117
Environmental and Other Evaluations of Alternatives for Management of Defense Transuranic Waste at the Idaho National Engineering Laboratory 133
Review of Processes for the Decontamination of Transuranic Wastes 253

Transuranically

Decontamination of Transuranically Contaminated Metallic Waste 64

Treating

Improvements in Methods and Apparatus for Cutting, Welding and Surface Treating Using a Laser Beam in Conjunction with an Arc 311

Tritium

The Decommissioning of a Tritium Contaminated Laboratory 86

Tuba

Baseline Data and Land Use Impact of the Tuba City Uranium Tailings Site 404

Tube

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control (1965-1975) 168

UMTRA

Uranium Mill Tailings Remedial Action (UMTRA) Joint Field Test 416
UMTRA Questions and Answers 455

UMTRAP

Gamma Survey Measurement Techniques at UMTRAP Sites 426
Geochemical Investigation of UMTRAP Designated Site at Canonsburg, Pennsylvania 431
The Status of the Uranium Mill Tailings Remedial Actions Project (UMTRAP) 432
The UMTRAP Technology Development Program: A Progress Report 437

PERMUTED TITLE INDEX

Unconfined

Near-Field Impact of 216-U-10 (U-Pond) Decommissioning on the Unconfined Aquifer 126

Underwater

Torch Cuts Off "Hot" Plates - Underwater Cutting Solves Radioactive Disposal Problem 84

SRE Underwater Plasma Arc Cutting Development Test Report 93

Underwater Oxygen Lance - Cutting of Metals, Concrete and Stone 273

Survey of Underwater Cutting of Metals 293

Dismantling Commercial Atomic Reactor Pressure Vessels - Combined Gouging and Gas Cutting Process Used Underwater 295

Underwater Cutting of Stainless Steel Plate and Pipe for Dismantling Reactor Pressure Vessels 296

Study on Underwater Plasma Arc Cutting for Stainless Steel 297

Two Views of Underwater Cutting and Welding 322

A Study of Underwater Thick Plate Cutting Technology 327

Unified

Cleaning Up Nuclear Facilities - An Aggressive and Unified Federal Program is Needed 14

Unit

Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 38 30

Enrico Fermi Atomic Power Plant, Unit 1 - Technical Specifications, Change 37 98

Decommissioning Peach Bottom Unit 1 - Final Report 165

Decommissioning of Unit A of the Nuclear Power Plant Gundremmingen and its Conversion to a Condition of Protective Storage 231

Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station 238

United

United States Atomic Energy Commission Safety Evaluation by the Division of Reactor Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority 27

An Aerial Radiological Survey of United States Department of Energy Sites in Ames, Iowa, Date of Survey: May 1977 46

United States Department of Energy Surplus Facilities Management Program 163

A Historical Review of the Radium-Extraction Industry in the United States (1906-1926) 427

Universal

Radiological Survey of Universal Cyclops, Inc., Titusville Plant (Formerly Vulcan Crucible Steel Company, Aliquippa, Pennsylvania), May 2-8, 1976 399

University

Decommissioning of the Oregon State University AGN-201 Reactor 85

Radiological Survey of Eckhart Hall. The University of Chicago, Chicago, Illinois, September 14, 1976-March 22, 1977 393

Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394

Radiological Survey of Ryerson Physical Laboratory, The University of Chicago, Chicago, Illinois, September 11-25, 1976 396

Radiological Survey of Kent Chemical Laboratory, The University of Chicago, Chicago, Illinois, September 7-13, 1977 397

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398

PERMUTED TITLE INDEX

Unsaturated

Unsaturated Hydraulic Parameters of Grand Junction Uranium Tailings 475

Design of Impervious Clay Liners by Unsaturated Flow Principles 501

Migration of Radionuclide Chains in a Non-Homogeneous Aquifer under Transient Saturated-Unsaturated Flow Conditions 538

Untreated

Groundwater Leaching of Neutralized and Untreated Acid-Leached Uranium Mill Tailings 533

Uptake

Forage Uptake of Uranium Series Radionuclides in the Vicinity of the Anaconda Uranium Mill 439

Uravan

Stabilization of Existing Uranium Mill Tailings Piles at Uravan, Colorado 401

Restoration of Surface Vegetation on Uranium Wastes at Uravan, Colorado 414

Urethane

The Use of Urethane Foam in the Decontamination and Decommissioning of Nuclear Facilities 70

Utah

Evaluation of Interface Between Tailings and Subtailings Soil, A Case Study: Vitro Tailings, Salt Lake City, Utah 430

Instrumentation for Off-Site Remedial Action in Salt Lake City, Utah 438

Study of the Utah Uranium-Milling Industry: Volume 1 - A Policy Analysis 448

National Uranium Resource Evaluation: Shiprock Quadrangle, Arizona, New Mexico, Colorado, and Utah 537

Utilities

Investigation of Reactor Decommissioning as a Precaution by Electric Utilities 202

Plans and Activities for Decommissioning of LWR Power Plants by the German Utilities 207

Utility

Utility Perspective of Nuclear Facility Decommissioning 214

Utility Planning for Decommissioning 232

Utilized

Conceptual Design Report: Below-Grade Bulk Waste Disposal Facility - Formerly Utilized Sites Remedial Action Program 374

Pathways Analysis and Radiation Dose Estimates for Radioactive Residues at Formerly Utilized MED/AEC Sites 379

Alternatives for Management of Wastes Generated by the Formerly Utilized Sites Remedial Action Program 380

Ocean FUSRAP: Feasibility of Ocean Disposal of Materials from the Formerly Utilized Sites Remedial Action Program (FUSRAP) 384

Model Environmental Assessment for a Property-Cleanup/Interim-Storage Remedial Action at a Formerly Utilized Site 386

Radiological Guidelines for Application to DOE's Formerly Utilized Sites Remedial Action Program 389

Formerly Utilized Sites: Remedial Action 390

Formerly Utilized MED/AEC Sites Remedial Action Program, Radiological Survey of the George Herbert Jones Chemical Laboratory, The University of Chicago, Chicago, Illinois, June 13-17, 1977 398

Vacuum

Vacuum Furnace for Radioactive Waste Volume Reduction 283

PERMUTED TITLE INDEX

Valley

Beaver Valley Power Station and Shippingport Atomic Power Station - 1977 Annual Environmental Report: Radiological - Volume 2 41

Beaver Valley Power Station and Shippingport Atomic Power Station - 1978 Annual Environmental Report: Radiological - Volume 2 42

An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43

West Valley Feasibility Study 72

Baseline Data and Land Use Impact of the Monument Valley Uranium Tailings Site 406

Values

Removal of Radioactivity and Mineral Values from Uranium Mill Tailings 478

Vegetation

Restoration of Surface Vegetation on Uranium Wastes at Uravan, Colorado 414

Vegetation for Acidic and Alkaline Tailing 518

Soil-Water Impacts from Using Vegetation and Rock Covers for Surface Stabilization of Uranium-Mill Tailings 579

Verification

Development and Verification Test on Remote Plasma Cutting of Large Metallic Waste 317

Probabilistic Modeling of Tailings Embankment Designs - Volume 1: Model Development and Verification 484

Probabilistic Modeling of Tailings Embankment Designs, Volume 2: Model Application and Verification 536

Vessel

Neutron Activation of Reactor Pressure Vessel and Biological Shield of the Decommissioned Gundremmingen Unit A Nuclear Power Station 238

Method for Explosive Demolition of Reactor Pressure Vessel 292

Vessels

Dismantling Commercial Atomic Reactor Pressure Vessels - Combined Gouging and Gas Cutting Process Used Underwater 295

Underwater Cutting of Stainless Steel Plate and Pipe for Dismantling Reactor Pressure Vessels 296

Vibratory

Cost-Benefits of a Mobile, Trailer-Contained, Vibratory Finishing Decontamination Facility 69

Separation of Transuranic Radionuclides from Soil by Vibratory Grinding 113

Sectioning of Contaminated Components for Decontamination by Vibratory Finishing and Electropolishing 251

Views

Two Views of Underwater Cutting and Welding 322

Vigorous

Vigorous Decontamination Tests of Steel Samples 242

Vitrification

In Situ Vitrification of Contaminated Soil: Pilot-Scale Field Testing 103

Vitro

Social Impact and Land Use at the Vitro Tailings Site 411

Evaluation of Interface Between Tailings and Subtailings Soil, A Case Study: Vitro Tailings, Salt Lake City, Utah 430

Volume

Beaver Valley Power Station and Shippingport Atomic Power Station - 1977 Annual Environ-

PERMUTED TITLE INDEX

mental Report: Radiological - Volume 2 41
Beaver Valley Power Station and Shippingport Atomic Power Station - 1978 Annual Environmental Report: Radiological - Volume 2 42
Economic Evaluation of Volume Reduction for Defense Transuranic Waste 114
Vacuum Furnace for Radioactive Waste Volume Reduction 283
Volume Reduction Techniques in Low-Level Radioactive Waste Management 351
Commingled Uranium-Tailings Study, Volume II - Technical Report 400
State Policies and Requirements for Management of Uranium Mining and Milling in New Mexico: Volume 3 - Adverse Effects of Uranium Mining and Milling on the Physical Environment 446
Study of the Utah Uranium-Milling Industry: Volume 1 - A Policy Analysis 448
Commingled Uranium-Tailings Study: Volume 1, Plan for Stabilization and Management of Commingled Uranium-Mill Tailings 459
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 1 466
Final Environmental Impact Statement for Remedial Action Standards for Inactive Uranium Processing Sites (40 CFR 192) - Volume 2 467
Probabilistic Modeling of Tailings Embankment Designs - Volume 1: Model Development and Verification 484
Probabilistic Modeling of Tailings Embankment Designs, Volume 2: Model Application and Verification 536
Development of Methods for Reclaiming Abandoned Tailings Ponds and Dams: Volume 1 601

Vulcan

Radiological Survey of Universal Cyclops, Inc., Titusville Plant (Formerly Vulcan Crucible Steel Company, Aliquippa, Pennsylvania), May 2-8, 1978 399

War

Overview of Research in Radiation Biology and Protective Measures in the Manhattan Project During the War Years, 1942 to 1946 377

Washington

Revegetation of Disturbed Grounds in the Semi-Arid Climate of Southcentral Washington 328
Radiological Survey of the National Guard Armory at Washington Park, 52nd Street and Cottage Grove Avenue, Chicago, Illinois 395

Water

Design of the Shippingport Light Water Breeder Reactor 9
Puerto Rico Water Resources Authority: Docket No. 115-4 - Order Authorizing Dismantling of Facility 22
United States Atomic Energy Commission Safety Evaluation by the Division of Reactor *Licensing: Docket No. 115-4 - Puerto Rico Water Resources Authority* 27
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 131
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 159
Technology, Safety and Costs of Decommissioning Reference Light Water Reactors Following Postulated Accidents 160
Post-Accident Cleanup and Decommissioning of a Reference Pressurized Water Reactor 161
Decommissioning a Boiling Water Reactor Nuclear Power Plant 164
Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry

PERMUTED TITLE INDEX

Control (1965-1975) 168
Develop Decontamination Techniques for Pressurized Water Reactors 264
Investigation of Highly Efficient Decontamination Solutions for Decommissioning of Pressurized Water Reactor Power Plants 266
High Pressure Water-Jet Scarification of High Density Concrete 288
System Development Capable of Demonstrating the Feasibility of Using Water Jets to Remove Contaminated Concrete Surfaces - Task 1 Report: System Design 289
Developmental Approach Onto Under-Water Plasma Arc Cutting the Bi-Axial Creep Test Equipment Irradiated in Japan Material Testing Reactor 310
Welding and Cutting Under Water 324
Shutdown of Nuclear Power Plants - Production of Activated Material from the Region of the Reactor Core by the Example of a Shutdown Pressurized Water Reactor 339
Surface-Water Hydrologic Criteria for Uranium-Mine Tailings Impoundments in Ontario 492
Aqueous Geochemical Interactions Between Ground Water and Uranium Minestope Backfilling - Grants Mineral Belt, Mew Mexico: Application of Eh-pH Diagrams 573
Thermodynamic Calculations and Phase Diagrams in Evaluating Tailings-Soil-Water Interactions 577
Soil-Water Impacts from Using Vegetation and Rock Covers for Surface Stabilization of Uranium-Mill Tailings 579
Simulation of Water Flow and Retention in Earthen-Cover Materials Overlying Uranium Mill Tailings 624

Watts

An Aerial Radiological Survey of the Watts Bar Nuclear Plant and Surrounding Area, Spring City, Tennessee 55

Welding

Control of Physical Agent Hazards of Arc Welding and Cutting 274
Recommended Practices for Plasma Arc Welding (Welding Workbook Data Sheets 31a, 31b) 280
Gas Welding and Cutting Torches 303
Improvements in Methods and Apparatus for Cutting, Welding and Surface Treating Using a Laser Beam in Conjunction with an Arc 311
Plasma Welding: 1972 - June, 1982 (Citations from the International Aerospace Abstracts Data Base) 312
Plasma Welding: 1970 - May 1982 (Citations from the Engineering Index Data Base) 313
Two Views of Underwater Cutting and Welding 322
Welding and Cutting Under Water 324

Weldon

Report on Preliminary Geological, Hydrological and Radiological Survey at the Weldon Spring Quarry During 1976 and 1977 49
Preliminary Characterization and Assessment of the Weldon Spring Low-Level Waste Disposal Site 56
Weldon Spring Decommissioning Study - Quarry Supplement 57
Weldon Spring Decommissioning Study 58
Weldon Spring Storage Site - Environmental Monitoring Report for 1979 and 1980 62

West

Draft Environmental Statement Related to the Decommissioning of the Rare Earths Facility, West Chicago, Illinois: Docket No. 40-2061 - Kerr-McGee Chemical Corporation 32
Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 38
An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding

PERMUTED TITLE INDEX

Area, West Valley, New York - Date of Survey: September 1979 43
Los Alamos DP West Plutonium Facility Decontamination Project 1978-1981 66
Los Alamos DP West Plutonium Facility Decontamination Project 67
West Valley Feasibility Study 72
Radiological Survey of the West Stands, New Chemistry Lab and Annex, and Ricketts Laboratory, The University of Chicago, Chicago, Illinois, August 31 to September 2, 1977 394
Design and Seepage Modeling Studies of Below-Grade Disposal, West Gas Hills, Wyoming 417
Dry Land Techniques in the Semiarid West 550

Western
Sohio Western Mining Company Tailing Dam 425
Measurements and Calculations of Radon Flux Attenuation by Western U.S. Soils 440

Westinghouse
Plan for Fully Decontaminating and Decommissioning of the Westinghouse Advanced Reactors Division Fuel Laboratories at Cheswick, Revision 33

Why
Why Not in the Ocean? 344

Windscale
Decommissioning of the Windscale Advanced Gas-Cooled Reactor 343

Wire
Disassembly of Decommissioned Nuclear Power Plants: Cutting Research on Test Pieces of Reinforced Concrete and Baryte Concrete with a Wire Saw 290

Workbook
Recommended Practices for Plasma Arc Welding (Welding Workbook Data Sheets 31a, 31b) 280

Worker
Aerosols from Metal Cutting Techniques Typical of Decommissioning Nuclear Facilities - Inhalation Hazards and Worker Protection 299

Working
Abandonment of Nuclear Power Stations at the End of Their Working Life 358

Works
Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works 391
Remedial Works at Dam No. 1, Elliot Lake, Ontario 608

WWER
Decontamination of Equipment in Nuclear Power Plants With WWER-440 Reactors 247

Wyoming
Interaction of Acidic Leachate with Soil Materials at Lucky McPathfinder Mill, Gas Hills, Wyoming 413
Design and Seepage Modeling Studies of Below-Grade Disposal, West Gas Hills, Wyoming 417
Land Use Study of the Riverton, Wyoming Uranium Tailings Site 420
Hydro-Geochemical Studies of Uranium Mill Tailing Piles at Riverton, Wyoming and Maybell, Colorado 435
Chemical Transport Beneath a Uranium Mill Tailings Pile, Riverton, Wyoming 477

X
Decommissioning Study for the Beznau Nuclear Power Plant (2 X 350 MW) - the Swiss Approach 210

PERMUTED TITLE INDEX

Years

Overview of Research in Radiation Biology and Protective Measures in the Manhattan Project During the War Years, 1942 to 1946 377

York

An Aerial Radiological Survey of the Nuclear Fuel Services Center (NFS) and Surrounding Area, West Valley, New York - Date of Survey: September 1979 43

Environmental Surveillance Plan for the Department of Energy's Niagara Falls Storage Site (NFSS), Lewiston, New York 44

Yucca

An Aerial Radiological Survey of Areas 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15 and 17 Yucca Flat, Nevada Test Site 47

Zion

Economic Impact of Closing Zion Nuclear Facility 12

399/400

PUBLICATION DESCRIPTION INDEX

PUBLICATION DESCRIPTION INDEX

AAEC/IP9 **530**

AD-A118-051 **13**

AHSB(S)R32 **329**

AI-AEC-MEMO-12736 **80**

AI-ERDA-13159 **99**

Alternatives 10(2/3):15-26 **639**

American Nuclear Society 1980 Annual Meeting, Proceedings of a Conference, Las Vegas, NV, June 9-12, 1980 **164**

American Nuclear Society 1982 Annual Meeting, Proceedings of a Conference, Los Angeles, CA, June 6-10, 1982 **103, 129, 245, 268**

American Nuclear Society 1982 Winter Meeting, Proceedings of a Conference, Washington, DC, November 14-18, 1982, 813 pp. **60, 65, 73, 365, 385, 544, 628**

Analytic of a report **56**

Analytical Chemistry and Nuclear Technology, Proceedings of the 25th Conference, Gatlinburg, TN, October 6, 1981 **59**

ANCR-1166 **118**

ANL-OHS/HP-81-101 (Rev.) **63**

ANL-OHS/HP-82-100 **398**

ANL-OHS/HP-82-101 **397**

ANL-OHS/HP-82-102 **393**

ANL-OHS/HP-82-103 **396**

ANL-OHS/HP-82-104 **399**

ANL-OHS/HP-82-105 **394**

ANL-OHS/HP-83-100 **395**

ANL-83-6 **381**

ANL/EIS-15 **4**

ANL/ES-125 **607**

ANL/ES-128 **652**

ANL/ES-97 **565**

Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness. Part 2: Ecological Sciences, 157 pp. **363**

Annual Report for 1981 to the DOE Office of the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness, Part 2: Ecological Sciences, 157 pp. **489, 509**

ASME 82-NE-21 **198**

Atomkernenergie Kerntechnik 41(4):279-280 **338**

ATR-82(7963-04)-1 **391**

ATR-82(7963-04)-2 **392**

BARC-1042 **562**

BARC-645 **304**

Blech, Rohre, Profile 27(4):226-228 **275**

BNL-NUREG-51409 (Vol. 1, Nos. 3-4) **131**

BNWL-B-90 **246**

Brennstoff-Waerme-Kraft (Federal Republic of Germany) 33(10):395-399 **229**

British Patent 1-594-058 **301**

British Patent 1-598-574 **300**

British Patent 1-600-796 **311**

PUBLICATION DESCRIPTION INDEX

Bulletin de l' Association Suisse des Electriciens 70(22):1200-1204 **358**

Bulletin of the Japan Institute of Metals 17(9):764-765 **350**

Bundesanzeiger Beilage 33(106a):3-9 **222**

Bureau of Mines Information Circular 8755 **627**

Bureau of Mines Information Circular 8857 **557, 574**

Bureau of Mines Open File Report 161(1)-82 **484**

Bureau of Mines Open File Report 161(4)-82 **536**

Bureau of Mines Open File Report 172-82 **568**

Bureau of Mines Open File Report 184-82 **634**

Bureau of Mines Open File Report 40(1)-82 **601**

Bureau of Mines Report of Investigation 8259 **527**

Bureau of Mines Report of Investigation 8653 **414**

Bureau of Mines Report of Investigation 8664 **528**

Canadian Chemical Processing 63(1):22-23 **643**

Canadian Geotechnical Journal 19(1):49-62 **589**

Canadian Institute of Mining and Metallurgy Bulletin 70(806):152-156 **587**

Canadian Institute of Mining and Metallurgy Bulletin 72(808):109-115 **606**

Canadian Institute of Mining and Metallurgy Bulletin 74(830):115-121 **625**

Canadian Institute of Mining and Metallurgy Bulletin 74(832):128-134 **588**

Canadian Institute of Mining and Metallurgy Bulletin 75(837):60-65 **617**

Canadian Institute of Mining and Metallurgy Bulletin 75(839):147-152 **553**

Canadian Institute of Mining and Metallurgy Bulletin 75(843):125-130 **581**

Canadian Journal of Civil Engineering 8(3):364-369 **492**

Canadian Mining Journal 102(3):71, 73-76 **497**

Canadian Mining Journal 103(3):53-55 **498**

CANMET-80-12E **513**

CANMET-80-13E **512**

CEA-CONF-5765 **305**

CEGB-RD/B/N-4231 **241**

CEGB-RD/B/N-4232 **270**

CEGB-RD/B/N-4373 **235**

CNEN-RT/PROT-(80)31 **240**

Concrete Decontamination, Proceedings of a Workshop, Seattle, WA, May 28-29. 1980, 206 pp. **71**

CONED-92413 **264**

CONED-92414 **264**

CONF-740406 **82**

CONF-760701 **368**

CONF-770271 **655**

CONF-770369 **649**

PUBLICATION DESCRIPTION INDEX

CONF-770409 281

CONF-7704103 441, 548

CONF-7706158 586, 597, 626, 647

CONF-770937 18

CONF-7710187 258

CONF-780422 566, 578

CONF-790447 493

CONF-791140 534

CONF-791234 101

CONF-800313 346

CONF-800334 64, 546, 558, 599

CONF-800392 543

CONF-800401 77, 371

CONF-8005177 425, 595, 613, 632

CONF-8005182 298

CONF-800542 71, 254

CONF-800607 164

CONF-800753 75

CONF-801155 439

CONF-810217 74, 156, 283, 336, 345, 357

CONF-810326 292

CONF-8105128 305

CONF-8106200 226

CONF-810949 638

CONF-8109868 360

CONF-8110111 529, 535

CONF-811012 630

CONF-811025 59

CONF-811049 401, 415-417, 426, 427, 430, 433, 436-438, 443, 475, 478, 479, 495, 500, 501, 504, 506, 511, 515, 516, 521, 525, 533, 538, 540, 545, 554, 573, 576, 580, 591, 596, 602, 605, 608, 614, 623, 636, 344

CONF-811056 139

CONF-820303 384, 579

CONF-820420 363, 364, 367

CONF-820525 523

CONF-820609 103, 129, 245, 268

CONF-820613 239

CONF-820705 198

CONF-820933 163

CONF-820973 249

CONF-821005 8, 17, 19, 20, 24, 34, 67, 70, 76, 78, 85-87, 90, 94, 97, 110, 140, 151, 152, 154, 155, 161, 199, 201, 205, 207, 210, 212, 214-217, 220, 223, 224, 227, 228, 231, 232, 238, 242, 243, 267, 272, 282, 291, 299, 306, 316, 326, 330, 333, 335, 337, 343, 361, 370, 372, 373, 380

CONF-821103 60, 65, 73, 365, 385, 544, 628

CONF-821209 402, 413, 429, 432, 440, 444, 447, 477, 486, 488, 491, 496, 503, 505, 522, 526, 549, 555, 556, 564, 567, 569, 571, 577, 585, 598, 600, 609, 611, 618, 620, 633, 642, 645, 646, 650, 654, 657

PUBLICATION DESCRIPTION INDEX

CONF-830528 **348, 354**

Contract No. ONL-WD13(27) **25**

COO-2743-2 **106**

COO-2743-3 **107**

COO-2743-4 **108**

Decontamination of Nuclear Facilities, Proceedings of an International Conference, Niagara Falls, Ontario, Canada, September 19-23, 1982 **249**

Decontamination Technology Transfer, Proceedings of the U.S. Department of Energy Transuranic Waste Management Program Meeting, Richland, WA, July 29-30, 1980 **75**

Denryoku Chuo Kenkyusho Hokoku 581001:1-47 **236**

Denryoku Chuo Kenkyusho Hokoku 581002:1-27 **213**

DFR/OIN-1 **342**

DOCKET-115-4 **22, 27**

DOCKET-50-146 **21**

DOCKET-50016-192 **98**

DOCKET-50016-196 **30**

DOCKET-50146-106 **26**

DOE News (April 22, 1983):1-2 **453**

DOE News (December 1982):1-4 **455**

DOE News (May 1983):1 **457, 458**

DOE/AL-165/UMTRA **615**

DOE/AL/TRU-8003 **115**

DOE/DP-0011 (Vol. 1) **459**

DOE/DP-0011 (Vol. 2) **400**

DOE/EA-0082 **3**

DOE/EA-0152 **31**

DOE/EA-0173 **4**

DOE/ET/37247-1 **1**

DOE/ET/37247-1-Attach. 1-2-3 **33**

DOE/ET/40110-1 **127**

DOE/ET/44207-1 **72**

DOE/EV-0005/22 **395**

DOE/EV-0005/23 **396**

DOE/EV-0005/24 **393**

DOE/EV-0005/25 **397**

DOE/EV-0005/26 **398**

DOE/EV-0005/33 **399**

DOE/EV-0005/34 **394**

DOE/EV/10130-1 **377**

DOE/EV/10305-2 **476**

DOE/IG-0191 **460**

DOE/LLW-14T **120**

DOE/LLW-4T **123**

DOE/LLW-6Tb **119**

DOE/LLW-6Td **122**

DOE/LLW-6Tf **121**

DOE/NBM-2012241 **37**

DOE/NE-0008 **483**

JBLICATION DESCRIPTION INDEX

DOE/NE-0017-1 130

DOE/NE-0025 462

DOE/NE-0025/1 461

DOE/NE-0039 482

DOE/NE-0042 173

DOE/NV/00410-72 117

DOE/OR/20722-2 374

DOE/PNRO-0292-T1 42

DOE/RG/10268-T3 6

DOE/RL/01030-T1 284

DOE/RLO-SFM-82-6 132

DOE/SF/75008-T6 93

DOE/TIC-3387 (Suppl. 1) 353

DOE/TIC-3392 390

DOE/TIC-3393 640

DOE/TIC-3394 352

DOE/UMT-0209 507

DOE/UMT-0211 487

Doryuokuro Giho (1980)35:46-47 310

EE-15 559

EGG-1183-1657 39

EGG-1183-1686 46

EGG-1183-1722 45

EGG-1183-1751 54

EGG-1183-1759 558

EGG-1183-1766 48

EGG-1183-1775 53

EGG-1183-1782 43

EGG-1183-1795 378

EGG-1183-1808 47

EGG-1183-1816 40

EGG-1183-1824 52

EGG-1183-1842 55

EGG-2128 50

EGG-2209 51

EGG-2236 96

EIR-368 339

EIR-448 290

Electric Light and Power 59(4):12-13 269

Electric Light and Power 59(8):33-34 200

Elektricheskie Stantsii (USSR) 81(4):6-8 247

EMD-82-3 12

Energiewirtschaftliche Tagesfragen 31(10):780-786 202

Energy Digest (London, United Kingdom) 11(2):33-34 219

Energy Policy (United Kingdom) 10(2):109-119 28

Energy Sources 6(3):215-243 604

Energy User News 7(20): 18 pp. 150

Engineering Mining Journal 182(7):94-95 637

PUBLICATION DESCRIPTION INDEX

Environmental Decontamination, Proceedings of a Workshop, Oak Ridge, TN, December 4-5, 1979, 256 pp. **101**

EPA-520/1-82-022 **468**

EPA-520/1-82-023 **465**

EPA-520/4-82-013-1 **466**

EPA-520/4-82-013-2 **467**

EPA-600/2-81-246 **162**

Episodes 1981(1):13-15 **616**

EPS-3-EC-78-10 **524**

EPS-4-WP-79-4 **499**

ERDA/AESOP 17, Proceedings of Conference, Boston, MA, September 13-15, 1977 **18**

ESD-DOE-13385 **104**

ESG-DOE-13237 **170**

ESG-DOE-13286 **211**

ETR-303 **285**

EUR-7440-EN **204**

FAPIG (Tokyo, Japan) 92:37-40 **317**

Federal Register 46(205):52061-52063 **138**

Federal Register 46(48):167278-167280 **470**

Federal Register 48(3):590-604 **469**

Federal Register 48(84):19584-19603 **471**

Flow Technology Report No. 205 **289**

Foerening Foer Elektricitetens Rationella Anvaendning 53(1):14-20 **362**

GECR-R-811 **431**

GEFR-00616-1 **171**

GEFR-00616-2 **172**

GEND-INF-009 **36**

Genshiryoku Iinkai Geppo 25(10):32-38 **221**

Geotechnical Practices for Disposal of Solid Waste Materials, Proceedings of a Conference, Ann Arbor, MI, June 13-15, 1977 **586, 597, 626, 647**

German Patent DE-2949807 **265**

GKSS-81/E/20 **369**

GKSS-81/E/21 **208**

Health Implications of the New Energy Technologies, Proceedings of a Conference, Park City, UT, April 4, 1979 **493**

Health Physics 36(3):289-294 **328**

Health Physics 39(3):497-504 **508**

Health Physics 42(1):27-32 **629**

Health Physics 42(5):695-702 **510**

Hearing of the Committee on Environment and Public Works, United States Senate, 97th Congress, First Session, June 16, 1981, Serial Number 97-H24 **472**

Hot Laboratories and Remote Handling, Proceedings of a Workshop, Karlsruhe, Federal Republic of Germany, May 21-22, 1981 **305**

IAEA Bulletin 23(2):33-35 **635**

IAEA Bulletin 24(2):30-34 **344**

IAEA Bulletin 24(2):6-12 **349**

IAEA-SR-57/42 **139**

IAEA/WMRA/13-81/11 **341, 347, 356, 619**

PUBLICATION DESCRIPTION INDEX

ICONS-02161 **11**

IDO-10103 (Vol. 1) **133**

IEEE Transactions on Nuclear Science 29(1):242-246 **630**

Indian Welding Journal 13(3):67-82 **293**

INFO-0019 **590**

INFO-0024 **563**

INFO-0044 **541**

INFO-0070 **583**

Ingenieur (The Hague, Netherlands) 93(50):16-19 **323**

Ingenioer-nytt 16(24):18-19 **366**

Inhalation Toxicology Research Institute Annual Report, October 1, 1980-September 30, 1981 **325**

INIS-MF-5983 **648**

International Congress on Technology and Technology Exchange, Proceedings of a Symposium, Pittsburgh, PA, May 3-6, 1982 **523**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp. **8, 17, 19, 20, 24**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp. **34**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp. **67, 70, 76, 78, 85-87, 90, 94, 97, 110, 140, 151**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp. **152**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp. **154, 155, 161, 199, 201, 205, 207, 210, 212, 214, 215**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp. **216**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp. **217**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp. **220**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp. **223, 224**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp. **227**

PUBLICATION DESCRIPTION INDEX

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp. **228, 231, 232, 238, 242, 243, 267, 272, 282**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp. **291, 299**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp. **306**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp. **316, 326, 330**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp. **333, 335, 337, 343, 361, 370, 372, 373, 380**

International Power Generation 5(5):46-47 **209**

IS-4787 **100**

IS-4798 **61**

Ishikawajima-Harima Engineering Review 22(1):35-39 **297**

Jahrestagung Kerntechnik '81 (Nuclear Technology '81), Proceedings of the Annual Meeting, Dusseldorf, Federal Republic of Germany, March 24-26, 1981 **292**

Japanese Patent 52/034731 **300**

Japanese Patent 52/034732 **301**

Japanese Patent 53/015104 **300**

Japanese Patent 56/57989/A **302**

Japanese Patent 81/[illegible]9400 **260**

Japanese Patent 81/38499 **255**

JIS Handbook **303**

Journal of the Shanghai Chiao-Tung University 1981(4).43-52 **327**

Journal of the Society of Instrument and Control Engineers 20(1):157-160 **225**

Journal of Water Pollution Control Federation 54(6):1002-1023 **331**

Kernenergie 25(3):115-120 **266**

Kung Yeh Chi Shu 85:16-23 **256**

LA-UR-74-591 **82**

LA-UR-81-3766 **521**

LA-5755 **83**

LA-9252-MS **376**

LA-9395-MS **7, 502**

LA-9409-MS **375**

LA-9479-PR **520**

LA-9513-MS **66**

LBL-12100 **56**

LBL-14486 **435**

License No. DPR-4 **21**

Liquid Metal Technology for Energy Systems, Proceedings of the Second International Con-

ference, Richland, WA, April 20-24, 1980 **77, 371**

LMF-91 **325**

Los Alamos Life Sciences Division's Biomedical and Environmental Research Programs: January-December 1981, 151 pp. **520**

Machine Design 53(22):56-60 **262**

Management of Radioactive Waste from Nuclear Power Plants, Proceedings of a Seminar, Karlsruhe, Federal Republic of Germany, October 5-9, 1981 **139**

Management of Waste from the LWR Fuel Cycle, Proceedings of an International Symposium, Denver, CO, July 11-16, 1976 **368**

Metal Construction 14(8):446-447 **296**

Metal Finishing 80(9):89-93 **250**

Mine Talk 1(1):16-18 **612**

Mine Talk 1(1):30-45 **621**

Mine Waste Disposal Technology, Proceedings of a Bureau of Mines Technology Transfer Workshop, Denver, CO, July 16, 1981 **557, 574**

Minerals Science and Engineering 12(2):53-72 **603**

Mitteilungen der BEFA 32(1) **273**

Monograph **359**

Natural Radiation Environment III, Proceedings of a Symposium, T.F. Gesell and W.M. Lowder, (Eds.), Houston, TX, April 23-28, 1978. U.S. Department of Energy, Technical Information Center, Oak Ridge, **566, 578**

NBS-GCR82-394 **514**

New Directions in Nuclear Energy with Emphasis on Fuel Cycles, Proceedings of the Third International European Nuclear Society/American Nuclear Society Conference, Brussels, Belgium, April 26-30, 198 **363, 364, 367**

NLCO-0010EV **388**

NLCO-006EV (Rev. 1) **387**

NLCO-008EV **44**

NLCO-011EV **166**

NLCO-1121 **58**

NLCO-1176 **62**

NP-23295 **41**

NP-23584 **165**

NP-2902586 **359**

Nuclear and Chemical Waste Management 2(3):197-200 **259**

Nuclear and Chemical Waste Management 3(4):251-259 **552**

Nuclear Energy, Conservation, and Solar Energy, Proceedings of the Second U.S. Department of Energy Environmental Control Symposium, Reston, VA, March 17-19, 1980, Vol. 2 **64, 546, 558, 599**

Nuclear Engineering International 26(313):36-40 **230**

Nuclear Power Plants. Ehnergiya, Moscow, Vol. 3 **244**

Nuclear Power Systems, Proceedings of an IEEE Symposium, San Francisco, CA, October 21-23, 1981 **630**

Nuclear Safety 21(4):486-495 **582**

Nuclear Waste Management Program Summary, 273 pp. **483**

PUBLICATION DESCRIPTION INDEX

NUREG-0584 (Rev.3) 234

NUREG-0782 (Vol. 1) 134

NUREG-0782 (Vol. 2) 135

NUREG-0782 (Vol. 3) 136

NUREG-0782 (Vol. 4) 137

NUREG-0904 32

NUREG/CR-1549 610

NUREG/CR-1583 565

NUREG/CR-1759 334

NUREG/CR-2192 131

NUREG/CR-2206 351

NUREG/CR-2243 622

NUREG/CR-2564 656

NUREG/CR-2601 (Vol. 1) 159

NUREG/CR-2601 (Vol. 2) 160

NUREG/CR-2642 570

NUREG/CR-2684 651

NUREG/CR-2722 38

NUREG/CR-2869 652

NUREG/CR-2894 532

NUREG/CR-2985 157

NUREG/CR-3116 158

NUS-3440 (Rev. 1) 125

NVO-181 649

Oak Ridge National Laboratory Review 15(1):28-32 149

Offshore Engineer 1982:66, 68 322

Offshore Research Focus 30:7 324

ORNL-5714 382

ORNL/EIS-199 105

ORNL/TM-7125 355

ORNL/TM-7439 124

ORNL/TM-8322 128

ORNL/TM-8479 35

ORNL/TM-8539 445

ORO-778 116

ORO-831 389

ORO-832 379

Overview Assessment of Nuclear Waste Management, 90 pp. 7, 502

PATRAM '83, Packaging and Transportation of Radioactive Materials, Proceedings of the Seventh International Symposium, New Orleans, LA, May 15-20, 1983 348, 354

PB-80-164866 274

PB-80-178619 517

PB-80-180649 169

PB-80-855737 314

PB-81-152662 464

PB-81-219503 547

PB-81-804932 594

PUBLICATION DESCRIPTION INDEX

PB-81-854713 313

PB-81-854721 312

PB-81-864290 593

PB-81-868796 315

PB-82-156506 320

PB-82-259698 14

PGJ/F-024-82 537

PNL-SA-8261 164

PNL-SA-8855 71, 254

PNL-SA-9215 529

PNL-SA-9486 237

PNL-SA-9726 239

PNL-SA-9895 579

PNL-3795 69

PNL-3877 624

PNL-3899 622

PNL-3943 251

PNL-4029 68

PNL-4100 (Part 2) 111, 383, 489, 509

PNL-4105-2 442

PNL-4132 434

PNL-4140 340

PNL-4150 539

PNL-4193 656

PNL-4196-2 428

PNL-4225 570

PNL-4252 651

PNL-4328 490

PNL-4340 507

PNL-4402 532

PNL-4405 485

PNL-4408 487

Pollution Technology Review No. 66. Noyes Data Corporation, Park Ridge, NJ, 288 pp. 531

Power Engineering 86(6):66-69 218

Proceedings of a Conference, Tucson, AZ, March 10, 1980, 754 pp. 346

Proceedings of a Seminar, Golden, CO, November 6-7, 1980, 280 pp. 653

Proceedings of a Workshop, Seattle, WA, May 28-29, 1980, 206 pp. 254

Proceedings of an American Nuclear Society Topical Meeting, Tucson, AZ, February 23-26, 1981, Vol. 1 and 2, 1736 pp. 345

Proceedings of an American Society of Mechanical Engineers/American Nuclear Society Nuclear Engineering Conference, Portland, OR, July 25-28, 1982 198

Proceedings of an International Conference, Golden, CO, October 4, 1981, 1105 pp. 535

Proceedings of the British Nuclear Energy Society Conference, Grange-over-Sands, United Kingdom, May 13-16 1980 298

Proceedings of the Edison Electric Institute's Health Physics Committee Meeting, Hartford, CT, September 10, 1981 360

PUBLICATION DESCRIPTION INDEX

Proceedings of the Fifth Annual Uranium Seminar, Albuquerque, NM, September 20-23, 1981 **638**

Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp. **642**

Proceedings of the International Radiation Protection Association Fourth International Congress, April 24-30, 1977, Vol. 3 **281**

Proceedings of the Second Annual Canadian Nuclear Society Conference, Ottawa, Ontario, Canada, June 8-10, 1981 **226**

Proceedings of the Second Atomic Energy Commission Pollution Control Conference, Albuquerque, NM, April 16, 1974 **82**

Proceedings of the Third International Society for Radiological Protection Symposium, Inverness, United Kingdom, June 6, 1982 **239**

Program Summary - Nuclear Waste Management and Fuel Cycle Programs, 79 pp. **482**

Public Law 95-236 **481**

Public Law 95-604 **451**

Public Law 96-106 **452**

Public Meeting on Federal Research into Biological Effects of Ionizing Radiation, Proceedings of a Symposium, Bethesda, MD, March 10, 1982 **543**

Public Utilities Fortnightly 103(9):54-56 **23**

Radiation Hazards in Mining: Control, Measurement, and Medical Aspects, Proceedings of an International Conference, Golden, CO, October 4, 1981. Society of Mining Engineers, American Institute of M **529**

Radioactive Waste Management, Proceedings of an International Conference, Winnipeg, Manitoba, Canada, September 12, 1982 **163**

Radiokhimiya (USSR) 22(6):893-897 **248**

RAND/R-2857-NYO **29**

Reclamation and Use of Disturbed Land in the Southwest, J.L. Thames, (Ed.). The University of Arizona Press, Tuscon, AZ, Ch. 27, 362 pp. **518**

Reclamation and Use of Disturbed Land in the Southwest, J.L. Thames, (Ed.). The University of Arizona Press, Tucson, AZ, Ch. 24, 362 pp. **519**

Reclamation and Use of Disturbed Land in the Southwest, J.L. Thames, (Ed.). The University of Arizona Press, Tucson, AZ, Ch. 23, 362 pp. **550**

Reclamation and Use of Disturbed Land in the Southwest, J.L. Thames, (Ed.). The University of Arizona Press, Tucson, AZ, Ch. 26, 362 pp. **561**

Reclamation and Use of Disturbed Land in the Southwest, J.L. Thames, (Ed.). The University of Arizona Press, Tuscon, AZ, Ch. 28, 362 pp. **575**

Reclamation of Disturbed Arid Lands, Proceedings of a Symposium, Denver, CO, February 20-24, 1977. University of New Mexico Press, Albuquerque, NM, 196 pp. **655**

Regulatory Guide 3.51 **641**

Report **10, 15, 16, 49, 57, 203, 233, 261, 386, 403-412, 418-424, 449, 450, 463**

Research Project **25**

Revue Generale Nucleaire 3:166-172 **206**

RFP-3091 **271**

RFP-3139 **109**

RFP-3161 **112**

PUBLICATION DESCRIPTION INDEX

RFP-3225 253

RFP-3245 114

RFP-3258 2

RFP-3296 113

RHO-CD-782 102

RHO-LD-157 126

RHO-SA-153 101

RHO-SA-187 75

RLO/SFM-82-2 (Vol. 1) 175

RLO/SFM-82-2 (Vol. 2) 176

RLO/SFM-82-2 (Vol. 3) 177

RLO/SFM-82-7 174

RN-Q-0045 79

RN-Q-0046 81

RN-Q-0048 95

RTD Communication No. 145 287

RTD Report No. 256 288

SAND-78-1332 446

SAND-80-2142 542

SAND-82-0287C 584

SAND-82-0288A 494

SAND-82-0459C 384

SAND-82-0722 480

SAND-82-1191 631

Savrochnoe Proizvodstvo (USSR) 1976(12):12-15 319

Schweisstechnik 34(1):8-10 278

Science of the Total Environment 19(1):83-94 560

Science 202(4364):191-195 474

Science 215:376-379 92

SL-82-3 276

Summary of Non-U.S. National and International Fuel Cycle and Radioactive Waste Management Program, 100 pp. 485

Svarochnoe Proizvodstvo (USSR) 1979(11):11-13 321

Svarochnoe Proizvodstvo (USSR) 1980(11):33-34 307

Swiss Association for Atomic Energy Bulletin No. 9 (Annex) 332

The Federal Nuclear Energy Program: A Synopsis 173

The Iron Age 188(2):90 84

The Nuclear Fuel Cycle: A Survey of the Public Health, Environmental, and National Security Effects of Nuclear Power. Massachusetts Institute of Technology Press, Cambridge, MA, 291 pp. 551

Thesis 592

Tooling and Production 46(12):66-69 308

Toxic and Hazardous Waste Disposal: New and Promising Ultimate Disposal Options. Ann Arbor Science Publishers, Inc., Ann Arbor, MI, Vol. 4 572

Transactions of the American Nuclear Society 38:195-196 257

PUBLICATION DESCRIPTION INDEX

Transactions of the American Nuclear Society 39:996-998 **91**

Transactions of the American Nuclear Society 40:97-98 **364**

Transactions of the American Nuclear Society 40:98 **367**

Transactions of the American Nuclear Society 40:99 **363**

Transactions of the American Nuclear Society 41:100-102 **245**

Transactions of the American Nuclear Society 41:102-103 **268**

Transactions of the American Nuclear Society 41:81-83 **129**

Transactions of the American Nuclear Society 41:99-100 **103**

Transactions of the American Nuclear Society 43:101 **385**

Transactions of the American Nuclear Society 43:309-310 **628**

Transactions of the American Nuclear Society 43:310-312 **544**

Transactions of the American Nuclear Society 43:57 **60**

Transactions of the American Nuclear Society 43:58-59 **73**

Transactions of the American Nuclear Society 43:59-60 **65**

Transactions of the American Nuclear Society 43:60-61 **365**

Transuranics in Desert Ecosystems: Nevada Applied Ecology Group, M.G. White, (Ed.), Proceedings of a NAEG Plutonium Report Meeting, Las Vegas, NV, March 2, 1977, 469 pp. **649**

TTC-0280 **124**

U.S. Patent 123,861 **277**

U.S. Senate Report 95-1266 **473**

UCRL-6890 **88**

UCRL-6992 **89**

UMT-0203 **624**

UMT-0207 **434**

UMT-0210 **490**

UMTRA Action (January 14, 1983):1 **454, 456**

UMTRA-DOE/ALO-226 **431**

UNC/OSFM-82-10a **190**

UNC/OSFM-82-12a **178**

UNC/OSFM-82-20a **193**

UNC/OSFM-82-21a **191**

UNC/OSFM-82-22a **192**

UNC/OSFM-82-24a **189**

UNC/OSFM-82-8a **184**

UNC/OSFM-82-9a **188**

UNC/OSFM-83-1a **185**

UNC/OSFM-83-13a **183**

UNC/OSFM-83-14a **186**

UNC/OSFM-83-15a **180**

UNC/OSFM-83-16 **181**

UNC/OSFM-83-17 **194**

UNC/OSFM-83-18 **196**

PUBLICATION DESCRIPTION INDEX

UNC/OSFM-83-2a 167

UNC/OSFM-83-3a 179

UNC/OSFM-83-4a 182

UNC/OSFM-83-5 195

UNC/OSFM-83-6 197

UNI-SA-95 163

Uranium Health Physics, Proceedings of a Summer School, Pretoria, South Africa, April 14-15, 1980 648

Uranium Mill Tailings Management, Proceedings of Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp. 521

Uranium Mill Tailings Management, Proceedings of the Fifth Symposium, Fort Collins, CO, December 9-10, 1982, 557 pp. 402, 413, 429, 432, 440, 444, 447, 477, 486, 488, 491, 496, 503, 505, 522, 526, 549, 555, 556, 564, 567, 569, 571, 577, 585, 598, 600, 609, 611, 618, 620, 633, 645, 646, 650, 654, 657

Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp. 401, 415-417, 426, 427, 430, 433, 436-438, 443, 475, 478, 479, 495, 500, 501, 504, 506, 511, 515, 516, 525, 533, 538, 540, 545, 554, 573, 576, 580, 591, 596, 602, 605, 608, 614, 623, 636, 644

Uranium Mill Tailings Management, Proceedings of the Second Symposium, Fort Collins, CO, November 19-20, 1979, 331 pp. 534

Uranium Mill Tailings Management, Proceedings of the Third Symposium, Fort Collins, CO, November 24-25, 1980, 581 pp. 439

Uranium Mine Waste Disposal, C.O. Brawner, (Ed.), Proceedings of the First International Conference, Vancouver, British Columbia, Canada, May 19-21, 1980. American Institute of Mining, Metallurgical 425, 595, 613, 632

Uranium Mining Technology, Proceedings of the First Conference, Reno, NV, April 24-29, 1977 441, 548

UTEC-80-094 448

VGB Kraftwerkstechnik 61(2):124-130 263

WAPD-LWBR-TE-401 167

WAPD-MRP-147 141

WAPD-MRP-148 5

WAPD-MRP-150 142

WAPD-MRP-151 143

WAPD-MRP-152 144

WAPD-MRP-153 146

WAPD-MRP-154 145

WAPD-MRP-155 148

WAPD-MRP-156 147

WAPD-MRP-157 153

WAPD-TM-1208 9

WAPD-TM-1309 168

Waste Management '81, The State of Waste Isolation in the U.S. and Elsewhere, Advocacy Programs, and Public Communications, R.G. Post (Ed.), Proceedings of an American Nuclear Society Topical Meeting 74, 156, 283, 336, 357

Waste Management '82, Waste Isolation in the U.S. and Elsewhere, Technical Programs, and

PUBLICATION DESCRIPTION INDEX

Public Communication, R.G. Post (Ed.), Proceedings of a Conference, Tucson, AZ, March 8-11, 1982, Vol. 2, 655 **384**

Waste Management '82, Waste Isolation in the U.S. and Elsewhere, Technical Programs, and Public Communication, R.G. Post (Ed.), Proceedings of a Conference, Tucson, AZ, March 8-11, 1982, Vol. 1, 612 **579**

Water Chemistry of Nuclear Reactor Systems, Proceedings of an International Conference, Bournemout, United Kingdom, October 24-28, 1977 **258**

Welding and Metal Fabrication 49(10):585-587 **294**

Welding Design and Fabrication 55(7):68-70 **309**

Welding Journal 61(9):59-60 **280**

Welding Production 28(4):37-40 **318**

Welding Review 1(3):52-54 **295**

WES-TR **276**

West German Patent DE2,745,458/B **252**

Wirtschaftswoche 33(40):20 **279**

Zentralinstitut fuer Schweisstechnik Mitteilungen (East Germany) 20(9):928-939 **286**

417/418

GEOGRAPHIC LOCATION INDEX

GEOGRAPHIC LOCATION INDEX

Arizona, Monument Valley, Monument Valley Site 406

Arizona, Shiprock Quadrangle 537

Arizona, Tuba City, Tuba City Site 404

California, Canoga Park, Rockwell International Headquarters Area 54

California, Canoga Park, Santa Susana Field Laboratories 54, 104, 170

California, Canoga Park, Santa Susana Field Laboratories, Sodium Reactor Experiment 93, 198

California, Eureka, Humboldt Bay, Unit 3 34

California, Pleasanton, General Electric Fuels Laboratory 171, 172

California, San Clemente, San Onofre Nuclear Generating Station 48

Colorado, Boulder 427

Colorado, Denver 427

Colorado, Durango 478, 511

Colorado, Durango, Durango Site 628

Colorado, Golden, Rocky Flats Plant 2, 106-108

Colorado, Grand Junction 415, 416, 434, 475, 479, 480, 486, 503, 564, 598

Colorado, Maybell, Maybell Site 435, 444, 447

Colorado, Mesa County 479

Colorado, Naturita, Naturita Site 410

Colorado, Shiprock Quadrangle 537

Colorado, Slickrock 409

Colorado, Uravan, Uravan Site 401, 414

Florida, Homestead, Turkey Point Units 3 and 4 34

Florida, Tampa 382

Idaho, Idaho Falls, EBR-1 Complex 118

Idaho, Idaho Falls, Idaho Chemical Processing Plant 76

Idaho, Idaho Falls, Idaho National Engineering Laboratory 50, 51, 133

Idaho, Idaho Falls, Idaho National Engineering Laboratory, Test Area North, PM-2A Facility 96

Idaho, Lowman, Lowman Site 412, 418, 463

Illinois, Argonne, Argonne National Laboratory 4, 52

Illinois, Argonne, Argonne National Laboratory, RFF Facility 3, 16

Illinois, Batavia, Fermi National Accelerator Laboratory 53

Illinois, Chicago 427

Illinois, Chicago, National Guard Armory 395

Illinois, Chicago, Palos Park Forest Preserve 381

Illinois, Chicago, University of Chicago 394

Illinois, Chicago, University of Chicago, Eckhart Hall 393

Illinois, Chicago, University of Chicago, George Herbert Jones Chemical Laboratory 398

Illinois, Chicago, University of Chicago, Kent Chemical Laboratory 397

Illinois, Chicago, Zion Nuclear Facility 12

GEOGRAPHIC LOCATION INDEX

Illinois, Morris, Dresden Nuclear Station Unit 1 **34, 39**

Illinois, Sheffield **121**

Iowa, Ames **46**

Iowa, Ames, Ames Laboratory Research Reactor **91, 100**

Kentucky, Maxey Flats **121**

Marshall Islands, Enewetak Atoll **60**

Michigan, Newport, Enrico Fermi Atomic Power Plant **30, 98, 158**

Minnesota, Elk River, Elk River Reactor **157**

Minnesota, Monticello, Monticello Nuclear Station **34**

Missouri, St. Louis County, Weldon Spring Quarry **49, 56, 57**

Missouri, St. Louis County, Weldon Spring Site **58, 62**

Missouri, St. Louis County, West Lake Landfill **38**

Nevada, Nevada Test Site, Yucca Flat **47**

New Jersey **374**

New Jersey, Jersey City, Kellex Site **378**

New Jersey, Middlesex, Middlesex Sampling Plant **60, 388**

New Jersey, Middlesex, Middlesex Sampling Plant Site **387**

New Jersey, New Brunswick, New Brunswick Laboratory **15, 31, 63, 140**

New Jersey, Orange **427**

New Mexico **446**

New Mexico, Albuquerque, Sohio L-Bar Uranium Mine and Mill **425**

New Mexico, Ambrosia Lake **419, 450, 636, 645**

New Mexico, Anaconda Uranium Mill **439**

New Mexico, Carlsbad, Gnome Site **60, 110**

New Mexico, Grants Mineral Belt **429, 573**

New Mexico, Los Alamos, Bayo Canyon **376**

New Mexico, Los Alamos, Los Alamos National Laboratory **86**

New Mexico, Los Alamos, Los Alamos National Laboratory, DP West Plutonium Facility **66**

New Mexico, Los Alamos, Los Alamos Scientific Laboratory **82, 83**

New Mexico, Los Alamos, Middle Pueblo Canyon **375**

New Mexico, Mt. Taylor Mill **576**

New Mexico, Shiprock Quadrangle **537**

New Mexico, Shiprock, Shiprock Site **403, 511, 628**

New Mexico, St. Anthony Mine **565**

New York **374**

New York, Buchanan, Indian Point Unit 1 **29, 34**

New York, Lackawanna **427**

New York, Lewiston, Lake Ontario Ordnance Works **391**

New York, Lewiston, Niagara Falls Storage Site **44, 166**

GEOGRAPHIC LOCATION INDEX

New York, Tonawanda, Line Air Products Company's Ceramics Plant 392

New York, West Valley 121

New York, West Valley, Western New York Nuclear Fuel Service Center 43, 72

Ohio, Columbus, Battelle Memorial Institute, Plutonium Laboratory 65

Ohio, Miamisburg, Mound Facility 45

Ohio, Miamisburg, Mound Facility, ANSPD Area 10

Ohio, Miamisburg, Mound Facility, OMA Area 10

Ohio, Piqua, Piqua Nuclear Facility 37

Oregon, Lakeview, Lakeview Site 408, 423

Pennsylvania, Aliquippa, Titusville 399

Pennsylvania, Canonsburg 427, 431, 458

Pennsylvania, Cheswick 427

Pennsylvania, Cheswick, Westinghouse Advanced Reactors Division Fuel Laboratories 1, 33

Pennsylvania, Lansdowne 427

Pennsylvania, Middletown, Three Mile Island Nuclear Power Station, Unit 1 71

Pennsylvania, Peach Bottom, Peach Bottom Atomic Power Station, Unit 1 165

Pennsylvania, Saxton, Saxton Nuclear Power Station 21, 26

Pennsylvania, Sellerville 427

Pennsylvania, Shippingport 92

Pennsylvania, Shippingport, Beaver Valley Power Station 41, 42

Pennsylvania, Shippingport, Shippingport Atomic Power Station 9, 19, 41, 42

Puerto Rico, San Juan, Bonus Reactor 22, 27

South Carolina, Aiken, Savannah River Laboratory 94

South Carolina, Aiken, Savannah River Plant 40

South Dakota, Sioux Falls, Pathfinder Generating Station 34

Tennessee, Oak Ridge, Oak Ridge National Laboratory 355

Tennessee, Oak Ridge, Oak Ridge National Laboratory, Building 3505 35, 59

Tennessee, Oak Ridge, Oak Ridge National Laboratory, Curium Source Fabrication Facility 73

Tennessee, Oak Ridge, Oak Ridge National Laboratory, ILW Transfer Line 25

Tennessee, Spring City, Watts Bar Nuclear Plant 55

Texas, Falls City, Falls City Site 407, 422

Texas, Ray City, Ray City Site 421

Utah, Mexican Hat, Mexican Hat Site 405

Utah, Salt Lake City 438, 478, 506, 511, 628

Utah, Salt Lake City, Vitro Site 411, 430, 457, 504

Utah, Shiprock Quadrangle 537

Washington, Dawn Mining Company Site 443, 533

Washington, Richland, Hanford Reservation 18, 75, 77, 101, 102, 126, 328

GEOGRAPHIC LOCATION INDEX

Washington, Richland, Hanford Reservation, WPPSS, WNP-2 **164**

Washington, Richland, Hanford Reservation, 233-S Building **74**

Wyoming, Converse County **424**

Wyoming, Exxon Highland Mill **533**

Wyoming, Gas Hills, Pathfinder Mill **413, 533**

Wyoming, Riverton, Riverton Site **420, 435, 444, 447, 477, 503**

Wyoming, Shirley Basin Uranium Mine **476**

Wyoming, West Gas Hills, Federal American Partner's Site **417**

Belgium **285**

Canada **258, 541, 563**

Canada, Ontario **497, 498**

Canada, Ontario, Bancroft **559**

Canada, Ontario, Cobourg **566**

Canada, Ontario, Deloro **566**

Canada, Ontario, Elliot Lake **516, 525, 528, 534, 566, 587, 589, 606, 608**

Canada, Ontario, Elliot Lake, Rio Algom Quirke Uranium Mine **588, 625**

Canada, Ontario, Lake Ontario, Pickering Generating Station **226**

Canada, Ontario, Port Hope **566**

Canada, Saskatchewan, Uranium City **566**

Federal Republic of Germany **279**

Federal Republic of Germany, Gundremmingen **231, 238**

France, CEA **305**

India **562**

India, Bihar, Jaduguda Uranium Complex **578**

Japan **310**

South Africa **491**

Sweden, Stockholm **306**

Switzerland **210**

Switzerland, Lucens Experimental Reactor **332**

United Kingdom **371**

United Kingdom, Cumbria **343**

KEYWORDS INDEX

KEYWORDS INDEX

ABRASION 64, 287

ABRASIVES 287

ABSORPTION SPECTROSCOPY 325

ACCIDENTS 36, 161, 236

ACCOUNTING 219

ACETYLENE 325

ACIDS 261, 478

ACTINIUM-227 478

ACTIVITY LEVELS 16, 25, 26, 34, 35, 41, 42, 49, 57, 58, 63, 73, 96, 104, 117, 138, 146, 182, 218, 224, 241, 330, 339, 381, 392, 394, 395, 454, 471, 498, 499, 511, 528, 534, 552, 555, 598, 618, 623, 645, 657

AERIAL MONITORING 39, 40, 43, 45, 46, 48, 52-54, 378, 558

AERIAL SURVEYING 39, 40, 45, 52, 56, 60

AEROSOLS 299, 325, 493, 524, 648

AGR TYPE REACTORS 219

AGRICULTURE 419-424

AIR 51, 61, 275, 286, 393, 396-399

AIR POLLUTION 4, 57, 101, 159, 160, 320, 344, 568, 594, 645

AIR QUALITY 526

AIR SAMPLERS 648

AIRCRAFT 43, 46, 48, 53, 54, 60, 378

ALGAE 578

ALKALI METAL COMPOUNDS 113

ALKALI METAL ISOTOPES 393, 396-399

ALKALI METALS 77, 371

ALKALINE EARTH ISOTOPES 376, 393, 399, 464, 476, 524, 547, 588, 589, 592, 607, 643

ALKALINE EARTH METAL COMPOUNDS 562, 588, 590

ALKALINE EARTH METALS 396-398, 562, 590

ALKYNES 325

ALLOYS 211, 241, 248, 266, 270, 271, 275, 280, 294, 307, 310, 319, 321, 325

ALPHA DETECTION 382, 393, 399

ALPHA PARTICLES 140, 242, 267, 514, 524

ALPHA RADIATION 63, 499

ALRR REACTOR 61, 91, 100

ALUMINUM 91, 275, 287, 320, 503, 533, 560, 602, 636

ALUMINUM ALLOYS 262, 274

AMERICIUM 109

AMERICIUM ISOTOPES 112

AMERICIUM-241 34, 35, 63, 112

AMES LABORATORY 61

AMMONIA 534

ANIMAL FEEDS 439

ANIMALS 340, 375, 385, 499, 507-509, 524, 543, 583, 607

ANTS 508

KEYWORDS INDEX

AQUATIC ECOSYSTEMS **559, 578**

AQUATIC ORGANISMS **524**

AQUEOUS HOMOGENEOUS REACTORS **99**

AQUEOUS SOLUTIONS **248**

AQUIFERS **53, 126, 417, 517, 589, 636**

ARC WELDING **274, 280, 307, 311, 313**

ARGON **275, 307**

ARSENIC **402, 413, 429, 431, 495, 511, 523, 573**

ARTHROPODS **499**

ASCHELMINTHES **559**

ASPHALTS **25, 416, 428, 437, 486, 487, 490, 500, 507, 512, 531, 544-546, 561, 599, 646**

ATMOSPHERIC PRECIPITATIONS **480, 492, 519, 550, 569, 575, 649**

ATOMIC ENERGY LAWS **213, 236**

AVAILABILITY **279**

BACKFILLING **528, 606**

BACKGROUND RADIATION **63, 239, 394, 463**

BARIUM **431, 478, 511, 523, 552, 553, 560, 636**

BARIUM CHLORIDES **497, 588**

BARIUM COMPOUNDS **562, 588, 590**

BARIUM SULFATES **497, 499, 590**

BARRIERS **428**

BASELINE ECOLOGY **340**

BEAVER VALLEY-1 REACTOR **41, 42**

BEAVER VALLEY-2 REACTOR **41, 42**

BENCH-SCALE EXPERIMENTS **325**

BENTONITE **592**

BERYLLIUM OXIDES **88, 89**

BERYLLIUM-7 **645**

BETA DETECTION **382, 393, 399**

BETA PARTICLES **76, 110, 241**

BIBLIOGRAPHIES **105, 312-315, 353, 390, 593, 594, 640**

BIBLIS-A REACTOR **229, 323**

BIOASSAY **385, 499, 520**

BIOLOGICAL EFFECTS **510**

BIOLOGICAL SHIELDS **91, 229, 238, 290, 291, 302, 306, 339**

BITUMENS **428, 507**

BOILERS **168**

BONUS REACTOR **22, 27**

BOREHOLES **610**

BREEDER REACTORS **143, 145-147, 153, 167, 298, 342, 371**

BRUNSBUETTEL REACTOR **229, 290, 323**

BUDGETS **18**

BUILDING MATERIALS **241, 339, 454, 481, 571, 592**

KEYWORDS INDEX

BUILDINGS 2, 10, 37, 63, 66, 74, 75, 82, 83, 152, 166, 170, 182, 204, 237, 383, 396-399, 463, 479, 481

BURIAL 96, 103, 117, 118, 121, 122, 125, 170, 334, 508, 532

BWR TYPE REACTORS 6, 34, 164, 229, 230, 249, 263, 290, 323

CADMIUM 429, 431

CADMIUM ISOTOPES 325

CALCINATION 572

CALCIUM 429, 478, 500, 533, 560

CALCIUM CARBONATES 544

CALCIUM SULFATES 496

CALCULATIONS 88, 89, 129, 203, 235, 379, 385, 389, 395, 415, 438, 440, 501, 505, 506, 577, 580, 585, 598, 614, 615, 618, 623, 641, 642, 654

CALIBRATION 36

CANDU TYPE REACTORS 226, 258

CAPITAL 6, 234

CARBON 241

CARBON DIOXIDE COOLED REACTORS 230, 279, 332

CARBON STEELS 241, 245, 248, 256, 266, 270, 325, 327

CARBONACEOUS MATERIALS 219

CASCADE IMPACTORS 325

CATTLE 607

CEMENTS 355, 496, 512, 592

CERAMICS 88, 89

CERIUM-144 76

CESIUM ISOTOPES 325, 393, 396-399

CESIUM-137 35, 39, 40, 45, 52, 76, 104, 393, 396-399

CHALCOGENIDES 248, 562

CHARGED PARTICLE DETECTION 393, 399

CHARGED PARTICLES 241

CHEMICAL ANALYSIS 431, 533, 576

CHEMICAL COMPOSITION 521

CHEMICAL PROPERTIES 496, 500, 513, 522, 525, 636, 638

CHEMICAL REACTIONS 168, 321, 478, 504, 562, 572, 593, 609

CHEMISTRY 476

CHIPMUNKS 340

CHLORIDES 50, 578, 588

CHLORINE 429, 533

CHLORINE COMPOUNDS 50, 588, 638

CHROMIUM 307, 431, 523, 573

CHROMIUM ALLOYS 248, 266, 271, 294, 307, 319, 321, 325

CHROMIUM OXIDES 248

CHROMIUM STEELS 266, 307, 319, 321, 325

CHROMIUM-NICKEL STEELS 266, 307, 319, 321, 325

KEYWORDS INDEX

CLAYS 49, 328, 374, 415, 416, 434, 498, 500, 515, 544, 571, 591, 596, 602, 609, 622-624, 644

CLEANING 1, 2, 11, 14, 32, 33, 99, 112, 113, 204, 221, 237, 242, 250, 255, 256, 258, 266, 269, 271, 281, 284, 285, 329, 368, 371, 375, 376, 393, 396-399, 458, 562

CLIMATES 105, 334, 569, 571

COAL 219

COAL PREPARATION PLANTS 631

COATINGS 258, 271

COBALT 525, 573

COBALT ISOTOPES 266

COBALT-60 4, 35, 39, 40, 45, 52, 242, 266, 394

COLLOIDS 325, 524, 604

COMBUSTION 342

COMMERCIAL SECTOR 116

COMMINUTION 113, 594

COMPARATIVE EVALUATIONS 28, 58, 72, 101, 157, 234, 251, 253, 289, 290, 295, 296, 299, 308, 316, 318, 351, 415, 416, 430, 434, 445, 456, 500, 506, 509, 556, 566, 569, 582, 596, 609, 633, 642, 655

COMPILATION 158

COMPRESSED AIR 275

COMPUTER CALCULATIONS 55, 517

COMPUTER CODES 322, 484, 536, 557, 614, 615, 654, 657

CONCRETES 34, 68, 71, 91, 170, 182, 210, 238, 241, 243, 254, 273, 276, 287-291, 326, 339, 343, 500, 531

CONSTRUCTION 9, 10, 166, 401, 425, 443, 456, 457, 481, 539, 571, 586, 597, 608, 646

CONTAINERS 3, 15, 65, 96, 132, 285, 294, 339, 347, 348

CONTAINMENT 36, 51, 161, 167, 267, 380, 507, 531, 574, 611

CONTAINMENT BUILDINGS 36, 71, 167

CONTAINMENT SYSTEMS 507, 509

CONTROL 462, 594, 651

CONTROL ELEMENTS 9

COOLANTS 148, 261

COOLING SYSTEMS 77, 145, 168, 258, 261, 277

COPPER 573, 636

CORROSION 168, 247, 321

CORROSION PRODUCTS 266

CORROSION RESISTANT ALLOYS 248, 271, 294, 321, 325

COST 2, 6, 8, 10, 13-15, 17, 19, 20, 23, 29, 31, 58, 64, 66-70, 86, 87, 90, 96, 104, 115, 117, 119, 122, 138, 140, 150, 151, 154, 157-162, 164-166, 170, 174, 179-181, 201, 203, 206, 210-212, 214, 215, 217-219, 221, 226, 227, 229, 233, 234, 242, 243, 253, 272, 286, 288, 290, 306, 323, 330, 336, 337, 351, 362, 366, 370, 373, 374, 385, 387, 400, 445, 448, 449, 453, 455, 456, 459, 460, 465-469, 471, 486, 487, 491, 502, 518, 545, 567, 576, 584, 596, 601, 615, 626, 642, 655

KEYWORDS INDEX

COST BENEFIT ANALYSIS **31, 69, 94, 114, 115, 117, 134-137, 217, 232, 243, 263, 383, 465-467, 567**

COVERINGS **415, 416, 434, 437, 440, 442, 468, 487-490, 495, 531, 544, 545, 564, 569-571, 579, 580, 585, 596, 600, 622-624, 633, 650, 656**

CREEP **310**

CRITICALITY **142**

CROSS SECTIONS **235**

CRYOGENIC FLUIDS **319**

CRYSTAL STRUCTURE **307, 321**

CURIUM OXIDES **73**

CURIUM-242 **73**

CURIUM-244 **73**

CUTTING **68, 84, 93, 96, 155, 245, 273, 278, 280, 284, 286-289, 293-295, 297, 299-301, 303, 304, 307-316, 319, 321, 322, 324-327, 350, 365**

CUTTING TOOLS **68, 84, 93, 198, 251, 273, 282, 284, 286-290, 294, 295, 297, 299-301, 304, 308-311, 315-318, 324, 326, 341, 365**

DAMS **401, 484, 491, 536, 540, 554, 556, 589, 601, 608, 631, 642, 654**

DATA ACQUISITION **446**

DATA ANALYSIS **105, 537**

DATA COMPILATION **105, 116, 355, 446, 648**

DATA PROCESSING **480**

DAUGHTER PRODUCTS **389, 396-398, 479, 524, 535, 538, 542, 566, 572, 581, 613**

DECAY **241**

DECISION MAKING **23, 446**

DECOMPOSITION **572**

DEER **476**

DEMOLITION **29, 65, 66, 82, 83, 91, 99, 152, 166, 175-177, 182, 204, 206, 220, 229, 241, 276, 279, 281, 285, 289, 291, 292, 302, 305, 323, 339, 358, 364, 366**

DEMONSTRATION PROGRAMS **75, 220, 289**

DEPOSITION **554**

DESERTS **550, 649, 655**

DESIGN **9-11, 20, 161, 166, 171, 172, 175-177, 201, 220, 222, 225, 283, 284, 289, 301, 312, 314, 329, 349, 370, 374, 401, 417, 425, 443, 484, 488, 501, 539, 549, 552, 554, 556, 571, 576, 585, 596, 600, 608, 626, 627, 633, 642, 646, 647, 650, 651, 653-655**

DETECTION **393, 399**

DEUTERIUM OXIDES **332**

DFR REACTOR **371**

DIAGRAMS **208, 229**

DIET **582**

DIFFUSION **415, 416, 428, 440, 501, 551, 565, 580, 596, 614, 615, 622, 629, 634**

DIORIT REACTOR **290**

DISASTERS **651, 656**

KEYWORDS INDEX

DISMANTLEMENT 15, 65, 204, 292, 305, 364

DISPERSIONS 248, 325, 385, 524, 562, 572

DISSOLUTION 38, 64, 248, 285, 547, 589, 590, 592, 593, 643

DOMESTIC ANIMALS 607

DOSE COMMITMENTS 285, 493

DOSE LIMITS 524

DOSE RATES 41, 42, 59, 270, 451, 481, 535

DOSIMETERS 426

DOSIMETRY 535, 543, 657

DRINKING WATER 58, 270, 524, 534, 551

DUSTS 522, 643, 657

EARTH ATMOSPHERE 50

ECOLOGY 340

ECONOMIC ANALYSIS 521

ECONOMICS 12, 150, 219, 286, 314, 320, 359, 362, 448, 490

ECOSYSTEMS 385, 559

EDUCATION 237

EDUCATIONAL FACILITIES 393

EH VALUE 413, 533

ELECTRIC ARCS 294, 310, 311, 319, 327

ELECTRIC CURRENTS 294, 310, 319, 327

ELECTRIC DISCHARGES 294, 319

ELECTRIC POWER 12, 203, 362

ELECTRIC UTILITIES 200, 269, 349

ELECTROCHEMISTRY 244, 248

ELECTRODES 244

ELECTROLYSIS 244, 248

ELECTROLYTES 244, 248, 262

ELECTROMAGNETIC RADIATION 241, 311, 321, 464

ELECTRON MICROSCOPY 325

ELECTRON TUBES 319

ELECTROPOLISHING 64, 243-245, 248, 250, 251, 255, 256, 259-262, 265

EMBANKMENTS 631, 651

EMERGENCY PREPAREDNESS 169

EMPLOYMENT 403-412

EMULSIONS 544, 546, 561

ENERGY POLICY 28, 219

ENERGY SOURCES 219

ENERGY SURPLUSES 219

ENERGY SYSTEMS 77, 277

ENGINEERED SAFETY SYSTEMS 507

ENGINEERING 211, 597, 626, 651

ENRICHED URANIUM REACTORS 5, 12, 29, 36, 61, 77, 100, 141-147, 149, 153, 167, 168, 208, 219, 229, 230, 269, 279, 310, 323, 369, 371

ENRICO FERMI-1 REACTOR 30, 98, 158

KEYWORDS INDEX

ENVIRONMENT 51, 120, 243, 327, 361, 559

ENVIRONMENTAL EFFECTS 4, 44, 50, 86, 105, 133, 225, 228, 375, 386, 589, 592, 621

ENVIRONMENTAL EXPOSURE PATHWAY 379, 383, 389, 439, 466-468, 524, 543, 582, 592, 607, 641, 657

ENVIRONMENTAL IMPACT STATEMENTS 4, 8, 32, 133, 386, 466-468

ENVIRONMENTAL IMPACTS 3, 20, 32, 33, 240, 340, 344, 376, 384, 446, 464, 472, 506, 524, 553, 559, 578, 594, 606, 610, 657

ENVIRONMENTAL PROTECTION 151, 388, 653

ENVIRONMENTAL TRANSPORT 38, 105, 331, 476, 503, 517, 524, 546, 548, 599, 607, 624, 629, 651

EPITHERMAL REACTORS 298, 371

EQUATIONS 475, 505, 506, 523, 526, 532, 538, 554, 556, 569, 573, 577, 580, 598, 614, 623, 633, 638, 657

EQUIPMENT 1, 25, 44, 72, 74, 76, 91, 103, 105, 152, 159-161, 179, 180, 211, 217, 246, 251, 259, 273, 276, 283, 284, 286, 288, 316, 329, 364, 611

EROSION 328, 387, 468, 488-490, 522, 561, 575, 585, 650, 651

ERR REACTOR 157

ETHICS 216

EVALUATION 111, 537

EVAPORATION 417, 447, 538, 624

EXCAVATION 96, 198

EXPERIMENTAL DATA 50, 112, 113, 266, 537

EXPERIMENTAL REACTORS 77, 371

EXPLOSIVE FRACTURING 252

EXPLOSIVES 252, 291, 292

EXTRACTION 547, 594, 638

EXTRACTIVE METALLURGY 593

FABRICATION 307

FAST REACTORS 298, 371

FATIGUE 321

FAULT TREE ANALYSIS 488

FBR TYPE REACTORS 298, 371

FEASIBILITY STUDIES 57, 220, 289, 295, 355, 384, 385, 485, 502, 585

FEDERAL ASSISTANCE PROGRAMS 150

FEDERAL REGULATIONS 124

FEED MATERIALS PLANTS 166, 382, 390, 392, 400, 428, 439, 441, 446, 448, 459, 462, 464, 480, 490, 493, 517, 541, 542, 546, 548, 558, 570, 590, 607, 635, 656

FERTILIZERS 414, 561

FILTRATION 109, 258, 593

FINANCIAL ASSISTANCE 269

FINANCIAL INCENTIVES 269

FINANCING 6, 28, 92, 150, 200, 213, 232, 236, 269, 359

FISHES 62, 499, 524, 578

KEYWORDS INDEX

FISSION PRODUCTS **34, 258, 330**

FLOODS **650, 651, 656**

FLOTATION **593, 606**

FLOW MODELS **624**

FLOWSHEETS **229**

FLUID FLOW **556**

FLUID FUELED REACTORS **99**

FLUID MECHANICS **624**

FLUIDS **61, 307, 319, 393, 396-399, 428, 524, 562, 592, 594, 629, 656**

FLUORINE **182**

FOOD **582, 607, 641**

FOOD CHAINS **439, 543, 582, 607**

FORAGE **439**

FORECASTING **116, 126, 129, 130, 175-177, 218, 352, 412, 501, 515, 526, 538, 556, 569, 610, 620, 630, 654, 657**

FOSSIL FUELS **219**

FOSSIL-FUEL POWER PLANTS **209, 219**

FRESH WATER **559**

FUEL ASSEMBLIES **9, 277, 298**

FUEL ASSEMBLY DISMANTLING **277, 298**

FUEL CYCLE **211**

FUEL CYCLE CENTERS **361**

FUEL ELEMENT CLUSTERS **298**

FUEL ELEMENTS **208, 277, 298, 332**

FUEL FABRICATION PLANTS **1, 33, 87, 97, 171, 172, 205, 361, 364**

FUEL REPROCESSING PLANTS **11, 35, 59, 76, 94, 271, 285, 361**

FUEL RODS **277**

FUELS **209, 219**

FUME HOODS **74**

FUNCTIONAL MODELS **283**

FUNGI **560, 655**

FURNACES **283, 284**

GAMMA DETECTION **382, 393**

GAMMA LOGGING **435, 540**

GAMMA RADIATION **35, 36, 39, 40, 43, 45, 46, 48, 52-54, 76, 108, 110, 159, 160, 235, 241, 378, 463, 464, 479, 499, 540**

GAS COOLED REACTORS **165, 219, 241, 261, 270, 279, 343, 356**

GCR TYPE REACTORS **219, 241, 270**

GEOCHEMICAL SURVEYS **537**

GEOCHEMISTRY **417, 429, 431, 435, 437, 477, 495, 525, 538, 573, 602, 620, 644**

GEOLOGIC DEPOSITS **346, 537**

GEOLOGICAL SURVEYS **537**

GEOLOGY **49, 50, 57, 62, 334, 374, 417, 431, 443, 516, 525, 627, 636**

GEOMORPHOLOGY **374**

GEOPHYSICAL SURVEYS **56, 462, 537**

GLOBAL ASPECTS **346**

KEYWORDS INDEX

GLOVEBOXES 1, 3, 16, 66, 67, 69, 70, 86, 87, 97, 171, 172, 179, 180, 195, 251, 267

GOLD 491, 601

GOVERNMENT POLICIES 24, 28, 123, 156, 219, 346, 446, 448, 594

GOVERNMENT PROGRAMS 453, 460, 481

GRAPHITE 241, 332, 356

GRAPHITE MODERATED REACTORS 77, 219, 241, 270

GRASSES 106-108, 328, 414, 439, 575

GRAVELS 415

GRINDING 113

GRINDING MACHINES 113

GROUND COVER 428, 476

GROUND DISPOSAL 126

GROUND WATER 35, 44, 49, 50, 57, 58, 62, 126, 131, 134-137, 379, 381, 389, 392, 417, 430, 435, 447, 464, 466, 467, 476, 4.7, 489, 496, 511, 516, 517, 524, 525, 533, 538, 544, 553, 567, 578, 579, 581, 589, 595, 596, 619, 628, 631, 632, 642, 648, 653

GROUTS 445, 628

GUIDELINES 30, 117, 379, 389, 469, 470, 551

HABITAT 340

HALIDES 50, 588

HALOGEN COMPOUNDS 50, 588

HANDBOOKS 303, 585

HANFORD RESERVATION 18, 101, 102, 112, 126

HARDNESS 307

HAZARDS 240, 270, 396-399, 464, 548, 607

HDR REACTOR 230

HEALTH HAZARDS 7, 14, 58, 67, 151, 216, 240, 270, 274, 278, 299, 316, 379, 380, 389, 392, 396-399, 449, 453, 464, 468, 469, 471, 479, 493, 534, 535, 548, 582, 607, 613, 621

HEALTH PHYSICS 83, 86, 166, 170, 249

HEARINGS 470, 472

HEAT AFFECTED ZONE 307

HEAT RESISTANT MATERIALS 325

HEAT RESISTING ALLOYS 325

HEAVY WATER COOLED REACTORS 61, 100

HEAVY WATER MODERATED REACTORS 61, 100, 230, 258, 279, 332

HELICOPTERS 60

HELMINTHS 559

HERBICIDES 507, 509

HIGH-LEVEL RADIOACTIVE WASTES 92, 94, 116, 128, 129, 346

HOMOGENEOUS REACTORS 84, 99

HOT CELLS 72, 73, 298, 305, 317

HOT LABS 75

HOUSES 463, 566

KEYWORDS INDEX

HRE REACTOR 84

HTGR TYPE REACTORS 165

HUMAN POPULATIONS 61, 399, 403-412, 446, 542, 566, 607

HUMIDITY 480

HWGCR TYPE REACTORS 230, 279, 332

HYDRAULICS 517, 624

HYDROCARBONS 325

HYDROCHLORIC ACID 113, 256, 604, 638

HYDROFLUORIC ACID 113

HYDROGEN COMPOUNDS 50, 61, 113, 126, 275, 464, 476, 559, 589, 592, 593, 624, 631

HYDROGEN ISOTOPES 61

HYDROLOGY 49, 50, 57, 62, 334, 374, 375, 417, 431, 435, 437, 443, 447, 450, 468, 475, 477, 492, 501, 516, 525, 532, 538, 589, 596, 620, 627, 636

HYDROXIDES 113

IMPACT STRENGTH 307

IMPINGEMENT 325

INCINERATORS 139, 162

INDIAN POINT-1 REACTOR 29

INDIAN POINT-2 REACTOR 29

INDIAN POINT-3 REACTOR 29

INDUSTRIAL MEDICINE 594

INDUSTRIAL PLANTS 400, 448, 459, 462, 464, 490, 493, 541, 548, 562, 570, 590, 607, 631, 635, 656

INDUSTRIAL WASTES 594

INERT ATMOSPHERE 319

INFORMATION 50, 112, 113, 124, 145, 365, 537

INFORMATION DISSEMINATION 8, 124, 373

INFORMATION NEEDS 365

INFORMATION SYSTEMS 158

INGESTION 101, 270, 379, 493, 582, 641, 657

INHALATION 299, 316, 379, 493, 530, 542, 582, 648, 657

INORGANIC ACIDS 113, 593

INSPECTION 285, 290

INSTITUTIONAL FACTORS 12, 331

INSURANCE 92

INTERAGENCY COOPERATION 462

INTERGOVERNMENTAL COOPERATION 462

INTERNAL CONVERSION RADIOISOTOPES 92

INTERNATIONAL AGREEMENTS 365

INTERNATIONAL COOPERATION 365, 635

INTERNATIONAL ORGANIZATIONS 541, 635

INTRUSION 340, 490, 507

INVENTORIES 7, 34, 63, 116, 129, 130, 157, 170, 241, 330, 348, 352, 356, 400

KEYWORDS INDEX

INVERTEBRATES 499

IODINE-129 34

ION EXCHANGE 258, 593

IONIZING RADIATIONS 241, 464

IRON 268, 429, 503, 523, 533, 573, 602, 636

IRON ALLOYS 241, 248, 266, 270, 271, 294, 307, 319, 321, 325

IRON BASE ALLOYS 241, 266, 270, 271, 294, 307, 319, 321, 325

IRON SULFIDES 525, 604

IRON-55 4, 34

IRRADIATION DEVICES 310

IRRADIATION REACTORS 61, 310

IRRIGATION 414, 519, 575

ISOMERIC TRANSITION ISOTOPES 92

ISOTOPE PRODUCTION REACTORS 61, 100

ISOTOPE RATIO 237

JMTR REACTOR 310

JOINTS 307

JPDR REACTOR 220

KEWB REACTOR 99

LABOR 68

LABORATORY EQUIPMENT 1

LAKES 559, 583, 589

LAND RECLAMATION 4, 15, 104, 105, 108, 328, 387, 414, 454, 457-459, 476, 490, 550, 575, 633, 649, 655

LAND USE 116, 376, 403-412, 418-424

LASER BEAM MACHINING 277, 315

LASER DRILLING 298

LASER RADIATION 311, 321

LASERS 277, 311

LASL 82, 83, 112

LAVAGE 368

LAWS 124, 213, 221, 236, 432, 433, 436, 451, 452, 473, 481

LEACHATES 521

LEACHING 38, 51, 58, 131, 374, 379, 413, 435, 445, 478, 485, 494, 498, 499, 511, 516, 517, 521, 523, 525, 533, 538, 547, 552, 553, 573, 579, 581, 589, 590, 592, 593, 596, 597, 603, 604, 606, 609, 625, 628, 636-638, 642, 643, 647, 652

LEAD 402, 429, 431, 495, 511, 523, 525, 573, 602, 636

LEAD ISOTOPES 589, 607

LEAD-210 413, 439, 582, 589, 607, 645

LEAD-214 503

LEAK TESTING 167

LEAKS 148

LEGISLATION 124, 269, 474, 641

LIABILITIES 169

LICENSES 21, 26, 124, 451

KEYWORDS INDEX

LICENSING 32, 124, 131, 202, 213, 229, 231, 236, 441, 448, 466, 467, 652

LIMNOLOGY 559

LINERS 271, 374, 417, 428, 437, 443, 445, 468, 500, 501, 515, 531, 544, 579, 591, 595, 596, 602, 609, 637, 642, 644, 646

LINGEN REACTOR 230

LIQUID HOMOGENEOUS REACTORS 99

LIQUID METAL COOLED REACTORS 77, 298, 371

LIQUID WASTES 19, 61, 242, 243, 266, 588

LITHIUM COMPOUNDS 86

LITHOLOGY 537

LMFBR TYPE REACTORS 342

LOW TEMPERATURE 292

LOW-LEVEL RADIOACTIVE WASTES 32, 44, 50, 56, 116, 119-123, 125, 127-129, 134-139, 156, 201, 217, 231, 334, 335, 340, 346, 351, 353, 355, 357, 384, 386, 559, 630, 643

LUCENS REACTOR 332

LUNGS 299, 479, 493, 542

LWBR TYPE REACTORS 9, 143, 145-147, 153, 167

MACHINE TOOLS 113

MACHINING 113, 277, 284, 294, 298, 307, 310, 319, 321, 325, 448

MAGNESIUM 533, 560

MAGNESIUM ALLOYS 241

MAGNESIUM BASE ALLOYS 241

MAGNESIUM OXIDES 310

MAGNOX TYPE REACTORS 235, 241, 270

MAINTENANCE 19, 141, 142, 144, 146, 147, 164, 225, 373, 425

MAMMALS 340, 476, 507, 508, 607

MAN 299, 316, 543, 571, 641, 657

MANGANESE 429, 503, 560, 573, 578, 602, 636

MANGANESE ALLOYS 321

MANGANESE COMPOUNDS 562

MANGANESE OXIDES 578

MANHATTAN PROJECT 173, 377, 379, 381, 389, 390, 392, 395-398, 427, 482, 483

MANIPULATORS 317

MANPOWER 212

MANUALS 303, 600

MAPS 55

MARINE DISPOSAL 384, 385

MARITIME TRANSPORT 208

MASS NUCLEI 92

MASS TRANSFER 476, 607, 624, 629, 651

MATERIALS DRILLING 298

MATERIALS HANDLING 342

MATERIALS HANDLING EQUIPMENT 283, 317

KEYWORDS INDEX

MATERIALS RECOVERY 462, 521, 547, 601, 603

MATERIALS TESTING 298, 310

MATERIALS TESTING REACTORS 310

MATHEMATICAL MODELS 129, 133, 203, 379, 417, 429, 484, 501, 506, 517, 526, 536, 538, 539, 543, 557, 602, 607, 614, 615, 620, 624, 630, 631, 636, 641, 654, 655, 657

MATHEMATICS 237

MAXIMUM ACCEPTABLE CONTAMINATION 111

MAXIMUM PERMISSIBLE CONCENTRATION 101, 102

MEASURING INSTRUMENTS 426, 480, 529, 535, 630

MEAT 607

MECHANICAL PROPERTIES 307, 310, 321

MECHANICAL TESTS 310

MECHANICS 624

MEDICAL PERSONNEL 285

MEDICINE 594

MEDIUM TEMPERATURE 266

MEETINGS 254, 345, 346

MELTING 139, 268, 283, 284, 327, 338, 350

METALLURGY 593

METALS 2, 32, 77, 242, 244, 245, 248, 253, 265, 268, 271, 282, 286, 293, 296, 299, 304, 308, 315, 316, 318, 350, 376, 393, 396-399, 524, 560, 562, 572, 590, 592

METEOROLOGY 50, 62, 334, 374, 435, 443, 450, 480, 526

METHODS 105, 174, 226, 246, 308, 351, 402, 442, 492, 549, 550, 567

MICE 340

MICROHARDNESS 307

MICROSCOPY 325

MICROSTRUCTURE 307, 321

MILK 607, 641

MILLING 446, 448, 468, 530, 551, 555, 578, 613

MILLS 439

MINERAL RESOURCES 537

MINERALOGY 504, 521, 537, 602, 644

MINERALS 521, 592, 624

MINES 524, 541, 574, 589, 594, 635, 643, 655

MINING 419-424, 530, 566, 578, 587, 594, 601, 643

MINING WASTES 512, 513, 613, 631

MIXED OXIDE FUEL FABRICATION PLANTS 211

MIXTURES 248, 562, 572

MODIFICATIONS 5, 141

MOISTURE 50, 434, 490, 629

KEYWORDS INDEX

MOLYBDENUM 429, 431, 495, 511, 523, 573

MONITORING 32, 36, 38, 50, 61, 90, 99, 325, 331, 376, 393, 396-400, 425, 448, 462, 480, 494, 524, 540, 594, 648

MOUND LABORATORY 112

MUNITIONS INDUSTRY 78

NAI DETECTORS 53, 60, 66, 444, 494, 584, 618

NAK COOLED REACTORS 342

NATIONAL GOVERNMENT 169, 594

NATIONAL ORGANIZATIONS 2, 50, 111-113, 126, 200

NATURAL RADIOACTIVITY 463, 566

NATURAL URANIUM REACTORS 241, 270

NEMATODES 559

NEOPLASMS 389, 392, 479, 534, 535, 542

NERVA REACTOR 79, 81, 95

NEUTRON-NEUTRON LOGGING 540

NICKEL 525

NICKEL ALLOYS 255, 266, 307, 319, 321, 325

NICKEL ISOTOPES 92, 270

NICKEL STEELS 307

NICKEL-59 92, 270

NICKEL-63 4, 34

NIEDERAICHBACH REACTOR 230, 279

NIOBIUM ISOTOPES 92

NIOBIUM-94 92

NIOBIUM-95 76

NITRATES 429, 534

NITRIC ACID 113, 604

NITROGEN 307, 319

NONMETALS 241, 307, 319, 393, 396-399, 462, 524, 592, 594, 629, 656

NOZZLES 313

NS OTTO HAHN 208, 369

NUCLEAR FUELS 116

NUCLEAR INDUSTRY 92, 150

NUCLEAR INSURANCE 92

NUCLEAR POWER 169, 219

NUCLEAR POWER PLANTS 6, 19, 23, 28, 124, 149, 150, 164, 200, 202, 203, 206, 207, 209, 217-219, 222-224, 227, 231-234, 238, 240, 247, 249, 263, 266, 270, 272, 302, 332, 337, 338, 348, 349, 358, 359, 362, 366, 493

NUCLEAR SHIPS 208, 354, 369, 372

NUCLEAR WEAPONS 67

NUMERICAL DATA 50, 112, 113, 537

OCCUPATIONAL SAFETY 4

OPERATION 5, 142-147, 153, 208, 258, 279, 369

OPTIMIZATION 615

ORE ENRICHMENT 594

KEYWORDS INDEX

ORE PROCESSING 541, 590, 593, 594

ORES 38, 448, 474, 541, 547, 562, 588-590, 593, 594, 629, 635, 643

ORGANIC COMPOUNDS 325, 428, 507, 547, 628

ORGANIC PHOSPHORUS COMPOUNDS 547

ORNL 35, 355

OTTO HAHN REACTOR 208, 230, 354, 369

OVERBURDEN 549

OXIDATION 593

OXIDES 211, 562

OXYGEN COMPOUNDS 50, 61, 113, 126, 464, 476, 559, 562, 589, 590, 592, 624, 631

PACKAGING 1, 132, 171, 172, 211, 346-348, 354

PARTICLE SIZE 299, 316, 325, 379, 416, 417, 447, 475, 508, 522, 576, 583, 641

PARTICLES 493, 524

PARTITION 64

PEACH BOTTOM-1 REACTOR 165

PEAT 516

PERFORMANCE 142, 168, 208, 284

PERFORMANCE EVALUATIONS 527

PERFORMANCE TESTING 288, 299, 310, 316, 326, 646

PERMEABILITY 374, 475, 500, 515, 591, 596, 602, 609, 614, 646, 654

PEROXIDES 266

PERSONNEL 13, 17, 25, 164, 206, 212, 215, 229, 285, 332, 441

PERSONNEL MONITORING 44

PERSONNEL PROTECTION 377

PERSULFATES 266

PFR REACTOR 298

PH VALUE 57, 62, 112, 113, 413, 417, 429, 431, 435, 477, 503, 504, 511, 516, 518, 525, 533, 552, 573, 575-577, 583, 588, 589, 591, 596, 602, 609, 620, 644

PHASE DIAGRAMS 577

PHASE TRANSFORMATIONS 283, 284, 592, 624

PHOSPHORIC ACID 248, 256, 382

PHWR TYPE REACTORS 226

PHYSICAL PROPERTIES 88, 89, 475, 500, 513, 522, 532, 569, 628, 650

PHYSICAL RADIATION EFFECTS 298

PICKERING REACTORS 226

PIEZOMETRY 589

PILOT PLANTS 103, 283, 382

PIPES 25, 96, 251, 296, 316, 332, 654

PLANKTON 583

PLANNING 3, 6, 8, 10, 15-19, 25-27, 30, 31, 33, 76, 94, 96, 100, 105, 110, 114, 124, 129, 130, 155, 164, 166, 171-182, 194, 195, 201, 202, 207, 210, 212, 215, 217, 218, 220-223, 225, 228-234, 238, 243, 249, 289, 329, 336, 337, 340, 343,

KEYWORDS INDEX

344, 349, 361, 364, 370, 373, 404, 412, 417, 450, 453, 455-457, 459-461, 488, 554, 556, 567, 585, 586, 600, 626, 642, 646, 650, 653-655

PLANT GROWTH 328, 490

PLASMA ARC 84

PLASMA ARC CUTTING 93, 198, 251, 295-297, 300, 301, 304, 308, 309, 316, 318, 324, 341

PLASMA ARC WELDING 93, 307, 309, 312, 318, 320, 350

PLASMA HEATING 139

PLASMA JETS 257, 317

PLASMA TORCHES 304, 350

PLASMATRONS 319

PLUTONIUM 2, 16, 63, 66, 67, 70, 74, 76, 82, 83, 87, 97, 105, 109, 140, 211, 271

PLUTONIUM DIOXIDE 368

PLUTONIUM ISOTOPES 112, 113

PLUTONIUM NITRATES 74, 75

PLUTONIUM-238 34, 65, 112, 267

PLUTONIUM-239 3, 34, 35, 65, 112, 113, 375, 389

PLUTONIUM-240 34, 389

PNL 416, 585

POLISHING 244

POLLUTION 162, 464, 589, 592, 594

POLLUTION CONTROL 594

POLLUTION REGULATIONS 111

POLONIUM 248

POLONIUM ISOTOPES 476, 607

POLONIUM-210 476, 607, 645

POLYETHYLENES 85, 443

POLYMERS 443, 500, 568, 628

PONDS 57, 62, 328, 402, 413, 417, 538, 555, 601

POPULATIONS 61, 399, 607

POROSITY 517, 532, 634

POTASSIUM 118, 371, 503

POTASSIUM-40 63

POWER GENERATION 12, 169, 203

POWER PLANTS 28, 149, 200, 219, 240, 266, 493

POWER REACTORS 5, 12, 29, 36, 77, 141-147, 149, 153, 161, 167, 168, 201, 212, 229, 230, 269, 272, 279, 298, 323, 371

PRECIPITATION 562, 588, 590

PRESSURE DEPENDENCE 319

PRESSURE TUBE REACTORS 258, 332

PRESSURE TUBES 310

PRESSURE VESSELS 292, 294, 302, 339

PRICE-ANDERSON ACT 169

PRIMARY COOLANT CIRCUITS 77, 145, 168, 258

PROCESSING 64, 113, 221, 266, 283, 284, 317, 462, 480, 541, 547, 562, 572, 588, 590, 593, 594, 643

KEYWORDS INDEX

PROPULSION REACTORS 208, 230, 369

PROTECTIVE COATINGS 258

PUBLIC HEALTH 17, 138, 216, 360, 379, 389, 449, 472, 530, 534, 535, 582, 621

PUBLIC INFORMATION 227

PUBLIC MEETINGS 470

PUBLIC OPINION 621

PUBLIC UTILITIES 6, 23, 200, 214, 269, 337

PUMPS 258

PWR TYPE REACTORS 5, 6, 9, 12, 29, 34, 36, 41, 42, 141-147, 149, 153, 167, 168, 208, 219, 230, 249, 264, 266, 269, 323, 339, 369

PYROLYSIS 572

QUALITY ASSURANCE 33, 222

RADIATION ACCIDENTS 169, 236

RADIATION DETECTION 66, 393, 399, 426, 438, 463, 545, 596, 618

RADIATION DETECTORS 36, 47, 51, 53, 55, 60, 110, 140, 394, 426, 438, 444, 494, 529, 535, 584, 596, 618, 630, 648

RADIATION DOSES 17, 20, 39-43, 45, 46, 48, 52-55, 61, 62, 91, 94, 104, 106-108, 113, 120, 138, 152, 157-161, 170, 210, 215-218, 225, 229, 239, 241, 270, 332, 375, 378, 379, 382, 383, 389, 393-395, 446, 449, 451, 479, 481, 506, 530, 535, 543, 558, 582, 607, 641, 657

RADIATION EFFECTS 298

RADIATION FLUXES 55, 166, 210, 238, 344, 415, 416, 440, 454, 471, 478, 486, 511, 514, 523, 527-529, 544, 545, 549, 564, 565, 580, 585, 596, 598, 600, 614, 615, 623, 633, 634, 642, 650

RADIATION HAZARDS 70, 128, 133, 159, 160, 215, 225, 240, 267, 270, 337, 338, 379, 389, 394, 396-399, 446, 464, 466, 467, 471, 510, 530, 535, 542, 548, 551, 606, 607, 612, 613

RADIATION MONITORING 19, 32, 35-46, 48-54, 56, 59, 61-63, 65, 99, 140, 165, 166, 175-177, 211, 237, 239, 245, 376, 378, 381, 382, 387, 388, 391-399, 401, 426, 438, 441, 444, 449, 458, 462, 514, 524, 527, 528, 596, 610, 615, 625, 630

RADIATION PROTECTION 17, 76, 101, 102, 111, 140, 164, 207, 212, 215, 228, 239, 249, 267, 302, 335, 357, 360, 514, 567

RADIATION PROTECTION LAWS 213, 221, 236, 472

RADIOACTIVATION 271, 339

RADIOACTIVE WASTE DISPOSAL 7, 16, 26, 32, 49, 56, 57, 62, 65, 67, 69, 70, 73, 83, 86, 87, 96, 97, 100, 104, 114, 116-126, 128, 131-138, 151, 154, 158, 162, 164, 171, 172, 198, 201, 204, 209, 212, 213, 216, 217, 221, 225, 236, 241, 242, 257, 306, 330, 332-338, 340, 343-345, 348, 349, 351-353, 355-357, 366, 370, 372-374, 380, 383-385, 391, 392, 417, 449, 451, 455, 465, 468, 473, 474, 476, 481, 487, 490, 492, 506, 507, 517, 531, 539, 559, 567, 570, 576, 583, 586, 587, 592, 596, 597, 605, 606, 616, 617, 626, 630, 632, 637, 640

RADIOACTIVE WASTE FACILITIES 50, 56, 74, 126, 340, 639

RADIOACTIVE WASTE MANAGEMENT 1, 15, 19, 20, 24, 26, 44, 50, 67, 70, 73, 94, 96, 100, 114, 115, 117, 119, 120, 123-

KEYWORDS INDEX

125, 127-130, 133-137, 140, 155-157, 159-161, 199, 201, 204, 205, 210-212, 216, 225, 228, 267, 272, 282, 330, 331, 334-337, 343, 345, 346, 348, 349, 351-353, 355, 357, 359, 370, 373, 400, 427, 436, 441, 448, 451, 459, 474, 490, 521, 539, 541, 563, 583, 605, 606, 612, 635, 639

RADIOACTIVE WASTE PROCESSING **69, 113, 115, 120, 139, 211, 221, 253, 266, 283, 284, 313, 314, 317, 331, 338, 345, 346, 372, 386, 427, 462, 468, 485, 546, 553, 588, 599, 603, 604, 638, 643**

RADIOACTIVE WASTE STORAGE **11, 20, 24, 44, 49, 51, 57, 58, 62, 87, 94, 118, 124, 132, 138, 166, 210, 215, 217, 231, 272, 331, 333, 346, 355, 368, 386, 391, 429, 492, 548, 563, 590**

RADIOACTIVITY **38, 50, 61, 101, 102, 146, 237, 241, 270, 339, 376, 393, 399, 439, 594**

RADIOACTIVITY LOGGING **610**

RADIOACTIVITY TRANSPORT **146**

RADIOBIOLOGY **377**

RADIOCHEMICAL ANALYSIS **355, 439**

RADIOCHEMICAL METHODS **523**

RADIOCHEMISTRY **381, 435, 444, 476, 523, 552**

RADIOECOLOGICAL CONCENTRATION **439**

RADIOECOLOGY **566**

RADIOMETRIC SURVEYS **34, 35, 47, 49, 51, 55, 56, 59, 60, 62, 65, 170, 375, 381, 391, 392, 395, 426, 435, 438, 444, 461-463, 494, 514, 537, 584, 596**

RADIONUCLIDE KINETICS **520, 543**

RADIONUCLIDE MIGRATION **38, 51, 120, 131, 133-137, 381, 383, 402, 429, 430, 435, 439, 476, 503, 505, 516, 524, 525, 538, 539, 543, 548, 566, 573, 577, 581, 606, 611, 620, 624, 629, 632, 636**

RADIUM **78, 396-398, 427, 485, 495, 497, 498, 534, 551-553, 578, 590, 604, 640**

RADIUM COMPOUNDS **590**

RADIUM ISOTOPES **393, 399, 464, 476, 524, 547, 588, 589, 592, 607, 643**

RADIUM SULFATES **499, 590**

RADIUM-226 **49, 57, 60, 62, 63, 379, 382, 383, 385, 387, 389, 392-394, 399, 413, 429, 439, 446, 454, 469, 476, 478, 493, 494, 499, 511, 524, 533, 534, 547, 552, 565, 582, 584, 588, 589, 592, 606, 607, 618, 625, 638, 643, 645**

RADIUM-228 **49, 57, 62, 618**

RADON **166, 379, 387, 391, 393, 395-399, 415, 416, 428, 434, 440, 462, 466-468, 471, 478, 479, 485-487, 490, 510, 511, 514, 524, 527, 529, 530, 535, 542, 544-546, 549, 551, 564-568, 580, 583, 585, 592, 594, 596, 599, 600, 610, 613-615, 622, 623, 629, 633, 634, 640, 642, 648, 650, 656, 657**

RADON ISOTOPES **464**

RADON-222 **62, 389, 493, 521, 523, 565, 582, 598, 641**

RARE EARTHS **32, 603**

RARE GASES **307, 393, 396-399, 428, 462, 524, 592, 594, 629, 656**

RATS **340**

REACTIVITY **144**

REACTOR ACCIDENTS **36, 71**

KEYWORDS INDEX

REACTOR COMPONENTS 5, 9, 77, 85, 141, 143, 145, 146, 159, 160, 168, 208, 210, 238, 258, 277, 291, 292, 294-296, 298, 339, 343

REACTOR COOLING SYSTEMS 77, 145, 159, 160, 168, 258, 277

REACTOR CORES 5, 9, 88, 89, 141, 143, 146, 148, 159, 160, 226, 277, 339

REACTOR DECOMMISSIONING 6, 21-23, 26-30, 34, 91, 92, 149, 150, 158, 163, 165, 169, 175-177, 181, 182, 198, 202, 206, 208, 216, 218, 220, 222, 226, 227, 229, 230, 233, 234, 240, 241, 249, 252, 291, 332, 335, 338, 348, 354, 358, 359, 362, 365, 366

REACTOR DISMANTLING 21, 22, 26, 27, 29, 30, 79-81, 88, 89, 95, 98, 99, 175-177, 198, 206, 216, 220, 229, 241, 279, 291, 295, 296, 302, 323, 332, 338, 339, 354, 358, 366

REACTOR FUELING 5, 141, 208

REACTOR KINETICS 88, 89

REACTOR LICENSING 202

REACTOR MAINTENANCE 5, 141, 142, 144, 146-148

REACTOR MATERIALS 116, 342

REACTOR OPERATION 5, 141-148, 153, 279

REACTOR SAFETY 36

REACTOR SHUTDOWN 12, 92, 147, 149, 206, 209, 323, 339

REACTOR SITES 37

REACTOR START-UP 142

REACTOR VESSELS 98, 170, 198, 235, 238, 291, 295

RECOMMENDATIONS 44, 75, 201, 223, 239, 391, 448, 474, 524, 530, 539, 632

RECOVERY 253, 271, 382, 462, 547, 652

REFINING 350

REGULATIONS 6, 8, 17, 20, 24, 111, 123, 124, 127, 131, 134-137, 151, 154, 164, 169, 175-177, 199, 201, 206, 207, 210, 213, 214, 221-223, 236, 337, 349, 361, 373, 386, 394, 446, 448, 451, 459, 465, 468, 471, 526, 531, 594, 600, 612, 613, 616, 621, 632, 641, 652

REMOTE HANDLING 155, 283

REMOTE HANDLING EQUIPMENT 305, 317

REMOTE HANDLING MATERIALS 317

REMOTE OPERATIONS 73, 305

REMOTE SENSING 558

REMOVAL 64, 65, 77, 80, 96, 104, 112, 113, 194, 276, 289, 371, 458, 547, 638

REPAIR 5, 141

REPROCESSING 202, 211

REPROCESSING PLANTS 261, 368

RESEARCH AND TEST REACTORS 61, 77, 100, 230, 310, 371

RESEARCH PROGRAMS 3, 16, 139, 149, 204, 428, 462, 476, 541

RESEARCH REACTORS 4, 17, 61, 85, 90, 100, 155, 201, 306, 310, 335

RESIDUES 375

KEYWORDS INDEX

RESISTIVITY SURVEYS 540

RESPIRATORY SYSTEM 299

RETENTION FUNCTIONS 624

REVEGETATION 106-108, 328, 414, 423, 489, 490, 499, 518, 519, 548, 550, 561, 575, 649, 655

REVIEWS 13, 127, 254, 276, 331, 336, 340, 345, 363, 364, 369, 482, 483, 510, 539, 542, 570, 574, 639, 652

RISK ASSESSMENT 58, 181, 182, 194, 195, 216, 299, 331, 346, 385, 392, 399, 466, 467, 479, 488, 493, 534, 542

RIVERS 32, 41, 42, 62, 537

ROCKS 507, 508, 569, 570, 624, 650, 651, 656

ROCKY FLATS PLANT 2, 112, 113

RODENTS 340, 507

ROOT ABSORPTION 439

ROOTS 328, 439, 507, 518

RUMINANTS 476, 607

RUNOFF 637, 651

RUTHENIUM-106 76

RWE-BAYERNWERK REACTOR 230

SAFETY 1, 3, 15-17, 20, 23, 36, 66, 83, 119, 159-161, 164, 198, 205, 206, 215, 222, 243, 304, 349, 364, 441

SAFETY STANDARDS 111, 377, 399, 446, 524, 626

SAMPLES 35, 65, 503, 504, 511, 516, 555, 598, 645

SAMPLING 34, 41, 42, 47, 51, 58, 63, 131, 140, 155, 237, 394, 402, 430, 431, 438, 439, 444, 494, 525, 552, 566, 584, 618, 648

SANDS 475, 516, 589

SANITARY LANDFILLS 38

SAXTON REACTOR 21, 26

SCALE MODELS 631

SCHOOL BUILDINGS 479

SCRUBBING 113

SEA BED 384

SEALANTS 527

SEALING MATERIALS 445, 487, 507, 512, 527, 545, 546, 568, 599, 608, 656

SEALS 545

SEAS 374, 385

SEDIMENTARY ROCKS 495

SEDIMENTATION 588

SEDIMENTS 34, 41, 42, 44, 375, 382, 413, 499, 524, 537, 555, 578, 583

SEEDS 518, 561, 575

SEEPAGE 58, 417, 501, 595, 608, 632

SEISMIC EFFECTS 656

SELENIUM 429, 431, 495, 511, 523, 573, 636

SENSITIVITY ANALYSIS 487

SEPARATION PROCESSES 38, 258, 547, 562, 588-590, 592-594, 643

KEYWORDS INDEX

SGR TYPE REACTORS 77

SHIELDING MATERIALS 338, 339

SHIELDS 338, 339

SHIP PROPULSION REACTORS 208, 230, 369

SHIPPINGPORT REACTOR 5, 9, 41, 42, 141-149, 153, 167, 168, 182

SHIPS 208, 369, 372

SHUTDOWNS 12, 442

SILICON 503, 602

SILVER 523, 601

SILVER-108M 235

SIMULATION 126, 129, 203, 325, 526, 538, 302, 607, 620, 624, 631, 636, 654, 655, 657

SINTERING 643

SITE SELECTION 124, 435

SITE SURVEYS 162, 237, 340

SIZE 325

SKELETON 493, 657

SLAGS 268, 297, 572

SLOPE STABILITY 631

SLUDGES 355, 391, 552, 553, 572

SLURRIES 523, 561, 572, 576

SMELTING 139, 268

SNAP REACTORS 170

SNAP 8 REACTOR 170

SOCIAL IMPACT 134-137

SOCIO-ECONOMIC FACTORS 4, 12, 331, 403-411

SODIUM 77, 30, 98, 113, 198, 371, 560

SODIUM COMPOUNDS 113

SODIUM COOLED REACTORS 77, 155, 298

SODIUM HYDROXIDES 113, 256

SOILS 34, 37, 38, 41, 42, 44, 50, 60, 63, 65, 96, 101-104, 108-113, 120, 138, 162, 170, 182, 237, 329, 374, 375, 379-382, 385, 387, 389, 393-399, 403, 413, 415, 416, 430, 431, 434, 439, 440, 446, 454, 457, 458, 468, 475, 476, 484, 486, 490, 494, 500, 501, 503, 507, 508, 515, 522, 531, 532, 544, 549, 555, 564, 569, 571, 575, 577, 579, 584, 591, 592, 596, 609, 614, 617, 618, 623, 624, 626, 628, 633, 636, 649-651

SOLID WASTES 19, 128, 211, 243, 283, 317, 400, 428, 448, 462, 464, 474, 476, 480, 487, 493, 524, 531, 541, 547, 559, 562, 563, 570, 572, 589, 590, 592-594, 607, 624, 629, 631, 635, 643, 651, 656

SOLIDIFICATION 523, 592

SOLUBILITY 504, 602

SOLVENT EXTRACTION 547

SORPTION 562, 624

SORPTIVE PROPERTIES 624

SPACE POWER REACTORS 170

SPECIFICATIONS 5, 141, 310, 321

SPECTROSCOPY 325

SPENT FUEL ELEMENTS 208, 298

KEYWORDS INDEX

SPENT FUELS **116, 127-130, 357**

SQUIRRELS **340**

SRE REACTOR 77, 182, 198

STABILITY 484, 500, 536, 590, 602, 608, 631, 644

STABILIZATION 58, 70, 96, 105, 107, **243, 286, 328, 374, 380, 400, 401, 416, 428, 434, 437, 442, 445, 449, 453, 455, 458-460, 462, 468, 471, 486, 487, 489, 490, 495, 497, 498, 502, 518, 521-523, 531, 544-546, 569-572, 575, 576, 579, 596, 599, 600, 619, 627, 628, 633, 642, 646, 650, 651, 656, 657**

STAINLESS STEEL-304 **325**

STAINLESS STEELS **93, 248, 250, 255-257, 260, 262, 271, 275, 278, 280, 294-297, 299, 304, 314, 316, 320, 321, 325**

STANDARDS **8, 10, 11, 15, 24, 101, 102, 111, 117, 123, 138, 151, 154, 175-177, 179, 180, 199, 201, 210, 214, 222, 239, 303, 337, 349, 361, 373, 379, 389, 394, 399, 432, 433, 437, 454, 460, 464-470, 492, 524, 618, 633**

STATE GOVERNMENT **124, 169**

STATE PROGRAMS **436**

STATISTICS **237, 479, 503, 645**

STEAM GENERATORS **168**

STEAM TURBINES **5, 141**

STEELS **241, 248, 256, 257, 266, 270, 271, 273, 275, 280, 287, 294, 307, 314, 319-321, 325, 327, 338**

STORAGE **11, 548, 590**

STORMS **656**

STRATIGRAPHY **516**

STRONTIUM **242, 602**

STRONTIUM ISOTOPES 325, 376

STRONTIUM-90 34, 35, 76, 104, 376

STRUCTURAL MODELS 631

SULFATES **429, 525, 555, 552, 562, 578, 590, 602, 636**

SULFUR **573**

SULFUR COMPOUNDS **266, 562, 590**

SULFUR-32 **477**

SULFUR-34 **477**

SULFURIC ACID **248, 256, 478, 523, 593, 602, 638**

SURFACE AIR **44, 61, 393, 399**

SURFACE CLEANING **65, 68, 72, 73, 75, 78, 80, 152, 242, 244-246, 251, 253, 256-263, 265, 289, 329**

SURFACE CONTAMINATION **68, 70, 78, 85, 90, 140, 159, 160, 224, 242, 243, 257, 261, 267**

SURFACE FINISHING **244, 248, 256, 258**

SURFACE MINING **610**

SURFACE PROPERTIES **624, 631**

SURFACE WATERS **32, 41, 42, 44, 50, 51, 57, 62, 387, 392, 431, 447, 466, 467, 492, 498, 524, 537, 553, 555, 559, 583, 589**

SURFACES **101, 271**

SURVEILLANCE **86, 90, 151, 154, 272, 373, 388, 400, 448**

KEYWORDS INDEX

SURVEYS **56, 462, 537**

SUSPENSIONS **562, 572**

TAILINGS **346, 400, 428, 439, 448, 459, 462, 464, 474, 476, 480, 490, 514, 517, 524, 536, 541, 547, 559, 562, 563, 570, 572, 574, 588-590, 592-594, 607, 624, 627, 629, 631, 635, 639, 643, 651, 656**

TANK TYPE REACTORS **61, 100, 310**

TANKS **96, 285, 332**

TAR **428, 487, 490**

TECHNETIUM-99 **34**

TECHNOLOGY ASSESSMENT **448**

TECHNOLOGY TRANSFER **365**

TEMPERATURE DEPENDENCE **266**

TESTING **79, 81, 95, 148, 167, 298, 310, 487, 507, 570, 599**

THEORETICAL DATA **116, 327**

THERMAL POWER PLANTS **28, 149, 200, 219, 240, 266, 270, 359, 362**

THERMAL REACTORS **5, 12, 29, 36, 61, 77, 100, 142-147, 149, 153, 167, 168, 230, 258, 269, 279**

THERMOCHEMICAL PROCESSES **342, 572**

THERMODYNAMIC PROPERTIES **504, 577, 638**

THICKNESS **321**

THORIUM **31, 32, 49, 57, 58, 62, 63, 138, 386, 388, 497, 498, 524, 603, 604. 606**

THORIUM ISOTOPES **393, 399, 476, 547, 607**

THORIUM ORES **603**

THORIUM REACTORS **77**

THORIUM-222 **393**

THORIUM-228 **499**

THORIUM-230 **379, 389, 413, 429, 439, 476, 478, 499, 503, 533, 547, 555, 607, 645, 657**

THORIUM-232 **382, 394, 399, 499, 584**

THORIUM-234 **503, 645**

THREE MILE ISLAND-2 REACTOR **36, 71, 269**

TIME DEPENDENCE **229, 266**

TITANIUM ADDITIONS **321**

TITANIUM ALLOYS **321**

TOOLS **113, 205, 294, 310, 317, 332**

TOPOGRAPHY **374, 431, 443, 569, 627, 655**

TORY-2A REACTOR **88, 89**

TORY-2C REACTOR **88, 89**

TRACE AMOUNTS **241, 248**

TRACERS **477**

TRANSITION ELEMENT COMPOUNDS **562**

TRANSPIRATION **447**

TRANSPORT **204, 208, 213, 338, 345**

TRANSPORT REGULATIONS **124**

KEYWORDS INDEX

TRANSPORTATION 3, 114, 115, 119, 122, 124, 127, 128, 132, 133, 333, 337, 347, 348, 351, 354, 452, 657

TRANSURANIUM ELEMENTS 2, 59, 64, 69, 74, 76, 112-114, 116, 117, 129, 133, 253, 267, 271

TRITIUM 4, 61, 86, 381

TUBES 168, 310

TURBINES 5, 141

TURBOMACHINERY 5, 141

ULTRAVIOLET RADIATION 274

UNDERGROUND DISPOSAL 51, 56, 110, 123, 131, 133-138, 335, 340, 343, 344, 349

UNDERGROUND FACILITIES 541, 589

UNDERGROUND MINING 610

UNDERGROUND OPERATIONS 96

UNDERWATER 310

UNDERWATER OPERATIONS 93, 294, 295, 297, 313, 314, 322, 324, 327

UPTAKE 385, 439, 520, 543, 555, 578, 583, 607, 641

URANIUM DEPOSITS 537, 610

URANIUM INDUSTRY 465, 472

URANIUM ISOTOPES 607

URANIUM MILLS 442, 451, 465-467, 637, 652

URANIUM MINES 349, 361, 439, 446, 485, 492, 493, 524, 527, 528, 534, 541, 555, 565, 568, 581, 587, 589, 594, 610, 612, 616, 635, 639, 643, 652

URANIUM MINING 586, 597, 621, 647

URANIUM ORES 38, 382, 427, 448, 468, 474, 494, 510, 539, 541, 547, 578, 587-590, 593, 594, 603, 604, 625, 629, 634, 635, 643, 652

URANIUM OXIDES 638

URANIUM TETRAFLUORIDE 31, 63

URANIUM-233 3, 9, 31, 63

URANIUM-234 389, 394, 439, 607

URANIUM-235 3, 31, 35, 63, 85, 394

URANIUM-238 35, 379, 382, 383, 389, 392, 394, 413, 439, 533, 555, 607, 645, 657

URBAN AREAS 38, 61, 558

VACUUM FURNACES 283

VACUUM MELTING 283

VALENCY 552

VANADIUM 413, 427, 429, 495, 511, 523, 573

VAPOR GENERATORS 168

VEGETATION 63, 106-108, 328, 375, 387, 403, 414, 434, 439, 476, 490, 507-509, 518-520, 522, 543, 550, 555, 559-561, 564, 575, 579, 583, 617, 641, 649, 655

VENTILATION SYSTEMS 3, 16, 87

VERTEBRATES 340, 476, 507, 524, 607

VITRIFICATION 103, 346

VOLUME 24, 68, 69, 116, 125, 170, 210, 284, 332, 334, 337, 374

KEYWORDS INDEX

VOLUME REDUCTION 16, 109, 123, 246, 259, 268, 351

WASHING 64

WASTE DISPOSAL 32, 38, 56, 126, 213, 221, 236, 241, 384, 474, 476, 559, 570, 592, 594, 627

WASTE MANAGEMENT 11, 32, 38, 50, 56, 113, 126, 213, 221, 236, 241, 266, 283, 317, 345, 384, 400, 442, 448, 462, 474, 476, 541, 547, 548, 559, 562, 563, 570, 572, 588, 590, 592, 594, 635

WASTE PROCESSING 103, 113, 221, 266, 283, 317, 351, 462, 547, 562, 572, 588

WASTE PRODUCT UTILIZATION 572

WASTE STORAGE 11, 563, 590

WASTE TRANSPORTATION 1, 204

WASTE WATER 61

WATER 37, 50, 51, 61, 113, 126, 256, 270, 275, 286, 289, 293, 302, 310, 326, 382, 454, 464, 476, 519, 524, 559, 561, 574, 585, 589, 592, 624, 631

WATER CHEMISTRY 143, 145, 146, 168

WATER COOLED REACTORS 5, 12, 29, 36, 99, 141-147, 149, 153, 167, 168, 208, 219, 230, 247, 261, 266, 269, 310, 323, 339, 369

WATER MODERATED REACTORS 5, 12, 29, 36, 99, 141-147, 149, 153, 167, 168, 208, 219, 229, 266, 269, 306, 310, 323, 339, 369

WATER POLLUTION 4, 101, 166, 344, 449, 464, 498, 553, 583, 589, 592, 594, 632, 653

WATER QUALITY 417

WATER TABLE 126, 447

WATER TREATMENT PLANTS 61

WATER WELLS 56

WEATHERING 570

WELDED JOINTS 307

WELDING 303, 307, 311, 312, 322, 324

WELL LOGGING 56, 537

WELLS 56, 578

WIND 454, 480, 522, 569, 585, 657

X RAY DIFFRACTION 644

YTTRIUM 242

ZINC 413, 525

ZION-1 REACTOR 12

ZION-2 REACTOR 12

ZIRCALOY-2 84

ZIRCONIUM BASE ALLOYS 310

ZONES 307

451/452

APPENDIX A

Supplemental References

APPENDIX A

1A
Abel, K.H., D.E. Robertson, C.W. Thomas, J.C. Evans, and E.A. Lepel, **Residual Radioactivity Assessments in Nuclear Power Plants: Concentrations, Distributions, and Inventories,** CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VI-55 - VI-56) (1982, October)

2A
Abu-Jarad, F., and J.H. Fremlin, University of Petroleum and Minerals, Dhahran, Saudi Arabia, Birmingham University, Birmingham, United Kingdom. **Working Level Monitor for Radon Measurements Inside Houses,** Radiation Protection Dosimetry 1(3):221-226 (1981)

3A
Ahlberg, P., A. Lindmark, and B. Rosen, Statens Geotekniska Institute, Linkoeping, Sweden. **Emission of Radon from Soil,** SGI-1-150/79; 21 pp. (1980, March)

4A
Ahn, T.M., and P. Soo, Brookhaven National Laboratory, Upton, NY. **Container Assessment - Corrosion Study of HLW Container Materials,** NUREG/CR-2317; BNL-NUREG-51499 (Vol. 2, No. 1); 21 pp. (1982, June)

5A
Alabama Power Company, Birmingham, AL. **Joseph M. Farley Nuclear Plant, Units 1 and 2; State of Alabama, Department of Public Health's Comments on the Draft Environmental Statement,** DOCKET-50348-140; DOCKET-50364-129 (1974, September)

6A
Alexa, J., **Solution for Decontamination of Surfaces of Low Alloy Steels,** Czechoslovakian Patent 190200B (1981, September 15)

7A
Alexander, W.A., T.W. Oakes, W.F. Ohnesorge, and H.M. Hubbard, Oak Ridge National Laboratory, Industrial Safety and Applied Health Physics Division, Oak Ridge, TN. **Site Characterization of Soil in Preparation for Decontamination and Decommissioning,** Health Physics 43(1):142 (1982)

8A
Allen, R.P., L.K. Fetrow, and M.W. McCoy, Pacific Northwest Laboratory, Richland, WA. **An Integrated Decontamination System for Surface-Contaminated TRU Waste,** The Treatment and Handling of Radioactive Wastes, A.G. Blasewitz, J.M. Davis, and M.R. Smith (Eds.). Battelle Press, Columbus, OH, 656 pp. (1982)

9A
Arnold, R.C., Metropolitan Edison Company, Middletown, PA. **Three Mile Island Unit 2: Decontamination Program,** Annals of the New York Academy of Sciences 81(365):76-85 (1981, June)

10A
Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA. **Atomics International Facilities with Current Dismantling Orders,** DOCKETS-50-094/147 (1977)

11A
Balaban-Irmenin, Y.V., Y.M. Ryazanov, A.K. Zinchenko, A.A. Smirnov, and V.F. Dyukov, **Generalization of an Operational Experi-**

APPENDIX A

ment in Decontaminating the Outer Surfaces of the Nuclear Plant Equipment and Buildings, Energetik 81(2):21-22

12A
Berven, B.A., T.E. Myrick, and P.T. Perdue, Oak Ridge National Laboratory, Oak Ridge, TN. **Use of Gamma-Ray Detection Instrumentation in ORNL Offsite Radiological Survey Program,** Transactions of the American Nuclear Society 41:235-236 (1982)

13A
Birkhold, U., and F. Krieger, GKSS-Forschungszentrum Geesthact GmbH, Geesthact-Terperhude, Federal Republic of Germany, Noell (G.G.) GmbH, Wuertzburg, Federal Republic of Germany. **Investigation of Techniques for Disassembly of the Biological Shield of the Decommissioned Power Plant at Niederaichbach (KKN),** Jahrestagung Kerntechnik '82 (Nuclear Technology '82), Proceedings of a German Nuclear Society Annual Meeting, Mannheim, Federal Republic of Germany, May 4-6, 1982; (pp. 765-768) (1982)

14A
Boisson, H., Centre d'Etudes Nucleaires, Bruyeres-le-Chatel, France. **Dismantling, Cutting up, and Disposing of a Large-Capacity Furnace for Plutonium Melting,** IAEA-SM-125/14; STI/PUB/238; CONF-691008; Radiation Safety Problems in the Design and Operation of Hot Facilities, Proceedings of an International Symposium, Saclay, France, October 13-17, 1969. International Atomic Energy Agency, Vienna; (pp. 595-610) (1970)

15A
Booth, L.F., and D.W. Groff, Radiation Management Corporation, Northbrook, IL. **Radiological Survey of the West Lake Landfill, St. Louis County, Missouri,** Health Physics 43(1):108 (1982)

16A
Boston Edison Company, Boston, MA. **Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 1,** DOCKET-50471-12; 420 pp. (1973, December 20)

17A
Boston Edison Company, Boston, MA. **Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 2,** DOCKET-50471-13; 381 pp. (1973)

18A
Boston Edison Company, Boston, MA. **Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 3,** DOCKET-50471-14; 475 pp. (1973)

19A
Boving, H.J., Colorado School of Mines, Golden, CO. **Use of Colorado Mine Waste and Mill Tailings in Ceramic Products,** Thesis (1969)

20A
Bradley, F.J., H. Michael, R. Kelly, L. Cabasino, and G. Kasyk, New York State Department of Labor, Radiological Health Unit, New York, NY. **Radiation Exposures Associated with Dismantling a Radium-Radon Pump,** Health Physics 43(1):142 (1982)

21A
Brandis, R., Ingenieurhochschule Berlin Wartenberg, Berlin, German Democratic Republic. **Development of Working Tools Adapted to Dismantling Requirements,** Agrartechnik 32(11):490-491 (1982)

22A
Brewer, L.W., Sandia National Laboratories, Albuquerque, NM. **Ra-226 Measurements Below Uranium Mill Tailings Piles,** Health Physics 43(1):157-158 (1982)

APPENDIX A

23A
Brinck, W.L., R.J. Schliekelman, D.L. Bennett, C.R. Bell, and I.M. Markwood, U.S. Environmental Protection Agency, Kansas City, MO, Iowa Department of Environmental Quality, Des Moines, IA, Illinois Environmental Protection Agency, Springfield, IL. **Determination of Radium Removal Efficiencies in Water Treatment Processes,** ORP/TAD-76-5; 25 pp. (1976, December)

24A
Britton, J., Pacific Northwest Laboratory, Richland, WA. **In Situ Electropolishing,** Videotape, 5:00 (1981, June 23)

25A
Britton, J., Pacific Northwest Laboratory, Richland, WA. **Electropolishing Update,** Videotape, 5:00 (1981, June 29)

26A
Brooksbank, R.E., Oak Ridge National Laboratory, Oak Ridge, TN. **Post-Accident Cleanup of Radioactivity at Three Mile Island,** DOE/TIC-11023; 27 pp. (1979)

27A
Buhl, T.E., J. Millard, D. Baggett, T. Brough, and S. Trevathan, New Mexico Department of Health, Environmental Improvement Division, Santa Fe, NM. **Radon and Radon Progeny Concentrations in New Mexico's Uranium Mining and Milling District,** Health Physics 43(1):123 (1982)

28A
Burgess, P.H., and W.J. Iles, National Radiological Protection Board, Harwell, United Kingdom. **Instrument Evaluation Number 20 - Unit Inspections U3C Radiation Survey Meter,** NRPB-IE-20; 12 pp. (1980, June)

29A
Burwell, C.C., and A.M. Weinberg, Oak Ridge Associated Universities, Institute of Energy Analysis, Oak Ridge, TN. **Reactor Decommissioning,** Science 216(4547):682 (1982)

30A
California Orders Probe on Funds to Dismantle Nuclear Power Plants, Wall Street Journal 104(2):27 (1981, January 26)

31A
Campbell, R.H., U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM. **The Uranium Mill Tailings Remedial Actions Project (UMTRAP),** CONF-830227; Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tuscon, AZ, February 27-March 3, 1983 (1983, March)

32A
Carstens, J.P., and B.S. Weil, Oak Ridge National Laboratory, Oak Ridge, TN. **Consolidated Fuel Reprocessing Program - Conceptual Study for a Laser Disassembly Development Unit (Fast Reactors),** ORNL/TM-6662; 70 pp. (1979, February)

33A
Carter, L.J., **Uranium Mill Tailings: Congress Addresses a Long-Neglected Problem,** Science 202(5):19 (1978, October 13)

34A
Carter, W.L., P.J. Johnson, and R.H. Rainey, Oak Ridge National Laboratory, Oak Ridge, TN. **Quantities and Characteristics of Transuranic Wastes from Commercial Fuel Cycles,** ORNL/TM-8580 (1982)

APPENDIX A

35A
Chang, S.Y., S.G. Ro, and J.S. Hong, Korea Advanced Energy Research Institute, Soul, Republic of Korea. **Measurement of Radon Daughters' Radioactivities by Using Single Filtering Method,** Bangason Bango Hakhoe Chi 6(1):25-30 (1981, February)

36A
Cheng, K.C., and J.W.M. Porritt, Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Ottawa, Ontario, Canada. **The Measurement of Radon Emanation Rates in a Canadian Cut and Fill Uranium Mine,** Canadian Industrial Mining and Metallurgical Bulletin 74(285):110-118 (1981)

37A
Cline, J.F., D.A. Cataldo, W.E. Skiens, and F.G. Burton, Pacific Northwest Laboratory, Richland, WA. **Biobarriers Used in Shallow Burial Ground Stabilization,** Nuclear Technology 58(2):150-153 (1982)

38A
Clipp, L.L., **Water Cannon Shows Promise for Gas Utility Trenching,** Pipeline Industry 39(1):31-33 (1973, July)

39A
Close, D.A., G.O. Bjarke, D.F. Anderson, and C.J. Umbarger, Los Alamos Scientific Laboratory, Los Alamos, NM. **Assay Instrumentation Support for an Electropolishing Facility at Pacific Northwest Laboratory,** LA-8243-PR; 76 pp. (1980, October)

40A
Colombo, P., R.L. Tate, and A.J. Weiss, Brookhaven National Laboratory, Upton, NY. **Assessment of Microbial Processes on Radionuclide Mobility in Shallow Land Burial,** BNL-51574; 86 pp. (1982, July)

41A
Comey, D.D., **Legacy of Uranium Tailings,** Bulletin of the Atomic Scientists 31:43 (1975, September)

42A
Consumers Power Company, Jackson, MI. **Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2,** DOCKET-50171-211; 10 pp. (1976, August)

43A
Cooley, L.R., M.R. McCampbell, and J.D. Thompson, EG&G Idaho, Inc., Idaho Falls, ID. **Current Practice of Incineration of Low-Level Institutional Radioactive Waste,** EGG-2076; 41 pp. (1981, February)

44A
Cooley, L.R., M.R. McCampbell, and J.D. Thompson, University of Maryland at Baltimore, Baltimore, MD. **Use Plan for Demonstration Radioactive Waste Incinerator,** EGG-2129; 78 pp. (1982, April)

45A
Cox, T.M., and G.A. Allison, U.S. Department of Transportation, Washington, DC, Colorado Division of Highways, Denver, CO. **F 019-2(14) Durango - South La Plata County Final Environmental Impact Statement,** FGWA-COLO-EIS-73-09-F; 29 pp. (1975, July)

46A
Croucher, D.W., EG&G Idaho, Inc., Idaho Falls, ID. **Three Mile Island Unit 2 Core Status Summary: A Basis for Tool Development for Reactor Disassembly and Defueling** GEND-007; 73 pp. (1981, May)

APPENDIX A

47A
Crowell, T., **Dismantling a Nuclear Reactor - A First,** Christian Science Monitor 72:9 (1980, January 28)

48A
Crowell, T., **Susquehanna Is Sued Over Uranium Tailings,** Wall Street Journal 104(2):34 (1981, May 12)

49A
Czyscinski, K.S., R.F. Pietrzak, and A.J. Weiss, Brookhaven National Laboratory, Upton, NY. **Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites,** NUREG/CR-2192; BNL-NUREG-51409 (Vol. 1, No. 2); 27 pp. (1981, August)

50A
Dairyland Power Cooperative, La Crosse, WI. **La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel,** DOCKET-50409-125; 73 pp. (1974, May 14)

51A
Dave, N.K., and T.P. Lim, Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Elliot Lake Laboratory, Elliot Lake, Ontario, Canada. **Modified Accumulator Method for Measuring Surface Radon Flux from a Uranium Tailings Pile,** Canadian Institute of Mining and Metallurgy Bulletin 75(843):131-134 (1982, July)

52A
Dave, N.K., T.P. Lim, and A.J. Vivyurka, Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, Elliot Lake Laboratory, Elliot Lake, Ontario, Canada. **Chemical and Radioisotope Stratification in an Abandoned Uranium Tailings Pile,** PNL-SA-9215; CONF-8110111; Radiation Hazards in Mining: Control, Measurement, and Medical Aspects, Proceedings of an International Conference, Golden, CO, October 4, 1981. Society of Mining Engineers, American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., New York, NY; (pp. 180-188) (1981)

53A
Deadline is Set for Cleanup at Radioactive Factory Site, New York Times 130(A10):8 (1981, April 14)

54A
Dennison, W.F., Atomics International Division, Rockwell International, Energy Systems Group, Canoga Park, CA. **SRE Fuel Decladding,** DOE/SF/00824-T37; N-704-FDR-990-004; 44 pp. (1977, March)

55A
Detilleux, E., W. Hild, and J. van Geel, European Company for the Chemical Processing of Irradiated Fuels, Mol, Belgium. **Reprocessing, Decontamination and Decommissioning Waste Management at Eurochemic,** The Treatment and Handling of Radioactive Wastes, A.G. Blasewitz, J.M. Davis, and M.R. Smith (Eds.). Battelle Press, Columbus, OH, 656 pp. (1982)

56A
Dietrich, G., J. Schartz, W. Hemplemann, and W. Stegmaier, Kernforschungszentrum Karlsruhe GmbH, Karlsruhe, Federal Republic of Germany. **Decontamination of Metallic Materials for Unrestricted Release,** CONF-830227; Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tuscon, AZ, February 27-March 3, 1983 (1983, March)

APPENDIX A

57A
Donovan, T.K., G.W. Cummings, E.J. Chart, and J.T. Tappan, Tennessee Valley Authority, Knoxville, TN, Silver King Mines, Inc., MacLaren Engineers, Planners and Scientists, Inc., Willowdale, Ontario, Canada, ARIX, Grand Junction, CO. **Uranium Mill Decommissioning - An Update on the Edgemont Experience,** CONF-830227; Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tuscon, AZ, February 27-March 3, 1983 (1983, March)

58A
DSMA Atcon Limited, Toronto, Ontario, Canada, Atomic Energy Control Board, Ottawa, Ontario, Canada. **Seismic and Radon Monitoring of Algocen Site at Elliot Lake,** INFO-0035; 26 pp. (1981, March)

59A
Duncan, D.L., U.S. Environmental Protection Agency, Office of Radiation Programs, Las Vegas, NV. **Radon and Radon Daughter Evaluations at an Inactive Uranium Mill Tailings Pile and at Selected Locations in Salt Lake City, Utah,** CONF-740702; Proceedings of the 19th Annual Health Physics Society Meeting, Houston, TX, July 7-11, 1974 (1974)

60A
Duray, J.R., Bendix Field Engineering Corporation, Grand Junction, CO. **Remedial Action Project's Technical Measurements Center - Status,** CONF-830227; Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tuscon, AZ, February 27-March 3, 1983 (1983, March)

61A
Durkin, J., U.S. Bureau of Mines, Pittsburgh, PA. **Error in Working-Level Hour: Calculations When the Alpha Energy From the Radon Daughters is not Discriminated,** Health Physics 41(3):477-481 (1981, September)

62A
EG&G Idaho, Inc., National Low-Level Radioactive Waste Management Program, Idaho Falls, ID. **The 1980 State-by-State Assessment of Low-Level Radioactive Waste Shipped to Commercial Disposal Sites,** LLWMP-11T; 110 pp. (1982, June)

63A
Electric Power Research Institute, Technical Information Division, Palo Alto, CA. **Nuclear Waste Disposal - Mill Tailings and Low Level Waste Risk Comparison and Criteria Development,** RP-1579-5 (1981, September 18)

64A
Ellis, W.R., and T. Wall, Australian Atomic Energy Commission Research Establishment, Lucas Heights, Sutherland, Australia. **Use of Particle Track Analysis to Measure Fissile Particle-Size Distributions in Contaminated Soils,** Nuclear Instruments and Methods in Physics Research 200(3-4):411-415 (1982)

65A
Engelmann, H.J., V. Duils, and R. Koester, Kernforschungszentrum Karlsruhe GmbH, Karlsruhe, Federal Republic of Germany. **Concepts for Packaging Radioactive Waste Generated by Decommissioning of Nuclear Power Reactors,** CONF-801115, PATRAM '80, Packaging and Transporting Radioactive Material, Proceedings of the Sixth Conference, Berlin, Federal Republic of Germany, November 10, 1980; (5 pp.) (1980)

66A
Everett, R.J., and C.L. Cain, U.S. Nuclear Regulatory Commission, Arlington, TX. **Uranium Mill Appraisal Program,** NUREG-0883; 32 pp. (1982, August)

APPENDIX A

67A
Farges, L., CEA, France. **Industrial Radioactive Low-Level Waste Management in France,** CONF-800313; Waste Management '80, the State of Waste Disposal Technology, Mill Tailings, and Risk Analysis Models, R.G. Post (Ed.), Proceedings of a Conference, Tucson, AZ, March 10, 1980, 754 pp.; (pp. 275-253) (1980)

68A
Federal Energy Regulatory Commission, Washington, DC. **FERC Order in Matter of Maine Yankee Atomic Power Proposed Decommissioning Charges for 830 Megawatt Nuclear Station,** Federal Register 46(239):60921 (1981, December 14)

69A
Feimster, E.L., and L.K. Hilton, EG&G Energy Measurements Group, Las Vegas, NV. **An Aerial Radiological Survey of the U.S. Department of Energy's Hanford Site, Richland, Washington,** EGG-1183-1828; 45 pp. (1978, June)

70A
Fetrow, L.K., R.P. Allen, and M.W. McCoy, Pacific Northwest Laboratory, Richland, WA. **Sectioning Techniques for Plutonium Contaminated Gloveboxes,** The Treatment and Handling of Radioactive Wastes, A.G. Blasewitz, J.M. Davis, and M.R. Smith (Eds.). Battelle Press, Columbus, OH, 656 pp. (1982)

71A
Fiebig, R., M. Kolb, and E. Schwieger, GKSS-Forschungszentrum Geesthact GmbH, Geesthact-Terperhude, Federal Republic of Germany. **Experimental and Theoretical Time Period Investigations of the Dynamics of the Second Core of the NS Otto Hahn Reactor,** GKSS-80/E/30; 38 pp. (1980)

72A
Filippenko, A.M., Y.S. Kharitonov, and V.D. Kashcheev, **Electrochemical Polishing with the Removal of a Small Layer of Metal,** Podgotovka Poverkhnosti pered Naneseniem Gal'vanich Pokrytii M. (1980):70-73 (1980)

73A
Final Shutdown of Research Reactor, Welt 282:2 (1980, December 3)

74A
Foley, M.G., W.J. Deutsch, J.N. Hartley, D.R. Kalkwarf, D.W. Mayer, R.W. Nelson, B.E. Opitz, S.R. Peterson, R.J. Serne, V.W. Thomas, W.H. Walters, and N.A. Wogman, Pacific Northwest Laboratory, Richland, WA. **Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983,** PNL-4608-2 (1983, April)

75A
Friedlander, G.D., **Decommissioning Commercial Reactors,** Field and Stream 189(5):44 (1978, February 15)

76A
Fujitsu Limited, Tokyo, Japan. **Electrolytic Polishing Bath for Stainless Steel,** Japanese Patent 82/05900 (1982, January 12)

77A
Gans, G.M., Jr., and N.H. Lacy, Burns and Roe Industrial Services Corporation, Paramus, NJ. **Radwaste Concerns During Nuclear Plant Decommissioning,** CONF-830227; Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tuscon, AZ, February 27-March 3, 1983 (1983, March)

APPENDIX A

78A
Gee, G.W., T.L. Jones, and D. Rai, Pacific Northwest Laboratory, Richland, WA. **Research Summary: Characterization of Radionuclide and Moisture Movement Through Arid Region Sediments,** PNL-SA-9887; 12 pp. (1981, September)

79A
General Accounting Office, Washington, DC. **Impact of Federal R and D Funding on Three Mile Island Cleanup Costs,** EMD-82-28; 24 pp. (1982, January)

80A
General Electric Company, Breeder Reactor Department, Sunnyvale, CA. **Southwest Experimental Fast Oxide Reactor - Request for Authority to Dismantle Facility,** DOCKET-50231-132; 6 pp. (1973, April 17)

81A
George, D.C., and L. Knight, Bendix Field Engineering Corporation, Technical Measurements Center, Grand Junction, CO. **Field Calibration Facilities for Environmental Measurement of Radium, Thorium, and Potassium,** GJ/TMC-01(82); 53 pp. (1982, November)

82A
George, D.C., and R.K. Price, Bendix Field Engineering Corporation, Technical Measurements Center, Grand Junction, CO. **Abbreviated Total-Count Logging Procedures for Use in Remedial Action,** GJ/TMC-03(82); 21 pp. (1982, December)

83A
Glenn, R.D., E. Walker, and F.F. Haywood, Bechtel National, Inc., Oak Ridge, TN, Eberline Instrument Corporation, Oak Ridge, TN. **Radiation Measurement Capability for Decontamination to Unrestricted Use,** CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp.; (pp. 31-61)(Addendum) (1982, October)

84A
Gloyna, E.F., and R.G. Post, University of Texas, Austin, TX. **Long-Range Low-Level Waste Management Needs,** CONF-800313; Waste Management '80, the State of Waste Disposal Technology, Mill Tailings, and Risk Analysis Models, R.G. Post (Ed.), Proceedings of a Conference, Tucson, AZ, March 10, 1980, 754 pp.; (pp. 9-20) (1980)

85A
Golchert, N.W., T.L. Duffy, and J Sedlet, Argonne National Laboratory, Occupational Safety and Health Division, Argonne, IL. **Environmental Monitoring at Argonne National Laboratory - Annual Report for 1982,** ANL-83-26; 104 pp. (1983, March)

86A
Gutman, L.M., D.P. Novikova, and T.A. Struina, Akademiya Nauk Ukrainskoj, Odessa, USSR. **Effect of Electric Arc Cutting Procedures on the Properties of Processed Metal Surfaces,** Avtomaticheskaya Svarka 5:60-63 (1980, May)

87A
Hakonson, T.E., G.C. White, and E.M. Karlen, Los Alamos National Laboratory, Los Alamos, NM. **Evaluation of Geologic Materials to Limit Biological Intrusion of Low-Level Waste Site Covers,** The Treatment and Handling of Radioactive Wastes, A.G. Blasewitz, J.M. Davis, and M.R. Smith (Eds.). Battelle Press, Columbus, OH, 656 pp. (1982)

APPENDIX A

88A
Halter, J.M., Pacific Northwest Laboratory, Richland, WA. **Concrete Spaller,** Videotape, 5:45 (1980, November 5)

89A
Hryniewicz, T., Technical University, Koszalin, Poland. **Technological Aspects of the Workpieces Treated by Electropolishing,** Materials Technology, Proceedings of the Sixth Inter-American Conference, San Francisco, CA, August 12-15, 1980 (1980)

90A
Ingersoll, J.G., B.D. Stitt, and G.H. Zapalac, Lawrence Berkeley Laboratory, Berkeley, CA. **A Method for Measuring the Exhalation of Radon from Building Materials,** LBL-10631; 41 pp. (1982, February)

91A
Jacobs, R.T., Exxon Nuclear Idaho, Idaho Falls, ID. **Remote Cutting, Fitup, and Welding for In-Plant Pipe Repairs,** Transactions of the American Nuclear Society 41(Suppl. 1):11; CONF-820307; Power Plant Construction, Operation, and Maintenance, Proceedings of the American Nuclear Society Power Division Topical Meeting, Charleston, SC, March 28-31, 1982, 87 pp.; (p. 11) (1982)

92A
Johnson, W.B., U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD. **Final Step in Decommissioning of SM-1A Nuclear Plant: A Close-Out Survey,** CONF-740702; Proceedings of the 19th Annual Health Physics Society Meeting, Houston, TX, July 7-11, 1974 (1974)

93A
Kalkwarf, D.R., K.K. Nielson, D.C. Rich, and V.C. Rogers, Pacific Northwest Laboratory, Richland, WA, Rogers and Associates Engineering Corporation, Salt Lake City, UT. **Comparison of Radon Diffusion Coefficients Measured by Transient-Diffusion and Steady-State Laboratory Methods,** NUREG/CR-2875; PNL-4370; RAE-18-3; 35 pp. (1982, November)

94A
Kernforschungszentrum Karlsruhe GmbH, Karlsruhe, Federal Republic of Germany. **Development of Methods and Techniques for the Decommissioning and Ultimate Disposal of Nuclear Facilities,** KFK-2435; Second Semi-annual Report for 1976; (pp. 492-495) (1977, April)

95A
Kirby, L.J., Pacific Northwest Laboratory, Richland, WA. **Radionuclide Distribution and Migration Mechanisms at Shallow Land Burial Sites,** NUREG/CR-2383; PNL-4067; 63 pp. (1981, October)

96A
Kluk, A.F., U.S. Department of Energy, Washington, DC. **Status of DOE Order 5820,** CONF-830227; Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tuscon, AZ, February 27-March 3, 1983 (1983, March)

97A
Kohler, E.J., K.P. Steward, and J.V. Iacono, Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Decommissioning and Component Removal,** Transactions of the American Nuclear Society 26(1):51A (1977)

98A
Kolbe, E., **Study of Power Distribution Over Melt Bath of Plasma Melting Furnaces**

APPENDIX A

Using Several Plasma Torches, CONF-770618; World Electrotechnical Congress, Proceedings of a Conference, Moscow, USSR, June 21-25, 1977 (1977)

99A
Krieger, F., Noell (G.G.) GmbH, Wuertzburg, Federal Republic of Germany. **Functioning of the Disassembly Manipulator for the Niederaichbach Nuclear Power Plant and Its Possible Applications in LWR-Type Reactors,** Jahrestagung Kerntechnik '82 (Nuclear Technology '82), Proceedings of a German Nuclear Society Annual Meeting, Mannheim, Federal Republic of Germany, May 4-6, 1982; (pp. 789-792) (1982)

100A
Krueger, R.H., **Decontamination and Decommissioning Plan for the Argonne National Laboratory Research Reactor (CP-5),** CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-169 - VII-170) (1982, October)

101A
Kyriazis, W.J., UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA. **Sodium Reactor Experiment Nuclear Facility Decommissioning,** Videotape, 23:00 (1983, March 16)

102A
Latner, N., S. Watnick, and R.T. Graveson, U.S. Department of Energy, Environmental Measurements Laboratory, New York, NY. **Integrating Working Level Monitor EML Type TF-11,** DOE/EML-389; 13 pp. (1981, January)

103A
Lettnin, H.K.J., and J. Obst, GKSS-Forschungszentrum Geesthact GmbH, Geesthact-Terperhude, Federal Republic of Germany. **Decommissioning of the Nuclear Merchant Ship "NS Otto Hahn",** Jahrestagung Kerntechnik '82 (Nuclear Technology '82), Proceedings of a German Nuclear Society Annual Meeting, Mannheim, Federal Republic of Germany, May 4-6, 1982; (pp. 749-752) (1982)

104A
Lo, R., and B. Snyder, U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Plan for Cleanup Operations at Three Mile Island Unit 2,** NUREG-0698 (Rev. 1); 35 pp. (1982, February)

105A
Loercher, G., I. Auler, and A. Gasch, NIS Nuklear-Ingenieur-Service GmbH, Hanau, Federal Republic of Germany. **Importance of a Number of Radionuclides During and After the Dismantling and Disposal of LWR Reactors,** CONF-800386; Jahrestagung Kerntechnik '80 (Nuclear Technology '80), Proceedings of an Annual Meeting, Berlin, Federal Republic of Germany, March 25-27, 1980 (1980)

106A
Loeschhorn, U., H. Galienberger, U. Birkhold, J. Obst, and W. Stasch, Kernforschungszentrum Karlsruhe GmbH, Karlsruhe, Federal Republic of Germany, GKSS-Forschungszentrum Geesthact GmbH, Geesthact-Terperhude, Federal Republic of Germany. **Decommissioning of Niederaichbach Power Plant (KKN) - Containment and Removal,** Jahrestagung Kerntechnik '82 (Nuclear Technology '82), Proceedings of a German Nuclear Society Annual Meeting, Mannheim, Federal Republic of Germany, May 4-6, 1982; (pp. 757-760) (1982)

APPENDIX A

107A
Logan, S.E., and R.L Conarty, Los Alamos Technical Associates, Inc., Los Alamos, NM. **Application of a Risk Assessment Method for Radioactive Waste Management,** CONF-800313; Waste Management '80, the State of Waste Disposal Technology, Mill Tailings, and Risk Analysis Models, R.G. Post (Ed.), Proceedings of a Conference, Tucson, AZ, March 10, 1980, 754 pp.; (pp. 93-108) (1980)

108A
Lombardo, T.G., **Nuclear Waste Disposal: Where and How,** IEEE Spectrum 17(12):38-43 (1980, December)

109A
Lowery, J.R., National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, AL. **Investigation of the Technical Micronics Control (TMC) Process for Electropolishing Various Metals,** NASA-TM-X-64516; 19 pp. (1970, April)

110A
Lundgren, R.A., Pacific Northwest Laboratory, Richland, WA. **Linear Shaped Charges for Nuclear Decommissioning and Decontamination,** Videotape, 5:12 (1980, September)

111A
Lundgren, R.A., Pacific Northwest Laboratory, Richland, WA. **Reactor Vessel Cutting Demonstration,** Videotape, 4:32 (1981, October 4)

112A
Management of Wastes from Uranium Mining and Milling, IAEA-SM-262; Proceedings of an International Symposium, Albuquerque, NM, May 10-14, 1982. International Atomic Energy Agency, Vienna (1982, May)

113A
Marchandise, H., **The Plasma Gun and Its Applications,** EUR-2439-F (1966, September 8)

114A
Marple, M.L., Los Alamos Scientific Laboratory, Los Alamos, NM. **Radium-226 in Plants and Substrates at Inactive Uranium Mill Sites in the Southwestern United States,** INIS-MF-6530; CONF-810153; The Natural Radiation Environment, Proceedings of the Second Special Symposium, Bombay, India, January 19-23, 1981 (1981)

115A
Marple, M.L., University of New Mexico, Albuquerque, NM. **Radium-226 in Vegetation and Substrates at Inactive Uranium Mill Sites,** Thesis; 74 pp. (1979)

116A
McCoy, M.W., Pacific Northwest Laboratory, Richland, WA. **Contamination Stabilizing Coatings for D&D Operations,** Videotape, 5:00 (1981)

117A
McCoy, M.W., R.P. Allen, and L.K. Fetrow, Pacific Northwest Laboratory, Richland, WA. **Vibratory Finishing for Decontamination - Pilot Scale Operation,** The Treatment and Handling of Radioactive Wastes, A.G. Blasewitz, J.M. Davis, and M.R. Smith (Eds.). Battelle Press, Columbus, OH, 656 pp. (1982)

118A
McCray, J.G., E.A. Nowatzki, G.M. Thompson, D.J. Betsill, and R. Mitwasi, University of Arizona, College of Engineering, Tuscon, AZ. **Low-Level Nuclear Waste Shallow Land Burial Trench Isolation,** NUREG/CR-3084 (1983, March)

APPENDIX A

119A
McKenzie, D.H., L.L. Cadwell, C.E. Cushing, R. Harty, W.E. Kennedy, M.A. Simmons, J.K. Soldat, and B. Swartzman, Pacific Northwest Laboratories, Richland, WA. **Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: A Report on Tasks 1 and 2 of Phase I,** NUREG/CR-2675 (Vol. 1); PNL-4241 (Vol. 1) (1983, January)

120A
McKenzie, D.H., L.L. Cadwell, L.E. Eberhardt, W.E. Kennedy, Jr., R.A. Peloquin, and M.A. Simmons, Pacific Northwest Laboratory, Richland, WA. **Relevance of Biotic Pathways to the Long-Term Regulation of Nuclear Waste Disposal: Topical Report on Reference Western Arid Low-Level Waste Sites,** NUREG/CR-2675 (Vol. 2); PNL-4241 (Vol. 2); 52 pp. (1982, September)

121A
McKenzie, D.H., L.L. Cadwell, L.E. Eberhardt, W.E. Kennedy, Jr., R.A. Peloquin, and M.A. Simmons, Pacific Northwest Laboratories, Richland, WA. **Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: Topical Report on Reference Eastern Humid Low-Level Sites,** NUREG/CR-2675 (Vol. 3); PNL-4241 (Vol. 3) (1983, January)

122A
Menlove, H.O., C.R. Holbrooks, and A. Ramalho, Los Alamos National Laboratory, Los Alamos, NM, International Atomic Energy Agency, Vienna, Austria. **Inventory Sample Coincidence Counter Manual,** LA-9544-M; ISPO-181; 18 pp. (1982, November)

123A
Metropolitan Edison Company, Reading, PA. **Three Mile Island Nuclear Station, Unit 1 - Letter on the Delay in the DHR Pump Disassembly,** DOCKET-50289-1100; 5 pp. (1977, January 6)

124A
Metry, A.A., and D.R. Phoenix, Weston (Roy F.), Inc., West Chester, PA. **In Situ Stabilization of a Low-Level Radioactive Site - A Case History,** The Treatment and Handling of Radioactive Wastes, A.G. Blasewitz, J.M. Davis, and M.R. Smith (Eds.). Battelle Press, Columbus, OH, 656 pp. (1982)

125A
Metz, F.I., Iowa State University, Ames, IA. **Electropolishing of Metals,** Thesis; 173 pp. (1960)

126A
Monnin, M., and J.L. Seidel, University of Clermont, Aubiere, France. **An Automatic Device for Radon Activity Measurements,** CONF-8109100; Solid State Nuclear Track Detectors, Proceedings of the 11th International Conference, Bristol, England, September 7-12, 1981 (1981)

127A
Morcos, N., R. Dayal, and A.J. Weiss, Brookhaven National Laboratory, Upton, NY. **Properties of Radioactive Wastes and Waste Containers,** NUREG/CR-2617; BNL-NUREG-51515; 174 pp. (1982, April)

128A
Morgan, J.M., Jr., Johns Hopkins University, Baltimore, MD. **A Stream Survey in the Uranium Mining and Milling Area of the Colorado Plateau,** Thesis; 354 pp. (1959)

129A
Myrick, T.E., M.S. Blair, R.W. Doane, and W.A. Goldsmith, Oak Ridge National Laboratory, Health and Safety Research Division, Oak Ridge, TN. **A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies**

APPENDIX A

Associated with Radium-226 Bearing Materials, ORNL/TM-8475; 84 pp. (1982, November)

130A
Napier, B.A., Pacific Northwest Laboratory, Richland, WA. **A Method for Determining Allowable Residual Contamination Levels of Radionuclide Mixtures in Soil,** PNL-3852; 68 pp. (1982, May)

131A
Natelson, M., B.R. Beaudoin, L.B. Freeman, G.L. Hargfield, H.C. Hecker, D.M. Rowland, and W.K. Sarber, Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, West Mifflin, PA. **Nuclear Performance of the LWBR at Shippingport - 1977-1980,** CONF-800942; Advances in Physics and Shielding, Proceedings of an American Nuclear Society Topical Meeting, Sun Valley, ID, September, 1980; (pp. 215-229) (1980)

132A
Nathwani, J.S., University of Toronto, Toronto, Ontario, Canada. **Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment,** Thesis (1979)

133A
Nebraska State Department of Health, Lincoln, NE. **Environmental Surveillance Program of the Decommissioned Hallam Nuclear Power Facility,** Contract No. EY-76-C-02-2097 (1979)

134A
Nemec, J.F., UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, Richland, WA. **Decommissioning of Nuclear Power Plants,** Nuclear Power Waste Technology, A.A. Moghissi, H.W. Godbee, M.S. Ozker, and M.W. Carter (Eds.), Ch. 8; (pp. 303-319) (1978)

135A
Neuman, S.P., University of Arizona, Department of Hydrology and Water Resources, Tucson, AZ. **Computer Prediction of Subsurface Radionuclide Transport - An Adaptive Numerical Method,** NUREG/CR-3076; 36 pp. (1983, January)

136A
New Joint Venture Will Dismantle Atomic Plants, Wall Street Journal 100:3 (1979, May 10)

137A
New Mexico Uranium Mill Closed After Waste Leaks at Dumpsite, New York Times 128(A):15 (1979, July 18)

138A
Ng, Y.C., C.S. Colsher, and S.E. Thompson, Lawrence Livermore National Laboratory, Livermore, CA, Science Applications, Inc., Schaumberg, IL. **Soil-to-Plant Concentration Factors for Radiological Assessments,** NUREG/CR-2975; 134 pp. (1982, October)

139A
Nuclear Reactors - Critical for the First Time in 1978, Nuclear Reactors - Decommissioning in 1978, Atomwirtschaft, Atomtechnik 24(2):84 (1979, February)

140A
Nyhan, J.W., B.J. Drennon, and J.M. Crowell, Los Alamos National Laboratory, Los Alamos, NM. **Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry,** LA-9363-LLWM; 10 pp. (1982, August)

141A
O'Connell, S.M., **Uranium Mill Tailings - Heaps of Trouble,** National Wildlife 18(2):24 (1980, June-July)

APPENDIX A

142A
Obst, J., and K.H. Hutz, GKSS-Forschungszentrum Geesthact GmbH, Geesthact-Terperhude, Federal Republic of Germany. **Experience in the Disassembly and Packaging of Contaminated Components of the NS Otto Hahn,** Jahrestagung Kerntechnik '82 (Nuclear Technology '82), Proceedings of a German Nuclear Society Annual Meeting, Mannheim, Federal Republic of Germany, May 4-6, 1982; (pp. 753-756) (1982)

143A
Oertel, G.K., and W.C. Remini, U.S. Department of Energy, Washington, DC. **National DOE Plan for the Recovery and Utilization of Byproducts from the Defense Nuclear Fuel Cycle,** CONF-830227; Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tuscon, AZ, February 27-March 3, 1983 (1983, March)

144A
Oldest Nuclear Generator Retired from Service, New York Times 132:8 (1982, October 2)

145A
Oztunali, O.I., Dames and Moore, Inc., White Plaines, NY. **Effect of Time-Dependent Radon Diffusion on Experimental Determinations,** CONF-830227; Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tuscon, AZ, February 27-March 3, 1983 (1983, March)

146A
Parks, A., **A Landscape of Nuclear Tombs,** Progressive 41(2):30 (1977, December)

147A
Peach, J.D., U.S. General Accounting Office, Energy and Minerals Division, Washington, DC. **Update on the Impact of Federal R and D Funding on Three Mile Island Cleanup Costs,** EMD-82-68; 3 pp. (1982, April)

148A
Pfligersdorffer, P., W. Hofmann, and E. Pohl, University of Salzburg, Salzburg, Austria. **Applicability of Nuclear Track Detectors to the Measurement of Environmental Levels of Radon and Decay Products,** CONF-8109100; Solid State Nuclear Track Detectors, Proceedings of the 11th International Conference, Bristol, England, September 7-12, 1981 (1981)

149A
Phelps, A.K., and White M.G., Bechtel National, Inc., Oak Ridge, TN, U.S. Department of Energy, Division of Remedial Action Projects, Washington, DC. **A Conceptual Facility Designed for Remedial Action Wastes,** NUREG/CP-0028; CONF-820911; Low-level Waste Disposal, Facility Design, Construction, and Operating Practices, Proceeding of an NRC/ORNL Conference, Washington, DC, September 29-30, 1982, 455 pp.; (pp. 45-65) (1983, March)

150A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - Notification of Final Reactor Shutdown,** DOCKET-50171-179; 1 p. (1974, November 1)

151A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, October 1974,** DOCKET-50278-220; 10 pp. (1974, November 8)

152A
Philadelphia Electric Company, Philadelphia, PA.

APPENDIX A

Peach Bottom Atomic Power Station, Unit 1 - Operations Requalification Program, Proposed Changes, DOCKET-50171-178; 5 pp. (1974, October 25)

153A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, September 1974,** DOCKET-50278-209 (1974, October 8)

154A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor,** DOCKET-50171-180 (1974, November 1)

155A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12,** DOCKET-50171-176; 6 pp. (1974, September 25)

156A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor,** DOCKET-50171-193; 1 p. (1975, June 19)

157A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, August 1974,** DOCKET-50278-200; 10 pp. (1974, September 9)

158A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Plan and Safety Analysis Report,** DOCKET-50171-171 (1974, August 29)

159A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - Proposed Changes in Operator Requalification Program,** DOCKET-50171-190; 2 pp. (1975, April 3)

160A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, November 1974,** DOCKET-50278-228; 10 pp. (1974, December 5)

161A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6,** DOCKET-50171-195; 71 pp. (1975, July 14)

162A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply,** DOCKET-50171-198; 19 pp. (1975, July 24)

163A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply,** DOCKET-50171-200 (1975, November 5)

APPENDIX A

164A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 78-01, Decommissioning Activities,** DOCKET-50171-230 (1978, February 23)

165A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-05, Routine,** DOCKET-50171-216; 6 pp. (1977, January 19)

166A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Violation and Reply,** DOCKET-50171-206; 20 pp. (1976, March 1)

167A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities,** DOCKET-50171-209; 2 pp. (1976, April 2)

168A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply,** DOCKET-50171-210; 19 pp. (1976, May 12)

169A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Report No. 3, July 31 to December 31 1976,** DOCKET-50171-218; 14 pp. (1977, March)

170A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, December 1974,** DOCKET-50171-185; 10 pp. (1975, January 8)

171A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974,** DOCKET-50171-186; 25 pp. (1975, February 28)

172A
Philadelphia Electric Company, Philadelphia, PA. **Peach Bottom Atomic Power Station, Unit 1 - Provisional Operating License, Amendment 1,** DOCKET-50171-191; 38 pp. (1975, May 15)

173A
Phoenix, D.R., Jacobs Engineering Group, Inc., Albuquerque, NM. **Remedial Action for Canonsburg,** CONF-830227; Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tuscon, AZ, February 27-March 3, 1983 (1983, March)

174A
Pietrzak, R.F., K.S. Czyscinski, and A.J. Weiss, Brookhaven National Laboratory, Upton, NY. **Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites,** NUREG/CR-2616; BNL-NUREG-51514; 78 pp. (1982, February)

175A
Power Reactor Development Corporation, Detroit, MI. **Enrico Fermi Atomic Power Plant, Unit 1 - Annual Decommissioned Report EF-122, July 1, 1975 to June 30, 1976,** DOCKET-50016-249 (1976, August 6)

APPENDIX A

176A
Power Reactor Development Corporation, Detroit, MI. **Enrico Fermi Atomic Power Plant, Unit 1 - License DPR-9, Technical Specifications, Proposed Change,** DOCKET-50016-227; 19 pp. (1974, May 7)

177A
Power Reactor Development Corporation, Detroit, MI. **Enrico Fermi Atomic Power Plant, Unit 1 - Report EF-120, Quarterly Operating Report, April to June 1974,** DOCKET-50016-232; 9 pp. (1974, August 20)

178A
Power Reactor Development Corporation, Detroit, MI. **Enrico Fermi Atomic Power Plant, Unit 1 - IE Inspection Report No. 75-01,** DOCKET-50016-246; 18 pp. (1975, December 30)

179A
Power Reactor Development Corporation, Detroit, MI. **Enrico Fermi Atomic Power Plant, Unit 1 - Notification That Decommissioning is Essentially Complete,** DOCKET-50016-242; 3 pp. (1975, November 6)

180A
Power Reactor Development Corporation, Detroit, MI. **Enrico Fermi Atomic Power Plant, Unit 1 - Additional Information on Decommissioning,** DOCKET-50016; 6 pp. (1975, May 30)

181A
Puerto Rico Water Resources Authority, San Juan, PR. **Boiling Nuclear Superheater Power Station Decommissioning - Final Report,** WRA-70-3 (1970, September 1)

182A
Reagan's TMI Cleanup: A Smoke and Mirror Trick, Electric Light and Power 59(12):20-21 (1981, December)

183A
Reck, R.O., University of Maryland, College Park, MD. **The Regional Economic and Environmental Impacts of the Uranium Mining and Milling Industry,** Thesis; 204 pp. (1971)

184A
Reeves, F.D., **Decommissioned,** Newsweek 58:28 (1961, July 10)

185A
Regulatory Bodies Ready for N-Plant Retirements, Electrical World 190(2):19 (1978, July 15)

186A
Reinhardt, W.G., **Mine Tailings: Pre-Reactor Waste,** SciQuest 53(2):16 (1980, May-June)

187A
Retroactive Insurance May Fund TMI-2 Cleanup, Electric Light and Power 59(3):2-15 (1981, March)

188A
Roberts, J.O., and J. Saltzman, U.S. Nuclear Regulatory Commission, Washington, DC. **Potential Impact of Licensee Default on Cleanup of TMI-2: Technical Report,** NUREG-0689; 148 pp. (1980, November)

189A
Roop, R.D., W.P. Staub, D.B. Hunsaker, Jr., R.H. Kettelle, D.W. Lee, F.G. Pin, and A.J. Witten, Oak Ridge National Laboratory, Oak Ridge, TN. **A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches,** ORNL/TM-8715; 67 pp. (1983, May)

APPENDIX A

190A
Ross, J., **Taking Apart Your Neighborhood Nuke,** Mother Jones 6(1):29-33 (1981, January)

191A
Salisbury, D.F., **Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium,** Christian Science Monitor 74:12 (1982, April 2)

192A
Saxton Nuclear Experimental Corporation, Saxton, PA. **Saxton Reactor - Correspondence on Status of Decommissioning,** DOCKET-50146-117; 1 p. (1973, September 18)

193A
Saxton Nuclear Experimental Corporation, Saxton, PA. **Saxton Reactor - RO Inspection Report No. 73-01 and Correspondence,** DOCKET-50146-116; 12 pp. (1973, August 15)

194A
Saxton Nuclear Experimental Corporation, Saxton, PA. **Saxton Nuclear Experimental Reactor - Annual Report 1974 and Report on the Decommissioned Status of the Facility,** DOCKET-50146-126; 18 pp. (1975, February 20)

195A
Saxton Nuclear Experimental Corporation, Saxton, PA. **Saxton Nuclear Experimental Reactor - License DPR-4, Technical Specifications, Proposed Change No. 51,** DOCKET-50146-125; 7 pp. (1974, November 27)

196A
Scharnhorst, N., Pacific Northwest Laboratory, Richland, WA. **Field Solidification of Radioactive Liquid Waste,** Videotape, 3:50 (1982, September 16)

197A
Shearer, S.D., University of Wisconsin at Madison, Madison, WI. **The Leachability of Radium-226 from Uranium Mill Waste Solids and River Sediments,** Thesis; 176 pp. (1962)

198A
Shepherd, T.A., Colorado State University, Fort Collins, CO. **A Methodology for Evaluating Uranium Tailings Management Alternatives,** Thesis; 450 pp. (1979)

199A
Short Course on Decommissioning and Decontamination of Nuclear Facilities, CONF-830711; Short Course on Decommissioning and Decontamination of Nuclear Facilities, Proceedings of a Seminar, Ann Arbor, MI, July 11-13, 1983 (1983, July)

200A
Singley, W.J., Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, West Mifflin, PA. **Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control,** CONF-770403; Proceedings of an American Power Conference, Chicago, IL, April 18-20, 1977 (1977)

201A
Skillman, G.R., and B.D. Elam, Jr., Babcock and Wilcox. **TMI-2 Cooldown and Cleanup,** CONF-800424; Proceedings of an American Power Conference, Chicago, IL, April 21-23, 1980; (pp. 771-775) (1980)

202A
Snyder, T.L., **Economics of Decontamination of Nuclear Power Plants,** CONF-771109; American Nuclear Society 1977 Winter Meeting, Proceedings of a Conference, San Francisco, CA, November 27-December 2, 1977 (1977)

APPENDIX A

203A
Stasch, W., and P. Herchenroeder, GKSS-Forschungszentrum Geesthact GmbH, Geesthact-Terperhude, Federal Republic of Germany. **Radiological Aspects in the Planning of Disassembly and Removal of Kernkraftwerk Niederaichbach (KKN),** Jahrestagung Kerntechnik '82 (Nuclear Technology '82), Proceedings of a German Nuclear Society Annual Meeting, Mannheim, Federal Republic of Germany, May 4-6, 1982; (pp. 761-764) (1982)

204A
Strasma, J.D., **Costs of Decommissioning as Reported to the Public to Date,** CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VII-236 - VII-237) (1982, October)

205A
Strong, K.P., and D.M. Levins, **Radon Diffusion Through Uranium Tailings and Earth Cover,** CONF-811007; Proceedings of the Congress of Chemical Engineering and World Chemical Exposition, Montreal, Quebec, Canada, October 4-9, 1981 (1981)

206A
Strong, K.P., D.M. Levins, and A.G. Fane, Australian Atomic Energy Commission Research Establishment, Lucas Heights, Sutherland, Australia, University of New South Wales, School of Chemical Engineering, Kensington, Australia. **Radon Diffusion Through Uranium Tailings and Earth Cover,** INIS-MF-6974; CONF-811194; Proceedings of the Third Australian Institute of Nuclear Science and Engineering Conference, Lucas Heights, Australia, November 12-13, 1981 (1981, November)

207A
Sweet, W., **Unresolved: The Front End of Nuclear Waste Disposal,** Bulletin of the Atomic Scientists 35(5):44 (1979, May)

208A
Swyler, K.J., and R. Dayal, Brookhaven National Laboratory, Upton, NY. **Characterization of TMI-Type Wastes and Solid Products,** NUREG/CR-2516; BNL-NUREG-51499 (Vol. 1, No. 4); 36 pp. (1982, March)

209A
Thompson, J.D., EG&G Idaho, Inc., Idaho Falls, ID. **Interim Report Low-Level Waste Institutional Waste Incinerator Program,** EGG-WM-5116; 225 pp. (1980, April)

210A
TMI Cleanup is Imperative Says NRC Staff, Archiv fuer Energiewirtschaft 35(11):908-910 (1981, November)

211A
TMI Cleanup to Cost More, Last Until 1985, Electric Light and Power 58(9):1-2 (1980, September)

212A
Town Lives with Uranium Wastes and Fears, New York Times 131(1):19 (1982, September 12)

213A
Tsivoglou, E.C., Robert A. Taft Sanitary Engineering Center, Cincinnati, OH. **Research for the Control of Radioactive Pollutants,** Journal of Water Pollution Control Federation 35:242-259 (1963, February)

APPENDIX A

214A
Tucker, M.K., and G.A. Franz, U.S. Department of Energy, Grand Junction Office, Grand Junction, CO, Colorado Department of Health, Denver, CO. **Grand Junction, Colorado Remedial Action Program,** CONF-830227; Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tuscon, AZ, February 27-March 3, 1983 (1983, March)

215A
U.S. Atomic Energy Commission, Directorate of Licensing, Washington, DC. **Elk River Reactor - Order Authorizing Dismantling of Facility,** DOCKET-1151-54; 3 pp. (1972, June)

216A
U.S. Atomic Energy Commission, Directorate of Licensing, Washington, DC. **Enrico Fermi Atomic Power Plant, Unit 1 - Request for Retirement Schedule,** DOCKET-50016-187; 1 p. (1972, January 22)

217A
U.S. Atomic Energy Commission, Division of Raw Materials, Washington, DC. **Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah,** RMO-3005; 34 pp. (1963, December)

218A
U.S. Atomic Energy Commission, Division of Reactor Licensing, Washington, DC. **Elk River Reactor - Condition for Action Prior to Issuance of Dismantling Order,** DOCKET-1151-43; 2 pp. (1971, June 29)

219A
U.S. Atomic Energy Commission, Grand Junction Operations Office, Grand Junction, CO. **Supplement to the Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah,** RMO-3005 (Suppl.); 9 pp. (1966, April)

220A
U.S. Department of Defense, Washington, DC. **Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants,** Federal Register 47(246) :57085 (1982, December 22)

221A
U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM. **Fact Sheet on Salt Lake City Uranium Mill Tailings Site, Salt Lake City, Utah - Draft Environmental Impact Statement Summary,** DOE News (January 1983):1-2 (1983, January)

222A
U.S. Department of Energy, Washington, DC. **Cleanup Completed at "Project Gnome" Site,** Department of Energy Information Weekly Announcements 3(42):3 (1979, October 16)

223A
U.S. Department of Energy, Washington, DC. **DOE to Prepare EIS for Inactive Uranium Mill Tailings Site Near Grand Junction, Colorado - Comments Invited,** Federal Register 48(15):2817 (1983, January 21)

224A
U.S. Department of Energy, Washington, DC. **DOE Will Decommission Shippingport Atomic Power Station in Shippingport, Pennsylvania Following Defueling of Reactor,** Federal Register 47(161):36276 (1982, August 19)

225A
U.S. Department of Energy, Washington, DC. **DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitr**

APPENDIX A

Rare Metals Plant in Canonsburg, Pennsylvania, Federal Register 47(137):31061 (1982, July 16)

226A
U.S. Department of Energy, Washington, DC. **DOE Notifies that Baggs, Wyoming Inactive Uranium Mill Tailings Site Is No Longer Eligible for Remedial Action,** Federal Register 46(239):60875 (1981, December 14)

227A
U.S. Department of Energy, Washington, DC. **DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site,** Federal Register 48(22):4522 (1983, February 1)

228A
U.S. Department of Energy, Washington, DC. **DOE Certifies Radiological Condition of Five Properties Associated with the Former Middlesex Sampling Plant, Middlesex and Piscataway Counties, New Jersey,** Federal Register 48(2):326 (1983, January 4)

229A
U.S. Department of Energy, Washington, DC. **DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981,** Federal Register 46(109):30383 (1981, June 8)

230A
U.S. Department of Energy, Washington, DC. **DOE Will Prepare EIS for Disposing Uranium Mill Tailings Near Canonsburg, Pennsylvania,** Federal Register 46(94):26807 (1981, June 3-4)

231A
U.S. Environmental Protection Agency, Washington, DC. **Naturally-Occurring Radioactive Materials,** EPA-520/4-77-005; Radiation Protection Activities - 1976; (pp. 7-24) (1977, August)

232A
U.S. Environmental Protection Agency, Washington, DC. **EPA Issues Control and Cleanup Standards for Residual Radioactive Materials at Inactive Uranium Processing Sites,** Federal Register 48(3):590 (1983, January 5)

233A
U.S. Environmental Protection Agency, Washington, DC. **EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request,** Federal Register 46(123):33148 (1981, June 23)

234A
U.S. Environmental Protection Agency, Washington, DC. **EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to June 15, 1981 - Hearing May 14-15, 1981,** Federal Register 46(91):26356 (1981, May 14-15)

235A
U.S. Nuclear Regulatory Commission, Washington, DC. **Licensing Requirements for Land Disposal of Radioactive Waste,** Federal Register 47(248):57446-57482 (1982, December 27)

236A
U.S. Nuclear Regulatory Commission, Washington, DC. **Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 1, Final Staff Report,** NUREG-0662 (Vol. 1); 102 pp. (1980, May)

APPENDIX A

237A
U.S. Nuclear Regulatory Commission, Washington, DC. **Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 2 - Final Staff Report,** NUREG-0662 (Vol. 2); 539 pp. (1980, June)

238A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings,** Federal Register 47(230):53889 (1982, November 30)

239A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota,** Federal Register 47(199):46001 (1982)

240A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois,** Federal Register 47(134):30331 (1982, July 13)

241A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois,** Federal Register 47(98):21943 (1982, May 20)

242A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility,** Federal Register 47(65):14632 (1982, April 5)

243A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Amends Agreement with Washington Allowing the State to Continue Regulating Byproduct Material,** Federal Register 47(51):11346 (1982)

244A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Revokes General License Allowing Possession of Byproduct Material in the Form of Uranium Mill Tailings,** Federal Register 47(33):7205 (1982, February 18)

245A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Invites Comments on Proposal Granting Texas Authority to Regulate Byproduct Material,** Federal Register 46(235):60075 (1981, December 8)

246A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and Dispose of Component Parts,** Federal Register 47(12):2802 (1982, January 19)

247A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Terminates License No. R-51 for Oregon State University to Dismantle AGN-201 Reactor in Corvallis, Oregon,** Federal Register 46(224):57208 (1981, November 20)

APPENDIX A

248A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Issues Uranium Mill Operators in Agreement States General License to Possess and Dispose of Mill Tailings,** Federal Register 46(217):55505 (1981, November 10)

249A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Makes Available Draft EIS for Proposed Decommissioning of Edgemont Uranium Mill, South Dakota,** Federal Register 46(188):47688 (1981, September 29)

250A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Invites Comments on Proposed Agreement with Washington to Permit the State to Regulate Byproduct Material,** Federal Register 46(190):48351 (1981, October 1)

251A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California,** Federal Register 46(123):22148 (1981, June 26)

252A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111,** Federal Register 46(114):31394; DOCKET-50-111 (1981, June 15)

253A
U.S. Nuclear Regulatory Commission, Washington, DC. **NRC Denies Trojan Decommissioning 'liance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344,** Federal Register 46(102):28774; DOCKET-50-344 (1981, May 28)

254A
Umbarger, C.J., Los Alamos National Laboratory, Los Alamos, NM. **TRU Waste Assay Instrumentation and Applications in Nuclear Facility Decommissioning,** CONF-821005; International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp.; (pp. VI-10 - VI-27) (1982, October)

255A
Umbarger, C.J., Los Alamos Scientific Laboratory, Health Research Division, Los Alamos, NM. **Soil Monitoring Instrumentation,** LA-UR-80-616; 10 pp. (1979)

256A
Uranium Mill Contaminates Groundwater, Science News 114(1):441 (1978, December 23)

257A
Utroska, D., **Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup,** Electric Light and Power 59(6):3-13 (1981, June)

258A
van Dyne, J.R., and C. Daniel, O.H. Materials Company. **The Cleanup of a Low-Level Radioactive Waste Site,** CONF-830227; Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tucson, AZ, February 27-March 3, 1983 (1983, March)

APPENDIX A

259A
Walton, F.B., **Optimization of Decontamination Strategy for CANDU-PHW Reactors,** CONF-7710187; Water Chemistry of Nuclear Reactor Systems, Proceedings of an International Conference, Bournemout, United Kingdom, October 24-28, 1977 (1977)

260A
Westinghouse Electric Corporation, Cheswick, PA. **Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA,** DOE/ET/37247-1-Attach. 5; 420 pp. (1982, January)

261A
Williams, L.C., and J.E. Mack, Oak Ridge National Laboratory, Oak Ridge, TN. **Design Requirements for a Metal Smelting Facility,** The Treatment and Handling of Radioactive Wastes, A.G. Blasewitz, J.M. Davis, and M.R. Smith (Eds.). Battelle Press, Columbus, OH, 656 pp. (1982)

262A
Wodtke, C.H., Oak Ridge National Laboratory, Oak Ridge, TN. **Cooling Off a Hot Plate,** Metalworking Bulletin 12(2):1 (1961, April)

263A
Yalcintas, M.G., U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, DC. **Symposium on Low-Level Waste Disposal - Facility Design, Construction, and Operating Practices,** NUREG/CP-0028; CONF-820911; Low-level Waste Disposal, Facility Design, Construction, and Operating Practices, Proceeding of an NRC/ORNL Conference, Washington, DC, September 29-30, 1982, 455 pp. (1983, March)

264A
Zelle, P.W., N.D. Kretz, D.R. Rayno, and W.E. Kisieleski, Argonne National Laboratory, Division of Environmental Impact Studies, Argonne, IL. **A Gamma-Ray System for Field Analysis of Tailings and Soil,** CONF-811049; Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp.; (pp. 181-192) (1981)

477/478

Title Index

PERMUTED TITLE INDEX

Abandoned
Chemical and Radioisotope Stratification in an Abandoned Uranium Tailings Pile **52A**
Abbreviated
Abbreviated Total-Count Logging Procedures for Use in Remedial Action **82A**
Accident
Post-Accident Cleanup of Radioactivity at Three Mile Island **26A**
Accumulator
Modified Accumulator Method for Measuring Surface Radon Flux from a Uranium Tailings Pile **51A**
Activities
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 78-01, Decommissioning Activities **164A**
Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities **167A**
DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**
Activity
An Automatic Device for Radon Activity Measurements **126A**
Adapted
Development of Working Tools Adapted to Dismantling Requirements **21A**
Adaptive
Computer Prediction of Subsurface Radionuclide Transport - An Adaptive Numerical Method **135A**
Addresses
Uranium Mill Tailings: Congress Addresses a Long-Neglected Problem **33A**
Advanced
Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA **260A**
Advising
Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor **156A**
Aerial
An Aerial Radiological Survey of the U.S. Department of Energy's Hanford Site, Richland, Washington **69A**
AGN
NRC Terminates License No. R-51 for Oregon State University to Dismantle AGN-201 Reactor in Corvallis, Oregon **247A**
NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California **251A**
Agreement
NRC Amends Agreement with Washington Allowing the State to Continue Regulating Byproduct Material **243A**
NRC Issues Uranium Mill Operators in Agreement States General License to Possess and Dispose of Mill Tailings **248A**
NRC Invites Comments on Proposed Agreement with Washington to Permit the State to Regulate Byproduct Material **250A**

PERMUTED TITLE INDEX

Alabama
Joseph M. Farley Nuclear Plant, Units 1 and 2; State of Alabama, Department of Public Health's Comments on the Draft Environmental Statement **5A**

Albatross
Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium **191A**

Algocen
Seismic and Radon Monitoring of Algocen Site at Elliot Lake **58A**

Alliance
NRC Denies Trojan Decommissioning Alliance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344 **253A**

Allowable
A Method for Determining Allowable Residual Contamination Levels of Radionuclide Mixtures in Soil **130A**

Alloy
Solution for Decontamination of Surfaces of Low Alloy Steels **6A**

Alpha
Error in Working-Level Hour: Calculations When the Alpha Energy From the Radon Daughters is not Discriminated **61A**

Alternatives
A Methodology for Evaluating Uranium Tailings Management Alternatives **198A**

Amend
NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings **238A**

Amendment
Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6 **161A**
Peach Bottom Atomic Power Station, Unit 1 - Provisional Operating License, Amendment 1 **172A**

Amends
NRC Amends Agreement with Washington Allowing the State to Continue Regulating Byproduct Material **243A**

American
EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request **233A**

Analysis
Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Plan and Safety Analysis Report **158A**
A Gamma-Ray System for Field Analysis of Tailings [illegible] oil **264A**
Use of Particle Track Analysis to Measure Fissile Particle-Size Distributions in Contaminated Soils **64A**

annual
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974 **171A**

Annual
Enrico Fermi Atomic Power Plant, Unit 1 - Annual Decommissioned Report EF-122, July 1, 1975 to June 30, 1976 **175A**
Saxton Nuclear Experimental Reactor - Annual Report 1974 and Report on the Decommissioned Status of the Facility **194A**

PERMUTED TITLE INDEX

annual
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2 **42A**

Annual
Environmental Monitoring at Argonne National Laboratory - Annual Report for 1982 **85A**

Anomalies
A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Radium-226 Bearing Materials **129A**

Apart
Taking Apart Your Neighborhood Nuke **190A**

Applicability
Applicability of Nuclear Track Detectors to the Measurement of Environmental Levels of Radon and Decay Products **148A**

Appraisal
Uranium Mill Appraisal Program **66A**

April
Enrico Fermi Atomic Power Plant, Unit 1 - Report EF-120, Quarterly Operating Report, April to June 1974 **177A**

Arc
Effect of Electric Arc Cutting Procedures on the Properties of Processed Metal Surfaces **86A**

ARD
Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA **260A**

Area
A Stream Survey in the Uranium Mining and Milling Area of the Colorado Plateau **128A**

Areas
DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**

Argonne
Decontamination and Decommissioning Plan for the Argonne National Laboratory Research Reactor (CP-5) **100A**
Environmental Monitoring at Argonne National Laboratory - Annual Report for 1982 **85A**

Arid
Relevance of Biotic Pathways to the Long-Term Regulation of Nuclear Waste Disposal: Topical Report on Reference Western Arid Low-Level Waste Sites **120A**
Research Summary: Characterization of Radionuclide and Moisture Movement Through Arid Region Sediments **78A**

Assay
Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry **140A**
TRU Waste Assay Instrumentation and Applications in Nuclear Facility Decommissioning **254A**
Assay Instrumentation Support for an Electropolishing Facility at Pacific Northwest Laboratory **39A**

PERMUTED TITLE INDEX

Assessment

Application of a Risk Assessment Method for Radioactive Waste Management **107A**

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 1, Final Staff Report **236A**

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 2 - Final Staff Report **237A**

Container Assessment - Corrosion Study of HLW Container Materials **4A**

Assessment of Microbial Processes on Radionuclide Mobility in Shallow Land Burial **40A**

The 1980 State-by-State Assessment of Low-Level Radioactive Waste Shipped to Commercial Disposal Sites **62A**

Assessments

Residual Radioactivity Assessments in Nuclear Power Plants: Concentrations, Distributions, and Inventories **1A**

Soil-to-Plant Concentration Factors for Radiological Assessments **138A**

Associated

A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Radium-226 Bearing Materials **129A**

Radiation Exposures Associated with Dismantling a Radium-Radon Pump **20A**

DOE Certifies Radiological Condition of Five Properties Associated with the Former Middlesex Sampling Plant, Middlesex and Piscataway Counties, New Jersey **228A**

Atmosphere

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 1, Final Staff Report **236A**

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 2 - Final Staff Report **237A**

Atomic

New Joint Venture Will Dismantle Atomic Plants **136A**

Peach Bottom Atomic Power Station, Unit 1 - Notification of Final Reactor Shutdown **150A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, October 1974 **151A**

Peach Bottom Atomic Power Station, Unit 1 - Operations Requalification Program, Proposed Changes **152A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, September 1974 **153A**

Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor **154A**

Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 **155A**

Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor **156A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, August 1974 **157A**

Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Plan and Safety Analysis Report **158A**

Peach Bottom Atomic Power Station, Unit 1 - Proposed Changes in Operator Requalification Program **159A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, November 1974 **160A**

PERMUTED TITLE INDEX

Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6 **161A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply **162A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply **163A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 78-01, Decommissioning Activities **164A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-05, Routine **165A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Violation and Reply **166A**
Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities **167A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply **168A**
Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Report No. 3, July 31 to December 31, 1976 **169A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, December 1974 **170A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974 **171A**
Peach Bottom Atomic Power Station, Unit 1 - Provisional Operating License, Amendment 1 **172A**
Enrico Fermi Atomic Power Plant, Unit 1 - Annual Decommissioned Report EF-122, July 1, 1975 to June 30, 1976 **175A**
Enrico Fermi Atomic Power Plant, Unit 1 - License DPR-9, Technical Specifications, Proposed Change **176A**
Enrico Fermi Atomic Power Plant, Unit 1 - Report EF-120, Quarterly Operating Report, April to June 1974 **177A**
Enrico Fermi Atomic Power Plant, Unit 1 - IE Inspection Report No. 75-01 **178A**
Enrico Fermi Atomic Power Plant, Unit 1 - Notification That Decommissioning is Essentially Complete **179A**
Enrico Fermi Atomic Power Plant, Unit 1 - Additional Information on Decommissioning **180A**
Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control **200A**
Enrico Fermi Atomic Power Plant, Unit 1 - Request for Retirement Schedule **216A**
DOE Will Decommission Shippingport Atomic Power Station in Shippingport, Pennsylvania Following Defueling of Reactor **224A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2 **42A**
FERC Order in Matter of Maine Yankee Atomic Power Proposed Decommissioning Charges for 830 Megawatt Nuclear Station **68A**

Atomics

Atomics International Facilities with Current Dismantling Orders **10A**

Attachment

Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA **260A**

PERMUTED TITLE INDEX

August

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, August 1974 **157A**

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**

Authority

NRC Invites Comments on Proposal Granting Texas Authority to Regulate Byproduct Material **245A**

NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and Dispose of Component Parts **246A**

NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 **252A**

Southwest Experimental Fast Oxide Reactor - Request for Authority to Dismantle Facility **80A**

Authorizing

Elk River Reactor - Order Authorizing Dismantling of Facility **215A**

Automated

Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry **140A**

Automatic

An Automatic Device for Rador Activity Measurements **126A**

Available

Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants **220A**

NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois **241A**

NRC Makes Available Draft EIS for Proposed Decommissioning of Edgemont Uranium Mill, South Dakota **249A**

Away

Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium **191A**

Babcock

NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and Dispose of Component Parts **246A**

Baggs

DOE Notifies that Baggs, Wyoming Inactive Uranium Mill Tailings Site Is No Longer Eligible for Remedial Action **226A**

Bath

Electrolytic Polishing Bath for Stainless Steel **76A**

Study of Power Distribution Over Melt Bath of Plasma Melting Furnaces Using Several Plasma Torches **98A**

Bay

NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility **242A**

Bearing

A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Radium-226 Bearing Materials **129A**

been

PERMUTED TITLE INDEX

Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor **156A**

Biobarriers

Biobarriers Used in Shallow Burial Ground Stabilization **37A**

Biological

Investigation of Techniques for Disassembly of the Biological Shield of the Decommissioned Power Plant at Niederaichbach (KKN) **13A**

Evaluation of Geologic Materials to Limit Biological Intrusion of Low-Level Waste Site Covers **87A**

Biotic

Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: A Report on Tasks 1 and 2 of Phase I **119A**

Relevance of Biotic Pathways to the Long-Term Regulation of Nuclear Waste Disposal: Topical Report on Reference Western Arid Low-Level Waste Sites **120A**

Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: Topical Report on Reference Eastern Humid Low-Level Sites **121A**

Bodies

Regulatory Bodies Ready for N-Plant Retirements **185A**

Boiling

Boiling Nuclear Superheater Power Station Decommissioning - Final Report **181A**

La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel **50A**

Bottom

Peach Bottom Atomic Power Station, Unit 1 - Notification of Final Reactor Shutdown **150A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, October 1974 **151A**

Peach Bottom Atomic Power Station, Unit 1 - Operations Requalification Program, Proposed Changes **152A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, September 1974 **153A**

Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor **154A**

Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 **155A**

Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor **156A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, August 1974 **157A**

Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Plan and Safety Analysis Report **158A**

Peach Bottom Atomic Power Station, Unit 1 - Proposed Changes in Operator Requalification Program **159A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, November 1974 **160A**

Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6 **161A**

PERMUTED TITLE INDEX

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply **162A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply **163A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 78-01, Decommissioning Activities **164A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-05, Routine **165A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Violation and Reply **166A**
Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities **167A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply **168A**
Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Report No. 3, July 31 to December 31, 1976 **169A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, December 1974 **170A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974 **171A**
Peach Bottom Atomic Power Station, Unit 1 - Provisional Operating License, Amendment 1 **172A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2 **42A**
Peach Bottom Decommissioning and Component Removal **97A**

Building

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 1, Final Staff Report **236A**
Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 2 - Final Staff Report **237A**
A Method for Measuring the Exhalation of Radon from Building Materials **90A**

Buildings

Generalization of an Operational Experiment in Decontaminating the Outer Surfaces of the Nuclear Plant Equipment and Buildings **11A**

Burial

Low-Level Nuclear Waste Shallow Land Burial Trench Isolation **118A**
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites **174A**
A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches **189A**
Biobarriers Used in Shallow Burial Ground Stabilization **37A**
Assessment of Microbial Processes on Radionuclide Mobility in Shallow Land Burial **40A**
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites **49A**
Radionuclide Distribution and Migration Mechanisms at Shallow Land Burial Sites **95A**

Byproduct

NRC Amends Agreement with Washington Allowing the State to Continue Regulating Byproduct Material **243A**
NRC Revokes General License Allowing Possession of Byproduct Material in the Form of Uranium Mill Tailings **244A**

PERMUTED TITLE INDEX

NRC Invites Comments on Proposal Granting Texas Authority to Regulate Byproduct Material **245A**
NRC Invites Comments on Proposed Agreement with Washington to Permit the State to Regulate Byproduct Material **250A**

Byproducts
National DOE Plan for the Recovery and Utilization of Byproducts from the Defense Nuclear Fuel Cycle **143A**

Calibration
Field Calibration Facilities for Environmental Measurement of Radium, Thorium, and Potassium **81A**

California
NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California **251A**
California Orders Probe on Funds to Dismantle Nuclear Power Plants **30A**

Canadian
The Measurement of Radon Emanation Rates in a Canadian Cut and Fill Uranium Mine **36A**

CANDU
Optimization of Decontamination Strategy for CANDU-PHW Reactors **259A**

Cannon
Water Cannon Shows Promise for Gas Utility Trenching **38A**

Canonsburg
Remedial Action for Canonsburg **173A**
DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**
DOE Will Prepare EIS for Disposing Uranium Mill Tailings Near Canonsburg, Pennsylvania **230A**

Carbide
NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings **238A**

Carolina
NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 **252A**

Center
Remedial Action Project's Technical Measurements Center - Status **60A**

Ceramic
Use of Colorado Mine Waste and Mill Tailings in Ceramic Products **19A**

Certifies
DOE Certifies Radiological Condition of Five Properties Associated with the Former Middlesex Sampling Plant, Middlesex and Piscataway Counties, New Jersey **228A**

Characterization
Characterization of TMI-Type Wastes and Solid Products **208A**
Site Characterization of Soil in Preparation for Decontamination and Decommissioning **7A**
Research Summary: Characterization of Radionuclide and Moisture Movement Through Arid Region Sediments **78A**

Charges
Linear Shaped Charges for Nuclear Decommissioning and Decontamination **110A**
FERC Order in Matter of Maine Yankee Atomic Power Proposed Decommissioning Charges for 830 Megawatt Nuclear Station **68A**

PERMUTED TITLE INDEX

Chemical

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**

Chemical and Radioisotope Stratification in an Abandoned Uranium Tailings Pile **52A**

Chemistry

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites **174A**

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control **200A**

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites **49A**

Cheswick

Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA **260A**

Chicago

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**

City

Fact Sheet on Salt Lake City Uranium Mill Tailings Site, Salt Lake City, Utah - Draft Environmental Impact Statement Summary **221A**

Radon and Radon Daughter Evaluations at an Inactive Uranium Mill Tailings Pile and at Selected Locations in Salt Lake City, Utah **59A**

Clean

DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**

Cleanup

NRC Plan for Cleanup Operations at Three Mile Island Unit 2 **104A**

Update on the Impact of Federal R and D Funding on Three Mile Island Cleanup Costs **147A**

Reagan's TMI Cleanup: A Smoke and Mirror Trick **182A**

Retroactive Insurance May Fund TMI-2 Cleanup **187A**

Potential Impact of Licensee Default on Cleanup of TMI-2: Technical Report **188A**

TMI-2 Cooldown and Cleanup **201A**

TMI Cleanup is Imperative Says NRC Staff **210A**

TMI Cleanup to Cost More, Last Until 1985 **211A**

Cleanup Completed at "Project Gnome" Site **222A**

EPA Issues Control and Cleanup Standards for Residual Radioactive Materials at Inactive Uranium Processing Sites **232A**

Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup **257A**

The Cleanup of a Low-Level Radioactive Waste Site **258A**

Post-Accident Cleanup of Radioactivity at Three Mile Island **26A**

Deadline is Set for Cleanup at Radioactive Factory Site **53A**

Impact of Federal R and D Funding on Three Mile Island Cleanup Costs **79A**

Close

Final Step in Decommissioning of SM-1A Nuclear Plant: A Close-Out Survey **92A**

PERMUTED TITLE INDEX

Closed
New Mexico Uranium Mill Closed After Waste Leaks at Dumpsite **137A**
Coatings
Contamination Stabilizing Coatings for D&D Operations **116A**
Coefficients
Comparison of Radon Diffusion Coefficients Measured by Transient-Diffusion and Steady-State Laboratory Methods **93A**
Coincidence
Inventory Sample Coincidence Counter Manual **122A**
Colorado
A Stream Survey in the Uranium Mining and Milling Area of the Colorado Plateau **128A**
Use of Colorado Mine Waste and Mill Tailings in Ceramic Products **19A**
Grand Junction, Colorado Remedial Action Program **214A**
DOE to Prepare EIS for Inactive Uranium Mill Tailings Site Near Grand Junction, Colorado - Comments Invited **223A**
DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981 **229A**
Commercial
Quantities and Characteristics of Transuranic Wastes from Commercial Fuel Cycles **34A**
The 1980 State-by-State Assessment of Low-Level Radioactive Waste Shipped to Commercial Disposal Sites **62A**
Decommissioning Commercial Reactors **75A**
Commercially
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites **174A**
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites **49A**
Commission
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983 **74A**
Component
NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and Dispose of Component Parts **246A**
Peach Bottom Decommissioning and Component Removal **97A**
Components
Experience in the Disassembly and Packaging of Contaminated Components of the NS Otto Hahn **142A**
Computer
Computer Prediction of Subsurface Radionuclide Transport - An Adaptive Numerical Method **135A**
Concentration
Soil-to-Plant Concentration Factors for Radiological Assessments **138A**
Concentrations
Residual Radioactivity Assessments in Nuclear Power Plants: Concentrations, Distributions, and Inventories **1A**
Radon and Radon Progeny Concentrations in New Mexico's Uranium Mining and Milling District **27A**
Concepts
Concepts for Packaging Radioactive Waste Generated by Decommissioning of Nuclear Power Reactors **65A**

PERMUTED TITLE INDEX

Conceptual
A Conceptual Facility Designed for Remedial Action Wastes **149A**
Consolidated Fuel Reprocessing Program - Conceptual Study for a Laser Disassembly Development Unit (Fast Reactors) **32A**

Concerns
Radwaste Concerns During Nuclear Plant Decommissioning **77A**

Concrete
Concrete Spaller **88A**

Congress
EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request **233A**
Uranium Mill Tailings: Congress Addresses a Long-Neglected Problem **33A**

Consolidated
Consolidated Fuel Reprocessing Program - Conceptual Study for a Laser Disassembly Development Unit (Fast Reactors) **32A**

Construction
Symposium on Low-Level Waste Disposal - Facility Design, Construction, and Operating Practices **263A**

Container
Container Assessment - Corrosion Study of HLW Container Materials **4A**

Containers
Properties of Radioactive Wastes and Waste Containers **127A**

Containment
Decommissioning of Niederaichbach Power Plant (KKN) - Containment and Removal **106A**

Contaminated
Experience in the Disassembly and Packaging of Contaminated Components of the NS Otto Hahn **142A**
DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**
Use of Particle Track Analysis to Measure Fissile Particle-Size Distributions in Contaminated Soils **64A**
Sectioning Techniques for Plutonium Contaminated Gloveboxes **70A**
An Integrated Decontamination System for Surface-Contaminated TRU Waste **8A**

Contaminates
Uranium Mill Contaminates Groundwater **256A**

Contamination
Contamination Stabilizing Coatings for D&D Operations **116A**
A Method for Determining Allowable Residual Contamination Levels of Radionuclide Mixtures in Soil **130A**

Continue
NRC Amends Agreement with Washington Allowing the State to Continue Regulating Byproduct Material **243A**

Control
Investigation of the Technical Micronics Control (TMC) Process for Electropolishing Various Metals **109A**
Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry

PERMUTED TITLE INDEX

Control **200A**
Research for the Control of Radioactive Pollutants **213A**
Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah **217A**
Supplement to the Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah **219A**
EPA Issues Control and Cleanup Standards for Residual Radioactive Materials at Inactive Uranium Processing Sites **232A**

Cooldown
TMI-2 Cooldown and Cleanup **201A**

Cooling
Cooling Off a Hot Plate **262A**

Core
Three Mile Island Unit 2 Core Status Summary: A Basis for Tool Development for Reactor Disassembly and Defueling **46A**
Experimental and Theoretical Time Period Investigations of the Dynamics of the Second Core of the NS Otto Hahn Reactor **71A**

Corporation
DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981 **229A**
NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**

Corrective
A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches **189A**

Correspondence
Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor **156A**
Saxton Reactor - Correspondence on Status of Decommissioning **192A**
Saxton Reactor - RO Inspection Report No. 73-01 and Correspondence **193A**

Corrosion
Container Assessment - Corrosion Study of HLW Container Materials **4A**

Corvallis
NRC Terminates License No. R-51 for Oregon State University to Dismantle AGN-201 Reactor in Corvallis, Oregon **247A**

Cost
TMI Cleanup to Cost More, Last Until 1985 **211A**

Costs
Update on the Impact of Federal R and D Funding on Three Mile Island Cleanup Costs **147A**
Costs of Decommissioning as Reported to the Public to Date **204A**
Impact of Federal R and D Funding on Three Mile Island Cleanup Costs **79A**

Count
Abbreviated Total-Count Logging Procedures for Use in Remedial Action **82A**

Counter
Inventory Sample Coincidence Counter Manual **122A**

Counties
DOE Certifies Radiological Condition of Five Properties Associated with the Former Middlesex Sampling Plant, Middlesex and Piscataway Counties, New Jersey **228A**

PERMUTED TITLE INDEX

County

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 15A

NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota 239A

NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois 241A

F 019-2(14) Durango - South La Plata County Final Environmental Impact Statement 45A

Cover

Radon Diffusion Through Uranium Tailings and Earth Cover 205A

Radon Diffusion Through Uranium Tailings and Earth Cover 206A

Covers

Evaluation of Geologic Materials to Limit Biological Intrusion of Low-Level Waste Site Covers 87A

CP

Decontamination and Decommissioning Plan for the Argonne National Laboratory Research Reactor (CP-5) 100A

Criteria

Nuclear Waste Disposal - Mill Tailings and Low Level Waste Risk Comparison and Criteria Development 63A

Critical

Nuclear Reactors - Critical for the First Time in 1978, Nuclear Reactors - Decommissioning in 1978 139A

Crosse

La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel 50A

Current

Atomics International Facilities with Current Dismantling Orders 10A

Current Practice of Incineration of Low-Level Institutional Radioactive Waste 43A

Cut

The Measurement of Radon Emanation Rates in a Canadian Cut and Fill Uranium Mine 36A

Cutting

Reactor Vessel Cutting Demonstration 111A

Dismantling, Cutting up, and Disposing of a Large-Capacity Furnace for Plutonium Melting 14A

Effect of Electric Arc Cutting Procedures on the Properties of Processed Metal Surfaces 86A

Remote Cutting, Fitup, and Welding for In-Plant Pipe Repairs 91A

Cycles

Quantities and Characteristics of Transuranic Wastes from Commercial Fuel Cycles 34A

D

Contamination Stabilizing Coatings for D&D Operations 116A

Update on the Impact of Federal R and D Funding on Three Mile Island Cleanup Costs 147A

Impact of Federal R and D Funding on Three Mile Island Cleanup Costs 79A

Dakota

NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota 239A

NRC Makes Available Draft EIS for Proposed Decommissioning of Edgemont Uranium Mill, South Dakota 249A

PERMUTED TITLE INDEX

Damage

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control 200A

Date

Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 155A

Costs of Decommissioning as Reported to the Public to Date 204A

Daughter

Radon and Radon Daughter Evaluations at an Inactive Uranium Mill Tailings Pile and at Selected Locations in Salt Lake City, Utah 59A

Daughters

Measurement of Radon Daughters' Radioactivities by Using Single Filtering Method 35A

Error in Working-Level Hour: Calculations When the Alpha Energy From the Radon Daughters is not Discriminated 61A

Deadline

DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981 229A

EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request 233A

EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to June 15, 1981 - Hearing May 14-15, 1981 234A

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois 240A

Deadline is Set for Cleanup at Radioactive Factory Site 53A

Debate

Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup 257A

Decay

Applicability of Nuclear Track Detectors to the Measurement of Environmental Levels of Radon and Decay Products 148A

December

Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Report No. 3, July 31 to December 31, 1976 169A

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, December 1974 170A

Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974 171A

Decladding

SRE Fuel Decladding 54A

Decommission

DOE Will Decommission Shippingport Atomic Power Station in Shippingport, Pennsylvania Following Defueling of Reactor 224A

NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota 239A

Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2 42A

Decommissioned

PERMUTED TITLE INDEX

Investigation of Techniques for Disassembly of the Biological Shield of the Decommissioned Power Plant at Niederaichbach (KKN) 13A

Environmental Surveillance Program of the Decommissioned Hallam Nuclear Power Facility 133A

Enrico Fermi Atomic Power Plant, Unit 1 - Annual Decommissioned Report EF-122, July 1, 1975 to June 30, 1976 175A

Decommissioned 184A

Saxton Nuclear Experimental Reactor - Annual Report 1974 and Report on the Decommissioned Status of the Facility 194A

Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants 220A

Decontaminating

Generalization of an Operational Experiment in Decontaminating the Outer Surfaces of the Nuclear Plant Equipment and Buildings 11A

Default

Potential Impact of Licensee Default on Cleanup of TMI-2: Technical Report 188A

Defense

National DOE Plan for the Recovery and Utilization of Byproducts from the Defense Nuclear Fuel Cycle 143A

Defueled

Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants 220A

Defueling

DOE Will Decommission Shippingport Atomic Power Station in Shippingport, Pennsylvania Following Defueling of Reactor 224A

Three Mile Island Unit 2 Core Status Summary: A Basis for Tool Development for Reactor Disassembly and Defueling 46A

Delay

Three Mile Island Nuclear Station, Unit 1 - Letter on the Delay in the DHR Pump Disassembly 123A

Demonstration

Reactor Vessel Cutting Demonstration 111A

Use Plan for Demonstration Radioactive Waste Incinerator 44A

Denies

NRC Denies Trojan Decommissioning Alliance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344 253A

Department

Joseph M. Farley Nuclear Plant, Units 1 and 2; State of Alabama, Department of Public Health's Comments on the Draft Environmental Statement 5A

An Aerial Radiological Survey of the U.S. Department of Energy's Hanford Site, Richland, Washington 69A

Dependent

Effect of Time-Dependent Radon Diffusion on Experimental Determinations 145A

Design

Design Requirements for a Metal Smelting Facility 261A

Symposium on Low-Level Waste Disposal - Facility Design, Construction, and Operating Practices 263A

Designed

A Conceptual Facility Designed for Remedial Action Wastes 149A

PERMUTED TITLE INDEX

Detecting
A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Radium-226 Bearing Materials 129A

Detection
Use of Gamma-Ray Detection Instrumentation in ORNL Offsite Radiological Survey Program 12A

Detectors
Applicability of Nuclear Track Detectors to the Measurement of Environmental Levels of Radon and Decay Products 148A

Determinations
Effect of Time-Dependent Radon Diffusion on Experimental Determinations 145A

Device
An Automatic Device for Radon Activity Measurements 126A

DHR
Three Mile Island Nuclear Station, Unit 1 - Letter on the Delay in the DHR Pump Disassembly 123A

Diffusion
Effect of Time-Dependent Radon Diffusion on Experimental Determinations 145A
Radon Diffusion Through Uranium Tailings and Earth Cover 205A
Radon Diffusion Through Uranium Tailings and Earth Cover 206A
Comparison of Radon Diffusion Coefficients Measured by Transient-Diffusion and Steady-State Laboratory Methods 93A

Disassembly
Three Mile Island Nuclear Station, Unit 1 - Letter on the Delay in the DHR Pump Disassembly 123A
Investigation of Techniques for Disassembly of the Biological Shield of the Decommissioned Power Plant at Niederaichbach (KKN) 13A
Experience in the Disassembly and Packaging of Contaminated Components of the NS Otto Hahn 142A
Radiological Aspects in the Planning of Disassembly and Removal of Kernkraftwerk Niederaichbach (KKN) 203A
Consolidated Fuel Reprocessing Program - Conceptual Study for a Laser Disassembly Development Unit (Fast Reactors) 32A
Three Mile Island Unit 2 Core Status Summary: A Basis for Tool Development for Reactor Disassembly and Defueling 46A
Functioning of the Disassembly Manipulator for the Niederaichbach Nuclear Power Plant and its Possible Applications in LWR-Type Reactors 99A

Discriminated
Error in Working-Level Hour Calculations When the Alpha Energy From the Radon Daughters is not Discriminated 61A

Dismantle
New Joint Venture Will Dismantle Atomic Plants 136A
NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and Dispose of Component Parts 246A
NRC Terminates License No. R-51 for Oregon State University to Dismantle AGN-201 Reactor in Corvallis, Oregon 247A
NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California 251A
NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No.

PERMUTED TITLE INDEX

50-111 252A
California Orders Probe on Funds to Dismantle Nuclear Power Plants 30A
Southwest Experimental Fast Oxide Reactor - Request for Authority to Dismantle Facility 80A

Dismantling
Atomics International Facilities with Current Dismantling Orders 10A
Importance of a Number of Radionuclides During and After the Dismantling and Disposal of LWR Reactors 105A
Dismantling, Cutting up, and Disposing of a Large-Capacity Furnace for Plutonium Melting 14A
Radiation Exposures Associated with Dismantling a Radium-Radon Pump 20A
Development of Working Tools Adapted to Dismantling Requirements 21A
Elk River Reactor - Order Authorizing Dismantling of Facility 215A
Elk River Reactor - Condition for Action Prior to Issuance of Dismantling Order 218A
Dismantling a Nuclear Reactor - A First 47A

Disposal
Importance of a Number of Radionuclides During and After the Dismantling and Disposal of LWR Reactors 105A
Nuclear Waste Disposal: Where and How 108A
Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: A Report on Tasks 1 and 2 of Phase I 119A
Relevance of Biotic Pathways to the Long-Term Regulation of Nuclear Waste Disposal: Topical Report on Reference Western Arid Low-Level Waste Sites 120A
Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: Topical Report on Reference Eastern Humid Low-Level Sites 121A
Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment 132A
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 174A
Unresolved: The Front End of Nuclear Waste Disposal 207A
Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants 220A
Licensing Requirements for Land Disposal of Radioactive Waste 235A
Symposium on Low-Level Waste Disposal - Facility Design, Construction, and Operating Practices 263A
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 49A
The 1980 State-by-State Assessment of Low-Level Radioactive Waste Shipped to Commercial Disposal Sites 62A
Nuclear Waste Disposal - Mill Tailings and Low Level Waste Risk Comparison and Criteria Development 63A
Development of Methods and Techniques for the Decommissioning and Ultimate Disposal of Nuclear Facilities 94A

Dispose
NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and Dispose of Component Parts 246A
NRC Issues Uranium Mill Operators in Agreement States General License to Possess and Dispose of Mill Tailings 248A

Disposing
Dismantling, Cutting up, and Disposing of a Large-Capacity Furnace for Plutonium

PERMUTED TITLE INDEX

Melting 14A
DOE Will Prepare EIS for Disposing Uranium Mill Tailings Near Canonsburg, Pennsylvania 230A

Disposition
NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings 238A

Distribution
Radionuclide Distribution and Migration Mechanisms at Shallow Land Burial Sites 95A
Study of Power Distribution Over Melt Bath of Plasma Melting Furnaces Using Several Plasma Torches 98A

Distributions
Residual Radioactivity Assessments in Nuclear Power Plants: Concentrations, Distributions, and Inventories 1A
Use of Particle Track Analysis to Measure Fissile Particle-Size Distributions in Contaminated Soils 64A

District
Radon and Radon Progeny Concentrations in New Mexico's Uranium Mining and Milling District 27A

Division
Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA 260A

Docket
NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 252A
NRC Denies Trojan Decommissioning Alliance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344 253A

Documents
Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA 260A

DOE
National DOE Plan for the Recovery and Utilization of Byproducts from the Defense Nuclear Fuel Cycle 143A
DOE to Prepare EIS for Inactive Uranium Mill Tailings Site Near Grand Junction, Colorado - Comments Invited 223A
DOE Will Decommission Shippingport Atomic Power Station in Shippingport, Pennsylvania Following Defueling of Reactor 224A
DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania 225A
DOE Notifies that Baggs, Wyoming Inactive Uranium Mill Tailings Site Is No Longer Eligible for Remedial Action 226A
DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site 227A
DOE Certifies Radiological Condition of Five Properties Associated with the Former Middle-

PERMUTED TITLE INDEX

sex Sampling Plant, Middlesex and Piscataway Counties, New Jersey 228A
DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981 229A
DOE Will Prepare EIS for Disposing Uranium Mill Tailings Near Canonsburg, Pennsylvania 230A
Status of DOE Order 5820 96A

DPR

Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 155A
Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6 161A
Enrico Fermi Atomic Power Plant, Unit 1 - License DPR-9, Technical Specifications, Proposed Change 176A
Saxton Nuclear Experimental Reactor - License DPR-4, Technical Specifications, Proposed Change No. 51 195A

Draft

Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants 220A
Fact Sheet on Salt Lake City Uranium Mill Tailings Site, Salt Lake City, Utah - Draft Environmental Impact Statement Summary 221A
NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois 240A
NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois 241A
NRC Makes Available Draft EIS for Proposed Decommissioning of Edgemont Uranium Mill, South Dakota 249A
Joseph M. Farley Nuclear Plant, Units 1 and 2; State of Alabama, Department of Public Health's Comments on the Draft Environmental Statement 5A

Driving

Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities 167A

Du

NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois 241A

Dumpsite

New Mexico Uranium Mill Closed After Waste Leaks at Dumpsite 137A

Durango

Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium 191A
DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981 229A
F 019-2(14) Durango - South La Plata County Final Environmental Impact Statement 45A

Dynamics

Experimental and Theoretical Time Period Investigations of the Dynamics of the Second Core of the NS Otto Hahn Reactor 71A

Earth

Radon Diffusion Through Uranium Tailings and Earth Cover 205A
Radon Diffusion Through Uranium Tailings and Earth Cover 206A

PERMUTED TITLE INDEX

Earths

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**

NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois **241A**

Eastern

Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: Topical Report on Reference Eastern Humid Low-Level Sites **121A**

Economic

The Regional Economic and Environmental Impacts of the Uranium Mining and Milling Industry **183A**

Economics

Economics of Decontamination of Nuclear Power Plants **202A**

Edgemont

NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota **239A**

NRC Makes Available Draft EIS for Proposed Decommissioning of Edgemont Uranium Mill, South Dakota **249A**

Uranium Mill Decommissioning - An Update on the Edgemont Experience **57A**

EF

Enrico Fermi Atomic Power Plant, Unit 1 - Annual Decommissioned Report EF-122, July 1, 1975 to June 30, 1976 **175A**

Enrico Fermi Atomic Power Plant, Unit 1 - Report EF-120, Quarterly Operating Report, April to June 1974 **177A**

Efforts

Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium **191A**

EIS

Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants **220A**

DOE to Prepare EIS for Inactive Uranium Mill Tailings Site Near Grand Junction, Colorado - Comments Invited **223A**

DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**

DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site **227A**

DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981 **229A**

DOE Will Prepare EIS for Disposing Uranium Mill Tailings Near Canonsburg, Pennsylvania **230A**

NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota **239A**

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**

NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois **241A**

NRC Makes Available Draft EIS for Proposed Decommissioning of Edgemont Uranium Mill, South Dakota **249A**

PERMUTED TITLE INDEX

Electric

NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility **242A**

NRC Denies Trojan Decommissioning Alliance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344 **253A**

Effect of Electric Arc Cutting Procedures on the Properties of Processed Metal Surfaces **86A**

Electrochemical

Electrochemical Polishing with the Removal of a Small Layer of Metal **72A**

Electrolytic

Electrolytic Polishing Bath for Stainless Steel **76A**

Electropolishing

Investigation of the Technical Micronics Control (TMC) Process for Electropolishing Various Metals **109A**

Electropolishing of Metals **125A**

In Situ Electropolishing **24A**

Electropolishing Update **25A**

Assay Instrumentation Support for an Electropolishing Facility at Pacific Northwest Laboratory **39A**

Technological Aspects of the Workpieces Treated by Electropolishing **89A**

Eligible

DOE Notifies that Baggs, Wyoming Inactive Uranium Mill Tailings Site Is No Longer Eligible for Remedial Action **226A**

Elk

Elk River Reactor - Order Authorizing Dismantling of Facility **215A**

Elk River Reactor - Condition for Action Prior to Issuance of Dismantling Order **218A**

Elliot

Seismic and Radon Monitoring of Algocen Site at Elliot Lake **58A**

Emanation

The Measurement of Radon Emanation Rates in a Canadian Cut and Fill Uranium Mine **36A**

Emission

Emission of Radon from Soil **3A**

EML

Integrating Working Level Monitor EML Type TF-11 **102A**

Energy

Error in Working-Level Hour: Calculations When the Alpha Energy From the Radon Daughters is not Discriminated **61A**

An Aerial Radiological Survey of the U.S. Department of Energy's Hanford Site, Richland, Washington **69A**

Enrico

Enrico Fermi Atomic Power Plant, Unit 1 - Annual Decommissioned Report EF-122, July 1, 1975 to June 30, 1976 **175A**

Enrico Fermi Atomic Power Plant, Unit 1 - License DPR-9, Technical Specifications, Proposed Change **176A**

Enrico Fermi Atomic Power Plant, Unit 1 - Report EF-120, Quarterly Operating Report, April to June 1974 **177A**

Enrico Fermi Atomic Power Plant, Unit 1 - IE Inspection Report No. 75-01 **178A**

Enrico Fermi Atomic Power Plant, Unit 1 - Notification That Decommissioning is Essentially

PERMUTED TITLE INDEX

Complete 179A
Enrico Fermi Atomic Power Plant, Unit 1 - Additional Information on Decommissioning 180A
Enrico Fermi Atomic Power Plant, Unit 1 - Request for Retirement Schedule 216A

Environment

Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment 132A

EPA

EPA Issues Control and Cleanup Standards for Residual Radioactive Materials at Inactive Uranium Processing Sites 232A
EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request 233A
EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to June 15, 1981 - Hearing May 14-15, 1981 234A

Equipment

Generalization of an Operational Experiment in Decontaminating the Outer Surfaces of the Nuclear Plant Equipment and Buildings 11A

Erosion

Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah 217A
Supplement to the Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah 219A

Error

Error in Working-Level Hour: Calculations When the Alpha Energy From the Radon Daughters is not Discriminated 61A

Essentially

Enrico Fermi Atomic Power Plant, Unit 1 - Notification That Decommissioning is Essentially Complete 179A

Eurochemic

Reprocessing, Decontamination and Decommissioning Waste Management at Eurochemic 55A

Evaluations

Radon and Radon Daughter Evaluations at an Inactive Uranium Mill Tailings Pile and at Selected Locations in Salt Lake City, Utah 59A

Exhalation

A Method for Measuring the Exhalation of Radon from Building Materials 90A

Existing

DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site 227A

Experience

Experience in the Disassembly and Packaging of Contaminated Components of the NS Otto Hahn 142A
Uranium Mill Decommissioning - An Update on the Edgemont Experience 57A

Expiration

Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 155A

Exposures

Radiation Exposures Associated with Dismantling a Radium-Radon Pump 20A

Extending

Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 155A

PERMUTED TITLE INDEX

Extends

EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request 233A

EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to June 15, 1981 - Hearing May 14-15, 1981 234A

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois 240A

Extension

Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities 167A

F

F 019-2(14) Durango - South La Plata County Final Environmental Impact Statement 45A

Fact

Fact Sheet on Salt Lake City Uranium Mill Tailings Site, Salt Lake City, Utah - Draft Environmental Impact Statement Summary 221A

Factory

Deadline is Set for Cleanup at Radioactive Factory Site 53A

Failed

La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel 50A

Fall

NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota 239A

Falls

DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site 227A

Farley

Joseph M. Farley Nuclear Plant, Units 1 and 2; State of Alabama, Department of Public Health's Comments on the Draft Environmental Statement 5A

Fate

Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment 132A

Fears

Town Lives with Uranium Wastes and Fears 212A

Federal

Update on the Impact of Federal R and D Funding on Three Mile Island Cleanup Costs 147A

Impact of Federal R and D Funding on Three Mile Island Cleanup Costs 79A

FERC

FERC Order in Matter of Maine Yankee Atomic Power Proposed Decommissioning Charges for 830 Megawatt Nuclear Station 68A

Fermi

Enrico Fermi Atomic Power Plant, Unit 1 - Annual Decommissioned Report EF-122, July 1, 1975 to June 30, 1976 175A

Enrico Fermi Atomic Power Plant, Unit 1 - License DPR-9, Technical Specifications, Pro-

PERMUTED TITLE INDEX

posed Change 176A
Enrico Fermi Atomic Power Plant, Unit 1 - Report EF-120, Quarterly Operating Report, April to June 1974 177A
Enrico Fermi Atomic Power Plant, Unit 1 - IE Inspection Report No. 75-01 178A
Enrico Fermi Atomic Power Plant, Unit 1 - Notification That Decommissioning is Essentially Complete 179A
Enrico Fermi Atomic Power Plant, Unit 1 - Additional Information on Decommissioning 130A
Enrico Fermi Atomic Power Plant, Unit 1 - Request for Retirement Schedule 216A

Field

Field Solidification of Radioactive Liquid Waste 196A
A Gamma-Ray System for Field Analysis of Tailings and Soil 264A
Field Calibration Facilities for Environmental Measurement of Radium, Thorium, and Potassium 81A

Fill

The Measurement of Radon Emanation Rates in a Canadian Cut and Fill Uranium Mine 36A

Filtering

Measurement of Radon Daughters' Radioactivities by Using Single Filtering Method 35A

Final

Peach Bottom Atomic Power Station, Unit 1 - Notification of Final Reactor Shutdown 150A
Boiling Nuclear Superheater Power Station Decommissioning - Final Report 181A
Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 1, Final Staff Report 236A
Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 2 - Final Staff Report 237A
NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota 239A
Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA 260A
F 019-2(14) Durango - South La Plata County Final Environmental Impact Statement 45A
Final Shutdown of Research Reactor 73A
Final Step in Decommissioning of SM-1A Nuclear Plant: A Close-Out Survey 92A

Finishing

Vibratory Finishing for Decontamination - Pilot Scale Operation 117A

Fissile

Use of Particle Track Analysis to Measure Fissile Particle-Size Distributions in Contaminated Soils 64A

Fitup

Remote Cutting, Fitup, and Welding for In-Plant Pipe Repairs 91A

Flux

Modified Accumulator Method for Measuring Surface Radon Flux from a Uranium Tailings Pile 51A

Form

NRC Revokes General License Allowing Possession of Byproduct Material in the Form of Uranium Mill Tailings 244A

PERMUTED TITLE INDEX

Former

DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**

DOE Certifies Radiological Condition of Five Properties Associated with the Former Middlesex Sampling Plant, Middlesex and Piscataway Counties. New Jersey **228A**

France

Industrial Radioactive Low-Level Waste Management in France **67A**

Front

Unresolved: The Front End of Nuclear Waste Disposal **207A**

Fuel

National DOE Plan for the Recovery and Utilization of Bypr .ducts from the Defense Nuclear Fuel Cycle **143A**

Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor **156A**

Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA **260A**

Consolidated Fuel Reprocessing Program - Conceptual Study for a Laser Disassembly Development Unit (Fast Reactors) **32A**

Quantities and Characteristics of Transuranic Wastes from Commercial Fuel Cycles **34A**

L- Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel **50A**

SRE Fuel Decladding **54A**

Functioning

Functioning of the Disassembly Manipulator for the Niederaichbach Nuclear Power Plant and Its Possible Applications in LWR-Type Reactors **99A**

Fund

Retroactive Insurance May Fund TMI-2 Cleanup **187A**

Funding

Update on the Impact of Federal R and D Funding on Three Mile Island Cleanup Costs **147A**

Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup **257A**

Impact of Federal R and D Funding on Three Mile Island Cleanup Costs **79A**

Funds

California Orders Probe on Funds to Dismantle Nuclear Power Plants **30A**

Furnace

Dismantling, Cutting up, and Disposing of a Large-Capacity Furnace for Plutonium Melting **14A**

Furnaces

Study of Power Distribution Over Melt Bath of Plasma Melting Furnaces Using Several Plasma Torches **98A**

Gamma

Use of Gamma-Ray Detection Instrumentation in ORNL Offsite Radiological Survey Program **12A**

A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with

PERMUTED TITLE INDEX

Radium-226 Bearing Materials 129A
Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry 140A
A Gamma-Ray System for Field Analysis of Tailings and Soil 264A

Gas
NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility 242A
Water Cannon Shows Promise for Gas Utility Trenching 38A

Generalization
Generalization of an Operational Experiment in Decontaminating the Outer Surfaces of the Nuclear Plant Equipment and Buildings 11A

Generated
Concepts for Packaging Radioactive Waste Generated by Decommissioning of Nuclear Power Reactors 65A

Generator
Oldest Nuclear Generator Retired from Service 144A
Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control 200A

Geologic
Evaluation of Geologic Materials to Limit Biological Intrusion of Low-Level Waste Site Covers 87A

Gloveboxes
Sectioning Techniques for Plutonium Contaminated Gloveboxes 70A

Gnome
Cleanup Completed at "Project Gnome" Site 222A

Go
Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium 191A

Governing
NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings 238A

Government
Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium 191A

Grand
Grand Junction, Colorado Remedial Action Program 214A
DOE to Prepare EIS for Inactive Uranium Mill Tailings Site Near Grand Junction, Colorado - Comments Invited 223A

Granting
NRC Invites Comments on Proposal Granting Texas Authority to Regulate Byproduct Material 245A

Grants
NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and Dispose of Component Parts 246A
NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 252A

Ground
Biobarriers Used in Shallow Burial Ground Stabilization 37A

PERMUTED TITLE INDEX

Groundwater
Uranium Mill Contaminates Groundwater 256A

Guenther
NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility 242A

Gun
The Plasma Gun and Its Applications 113A

Hahn
Decommissioning of the Nuclear Merchant Ship "NS Otto Hahn" 103A
Experience in the Disassembly and Packaging of Contaminated Components of the NS Otto Hahn 142A
Experimental and Theoretical Time Period Investigations of the Dynamics of the Second Core of the NS Otto Hahn Reactor 71A

Hallam
Environmental Surveillance Program of the Decommissioned Hallam Nuclear Power Facility 133A

Hanford
An Aerial Radiological Survey of the U.S. Department of Energy's Hanford Site, Richland, Washington 69A

Has
Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor 156A

has
Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor 156A

Health
Joseph M. Farley Nuclear Plant, Units 1 and 2; State of Alabama, Department of Public Health's Comments on the Draft Environmental Statement 5A

Heaps
Uranium Mill Tailings - Heaps of Trouble 141A

Hearing
EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to June 15, 1981 - Hearing May 14-15, 1981 234A

History
In Situ Stabilization of a Low-Level Radioactive Site - A Case History 124A

HLW
Container Assessment - Corrosion Study of HLW Container Materials 4A

Hot
Cooling Off a Hot Plate 262A

Hour
Error in Working-Level Hour: Calculations When the Alpha Energy From the Radon Daughters is not Discriminated 61A

Houses
Working Level Monitor for Radon Measurements Inside Houses 2A

Humboldt
NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility 242A

PERMUTED TITLE INDEX

Humid

Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: Topical Report on Reference Eastern Humid Low-Level Sites **121A**

IE

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply **162A**

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply **163A**

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 78-01, Decommissioning Activities **164A**

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-05, Routine **165A**

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Violation and Reply **166A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply **168A**

Enrico Fermi Atomic Power Plant, Unit 1 - IE Inspection Report No. 75-01 **173A**

Illinois

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**

NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois **241A**

Impact

Update on the Impact of Federal R and D Funding on Three Mile Island Cleanup Costs **147A**

Potential Impact of Licensee Default on Cleanup of TMI-2: Technical Report **188A**

Fact Sheet on Salt Lake City Uranium Mill Tailings Site, Salt Lake City, Utah - Draft Environmental Impact Statement Summary **221A**

F 019-2(14) Durango - South La Plata County Final Environmental Impact Statement **45A**

Impact of Federal R and D Funding on Three Mile Island Cleanup Costs **79A**

Impacts

The Regional Economic and Environmental Impacts of the Uranium Mining and Milling Industry **183A**

Imperative

TMI Cleanup is Imperative Says NRC Staff **210A**

Incineration

Current Practice of Incineration of Low-Level Institutional Radioactive Waste **43A**

Incinerator

Interim Report Low-Level Waste Institutional Waste Incinerator Program **209A**

Use Plan for Demonstration Radioactive Waste Incinerator **44A**

Industrial

Industrial Radioactive Low-Level Waste Management in France **67A**

Industry

The Regional Economic and Environmental Impacts of the Uranium Mining and Milling Industry **183A**

Information

Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities **167A**

Enrico Fermi Atomic Power Plant, Unit 1 - Additional Information on Decommissioning **180A**

PERMUTED TITLE INDEX

Inspection
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply **162A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply **163A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 78-01, Decommissioning Activities **164A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-05, Routine **165A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Violation and Reply **166A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply **168A**
Enrico Fermi Atomic Power Plant, Unit 1 - IE Inspection Report No. 75-01 **178A**
Saxton Reactor - RC Inspection Report No. 73-01 and Correspondence **193A**
Inspections
Instrument Evaluation Number 20 - Unit Inspections U3C Radiation Survey Meter **28A**
Institutional
Interim Report Low-Level Waste Institutional Waste Incinerator Program **209A**
Current Practice of Incineration of Low-Level Institutional Radioactive Waste **43A**
Instrument
Instrument Evaluation Number 20 - Unit Inspections U3C Radiation Survey Meter **28A**
Instrumentation
Use of Gamma-Ray Detection Instrumentation in ORNL Offsite Radiological Survey Program **12A**
TRU Waste Assay Instrumentation and Applications in Nuclear Facility Decommissioning **254A**
Soil Monitoring Instrumentation **255A**
Assay Instrumentation Support for an Electropolishing Facility at Pacific Northwest Laboratory **39A**
Insurance
Retroactive Insurance May Fund TMI-2 Cleanup **187A**
Integrated
An Integrated Decontamination System for Surface-Contaminated TRU Waste **8A**
Integrating
Integrating Working Level Monitor EML Type TF-11 **102A**
Interim
Interim Report Low-Level Waste Institutional Waste Incinerator Program **209A**
International
Atomics International Facilities with Current Dismantling Orders **10A**
Intrusion
Evaluation of Geologic Materials to Limit Biological Intrusion of Low-Level Waste Site Covers **87A**
Inventories
Residual Radioactivity Assessments in Nuclear Power Plants: Concentrations, Distributions, and Inventories **1A**
Inventory
Inventory Sample Coincidence Counter Manual **122A**
Invited
DOE to Prepare EIS for Inactive Uranium Mill Tailings Site Near Grand Junction, Colorado - Comments Invited **223A**

PERMUTED TITLE INDEX

Invites

NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings 238A

NRC Invites Comments on Proposal Granting Texas Authority to Regulate Byproduct Material 245A

NRC Invites Comments on Proposed Agreement with Washington to Permit the State to Regulate Byproduct Material 250A

Island

NRC Plan for Cleanup Operations at Three Mile Island Unit 2 104A

Three Mile Island Nuclear Station, Unit 1 - Letter on the Delay in the DHR Pump Disassembly 123A

Update on the Impact of Federal R and D Funding on Three Mile Island Cleanup Costs 147A

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 1, Final Staff Report 236A

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 2 - Final Staff Report 237A

Post-Accident Cleanup of Radioactivity at Three Mile Island 26A

Three Mile Island Unit 2 Core Status Summary: A Basis for Tool Development for Reactor Disassembly and Defueling 46A

Impact of Federal R and D Funding on Three Mile Island Cleanup Costs 79A

Three Mile Island Unit 2: Decontamination Program 9A

Isolation

Low-Level Nuclear Waste Shallow Land Burial Trench Isolation 118A

Isotope

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 174A

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 49A

Issuance

Elk River Reactor - Condition for Action Prior to Issuance of Dismantling Order 218A

Issues

EPA Issues Control and Cleanup Standards for Residual Radioactive Materials at Inactive Uranium Processing Sites 232A

NRC Issues Uranium Mill Operators in Agreement States General License to Possess and Dispose of Mill Tailings 248A

Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup 257A

January

Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2 42A

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983 74A

Jersey

DOE Certifies Radiological Condition of Five Properties Associated with the Former Middlesex Sampling Plant, Middlesex and Piscataway Counties, New Jersey 228A

Joint

New Joint Venture Will Dismantle Atomic Plants 136A

Joseph

Joseph M. Farley Nuclear Plant, Units 1 and 2; State of Alabama, Department of Public Health's Comments on the Draft Environmental Statement 5A

PERMUTED TITLE INDEX

July

Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Report No. 3, July 31 to December 31, 1976 **169A**

Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974 **171A**

Enrico Fermi Atomic Power Plant, Unit 1 - Annual Decommissioned Report EF-122, July 1, 1975 to June 30, 1976 **175A**

DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981 **229A**

EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request **233A**

Junction

Grand Junction, Colorado Remedial Action Program **214A**

DOE to Prepare EIS for Inactive Uranium Mill Tailings Site Near Grand Junction, Colorado - Comments Invited **223A**

June

Enrico Fermi Atomic Power Plant, Unit 1 - Annual Decommissioned Report EF-122, July 1, 1975 to June 30, 1976 **175A**

Enrico Fermi Atomic Power Plant, Unit 1 - Report EF-120, Quarterly Operating Report, April to June 1974 **177A**

EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to June 15, 1981 - Hearing May 14-15, 1981 **234A**

Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2 **42A**

Kernkraftwerk

Radiological Aspects in the Planning of Disassembly and Removal of Kernkraftwerk Niederaichbach (KKN) **203A**

Kerr

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**

KKN

Decommissioning of Niederaichbach Power Plant (KKN) - Containment and Removal **106A**

Investigation of Techniques for Disassembly of the Biological Shield of the Decommissioned Power Plant at Niederaichbach (KKN) **13A**

Radiological Aspects in the Planning of Disassembly and Removal of Kernkraftwerk Niederaichbach (KKN) **203A**

KW

NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 **252A**

L

Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry **140A**

La

F 019-2(14) Durango - South La Plata County Final Environmental Impact Statement **45A**

PERMUTED TITLE INDEX

La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel 50A

Laboratories

Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA 260A

Laboratory

Decontamination and Decommissioning Plan for the Argonne National Laboratory Research Reactor (CP-5) 100A

Assay Instrumentation Support for an Electropolishing Facility at Pacific Northwest Laboratory 39A

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983 74A

Environmental Monitoring at Argonne National Laboratory - Annual Report for 1982 85A

Comparison of Radon Diffusion Coefficients Measured by Transient-Diffusion and Steady-State Laboratory Methods 93A

Lake

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 15A

Fact Sheet on Salt Lake City Uranium Mill Tailings Site, Salt Lake City, Utah - Draft Environmental Impact Statement Summary 221A

Seismic and Radon Monitoring of Algocen Site at Elliot Lake 58A

Radon and Radon Daughter Evaluations at an Inactive Uranium Mill Tailings Pile and at Selected Locations in Salt Lake City, Utah 59A

Land

Low-Level Nuclear Waste Shallow Land Burial Trench Isolation 118A

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 174A

A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches 189A

Licensing Requirements for Land Disposal of Radioactive Waste 235A

Assessment of Microbial Processes on Radionuclide Mobility in Shallow Land Burial 40A

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 49A

Radionuclide Distribution and Migration Mechanisms at Shallow Land Burial Sites 95A

Landfill

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 15A

Landscape

A Landscape of Nuclear Tombs 146A

Laser

Consolidated Fuel Reprocessing Program - Conceptual Study for a Laser Disassembly Development Unit (Fast Reactors) 32A

Launch

NRC Denies Trojan Decommissioning Alliance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344 253A

Layer

Electrochemical Polishing with the Removal of a Small Layer of Metal 72A

PERMUTED TITLE INDEX

Leachability
The Leachability of Radium-226 from Uranium Mill Waste Solids and River Sediments 197A
Leaching
Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment 132A
Leaks
New Mexico Uranium Mill Closed After Waste Leaks at Dumpsite 137A
Legacy
Legacy of Uranium Tailings 41A
Letter
Three Mile Island Nuclear Station, Unit 1 - Letter on the Delay in the DHR Pump Disassembly 123A
License
Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 155A
Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6 161A
Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities 167A
Peach Bottom Atomic Power Station, Unit 1 - Provisional Operating License, Amendment 1 172A
Enrico Fermi Atomic Power Plant, Unit 1 - License DPR-9, Technical Specifications, Proposed Change 176A
Saxton Nuclear Experimental Reactor - License DPR-4, Technical Specifications, Proposed Change No. 51 195A
NRC Revokes General License Allowing Possession of Byproduct Material in the Form of Uranium Mill Tailings 244A
NRC Terminates License No. R-51 for Oregon State University to Dismantle AGN-201 Reactor in Corvallis, Oregon 247A
NRC Issues Uranium Mill Operators in Agreement States General License to Possess and Dispose of Mill Tailings 248A
NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 252A
Licensee
Potential Impact of Licensee Default on Cleanup of TMI-2: Technical Report 188A
Licensing
Licensing Requirements for Land Disposal of Radioactive Waste 235A
Limit
Evaluation of Geologic Materials to Limit Biological Intrusion of Low-Level Waste Site Covers 87A
Linear
Linear Shaped Charges for Nuclear Decommissioning and Decontamination 110A
Liquid
Field Solidification of Radioactive Liquid Waste 196A
Lives
Town Lives with Uranium Wastes and Fears 212A
Location
La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel 50A

PERMUTED TITLE INDEX

Locations
Radon and Radon Daughter Evaluations at an Inactive Uranium Mill Tailings Pile and at Selected Locations in Salt Lake City, Utah 59A

Logging
Abbreviated Total-Count Logging Procedures for Use in Remedial Action 82A

Longer
DOE Notifies that Baggs, Wyoming Inactive Uranium Mill Tailings Site Is No Longer Eligible for Remedial Action 226A

Louis
Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 15A

Low
Low-Level Nuclear Waste Shallow Land Burial Trench Isolation 118A
Relevance of Biotic Pathways to the Long-Term Regulation of Nuclear Waste Disposal: Topical Report on Reference Western Arid Low-Level Waste Sites 120A
Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: Topical Report on Reference Eastern Humid Low-Level Sites 121A
In Situ Stabilization of a Low-Level Radioactive Site - A Case History 124A
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 174A
Interim Report Low-Level Waste Institutional Waste Incinerator Program 209A
The Cleanup of a Low-Level Radioactive Waste Site 258A
Symposium on Low-Level Waste Disposal - Facility Design, Construction, and Operating Practices 263A
Current Practice of Incineration of Low-Level Institutional Radioactive Waste 43A
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 49A
Solution for Decontamination of Surfaces of Low Alloy Steels 6A
The 1980 State-by-State Assessment of Low-Level Radioactive Waste Shipped to Commercial Disposal Sites 62A
Nuclear Waste Disposal - Mill Tailings and Low Level Waste Risk Comparison and Criteria Development 63A
Industrial Radioactive Low-Level Waste Management in France 67A
Long-Range Low-Level Waste Management Needs 84A
Evaluation of Geologic Materials to Limit Biological Intrusion of Low-Level Waste Site Covers 87A

Luis
NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California 251A

LWBR
Nuclear Performance of the LWBR at Shippingport - 1977-1980 131A

LWR
Importance of a Number of Radionuclides During and After the Dismantling and Disposal of LWR Reactors 105A
Functioning of the Disassembly Manipulator for the Niederaichbach Nuclear Power Plant and Its Possible Applications in LWR-Type Reactors 99A

Lynchburg
NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and Dispose of Component Parts 246A

M
Joseph M. Farley Nuclear Plant, Units 1 and 2; State of Alabama, Department of Public Health's Comments on the Draft Environmental Statement 5A

PERMUTED TITLE INDEX

Maine

FERC Order in Matter of Maine Yankee Atomic Power Proposed Decommissioning Charges for 830 Megawatt Nuclear Station **68A**

Makes

Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants **220A**

NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois **241A**

NRC Makes Available Draft EIS for Proposed Decommissioning of Edgemont Uranium Mill, South Dakota **249A**

Manipulator

Functioning of the Disassembly Manipulator for the Niederaichbach Nuclear Power Plant and Its Possible Applications in LWR-Type Reactors **99A**

Manual

Inventory Sample Coincidence Counter Manual **122A**

March

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983 **74A**

Material

NRC Amends Agreement with Washington Allowing the State to Continue Regulating Byproduct Material **243A**

NRC Revokes General License Allowing Possession of Byproduct Material in the Form of Uranium Mill Tailings **244A**

NRC Invites Comments on Proposal Granting Texas Authority to Regulate Byproduct Material **245A**

NRC Invites Comments on Proposed Agreement with Washington to Permit the State to Regulate Byproduct Material **250A**

Materials

A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Radium-226 Bearing Materials **129A**

Naturally-Occurring Radioactive Materials **231A**

EPA Issues Control and Cleanup Standards for Residual Radioactive Materials at Inactive Uranium Processing Sites **232A**

Container Assessment - Corrosion Study of HLW Container Materials **4A**

Decontamination of Metallic Materials for Unrestricted Release **56A**

Evaluation of Geologic Materials to Limit Biological Intrusion of Low-Level Waste Site Covers **87A**

A Method for Measuring the Exhalation of Radon from Building Materials **90A**

Matter

FERC Order in Matter of Maine Yankee Atomic Power Proposed Decommissioning Charges for 830 Megawatt Nuclear Station **68A**

McGee

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**

Measure

Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry **140A**

Use of Particle Track Analysis to Measure Fissile Particle-Size Distributions in Contaminated Soils **64A**

PERMUTED TITLE INDEX

Measured
Comparison of Radon Diffusion Coefficients Measured by Transient-Diffusion and Steady-State Laboratory Methods 93A
Measurement
Applicability of Nuclear Track Detectors to the Measurement of Environmental Levels of Radon and Decay Products 148A
Measurement of Radon Daughters' Radioactivities by Using Single Filtering Method 35A
The Measurement of Radon Emanation Rates in a Canadian Cut and Fill Uranium Mine 36A
Field Calibration Facilities for Environmental Measurement of Radium, Thorium, and Potassium 81A
Radiation Measurement Capability for Decontamination to Unrestricted Use 83A
Measurements
An Automatic Device for Radon Activity Measurements 126A
Working Level Monitor for Radon Measurements Inside Houses 2A
Ra-226 Measurements Below Uranium Mill Tailings Piles 22A
Remedial Action Project's Technical Measurements Center - Status 60A
Measures
A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches 189A
Measuring
Modified Accumulator Method for Measuring Surface Radon Flux from a Uranium Tailings Pile 51A
A Method for Measuring the Exhalation of Radon from Building Materials 90A
Mechanisms
Radionuclide Distribution and Migration Mechanisms at Shallow Land Burial Sites 95A
Megawatt
FERC Order in Matter of Maine Yankee Atomic Power Proposed Decommissioning Charges for 830 Megawatt Nuclear Station 68A
Melt
Study of Power Distribution Over Melt Bath of Plasma Melting Furnaces Using Several Plasma Torches 98A
Melting
Dismantling, Cutting up, and Disposing of a Large-Capacity Furnace for Plutonium Melting 14A
Study of Power Distribution Over Melt Bath of Plasma Melting Furnaces Using Several Plasma Torches 98A
Merchant
Decommissioning of the Nuclear Merchant Ship "NS Otto Hahn" 103A
Metal
Design Requirements for a Metal Smelting Facility 261A
Electrochemical Polishing with the Removal of a Small Layer of Metal 72A
Effect of Electric Arc Cutting Procedures on the Properties of Processed Metal Surfaces 86A
Metallic
Decontamination of Metallic Materials for Unrestricted Release 56A
Metals
Investigation of the Technical Micronics Control (TMC) Process for Electropolishing Various Metals 109A
Electropolishing of Metals 125A

PERMUTED TITLE INDEX

DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania 225A

Meter

Instrument Evaluation Number 20 - Unit Inspections U3C Radiation Survey Meter 28A

Methodology

A Methodology for Evaluating Uranium Tailings Management Alternatives 198A

Mexico

New Mexico Uranium Mill Closed After Waste Leaks at Dumpsite 137A

Radon and Radon Progeny Concentrations in New Mexico's Uranium Mining and Milling District 27A

Microbial

Assessment of Microbial Processes on Radionuclide Mobility in Shallow Land Burial 40A

Micronics

Investigation of the Technical Micronics Control (TMC) Process for Electropolishing Various Metals 109A

Middlesex

DOE Certifies Radiological Condition of Five Properties Associated with the Former Middlesex Sampling Plant, Middlesex and Piscataway Counties, New Jersey 228A

Migration

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 174A

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 49A

Radionuclide Distribution and Migration Mechanisms at Shallow Land Burial Sites 95A

Mile

NRC Plan for Cleanup Operations at Three Mile Island Unit 2 104A

Three Mile Island Nuclear Station, Unit 1 - Letter on the Delay in the DHR Pump Disassembly 123A

Update on the Impact of Federal R and D Funding on Three Mile Island Cleanup Costs 147A

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 1, Final Staff Report 236A

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 2 - Final Staff Report 237A

Post-Accident Cleanup of Radioactivity at Three Mile Island 26A

Three Mile Island Unit 2 Core Status Summary: A Basis for Tool Development for Reactor Disassembly and Defueling 46A

Impact of Federal R and D Funding on Three Mile Island Cleanup Costs 79A

Three Mile Island Unit 2: Decontamination Program 9A

Milling

Management of Wastes from Uranium Mining and Milling 112A

A Stream Survey in the Uranium Mining and Milling Area of the Colorado Plateau 128A

The Regional Economic and Environmental Impacts of the Uranium Mining and Milling Industry 183A

Radon and Radon Progeny Concentrations in New Mexico's Uranium Mining and Milling District 27A

Mills

NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings 238A

PERMUTED TITLE INDEX

Mine
Mine Tailings: Pre-Reactor Waste 156A
Use of Colorado Mine Waste and Mill Tailings in Ceramic Products 19A
The Measurement of Radon Emanation Rates in a Canadian Cut and Fill Uranium Mine 36A

Mining
Management of Wastes from Uranium Mining and Milling 112A
A Stream Survey in the Uranium Mining and Milling Area of the Colorado Plateau 123A
The Regional Economic and Environmental Impacts of the Uranium Mining and Milling Industry 183A
EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request 233A
Radon and Radon Progeny Concentrations in New Mexico's Uranium Mining and Milling District 27A

Mirror
Reagan's TMI Cleanup: A Smoke and Mirror Trick 182A

Missouri
Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 15A

Mixtures
A Method for Determining Allowable Residual Contamination Levels of Radionuclide Mixtures in Soil 130A

Mobile
A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Radium-226 Bearing Materials 129A

Mobility
Assessment of Microbial Processes on Radionuclide Mobility in Shallow Land Burial 40A

Moisture
Research Summary: Characterization of Radionuclide and Moisture Movement Through Arid Region Sediments 78A

Monitor
Integrating Working Level Monitor EML Type TF-11 102A
Working Level Monitor for Radon Measurements Inside Houses 2A

Monitoring
Soil Monitoring Instrumentation 255A
Seismic and Radon Monitoring of Algocen Site at Elliot Lake 58A
Environmental Monitoring at Argonne National Laboratory Annual Report for 1982 85A

Monthly
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, October 1974 151A
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, September 1974 153A
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, August 1974 157A
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, November 1974 160A
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, December 1974 170A

Monticello

PERMUTED TITLE INDEX

Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah **217A**
Supplement to the Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah **219A**

Move

Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium **191A**

Movement

Research Summary: Characterization of Radionuclide and Moisture Movement Through Arid Region Sediments **78A**

N

Regulatory Bodies Ready for N-Plant Retirements **185A**

National

Decontamination and Decommissioning Plan for the Argonne National Laboratory Research Reactor (CP-5) **100A**
National DOE Plan for the Recovery and Utilization of Byproducts from the Defense Nuclear Fuel Cycle **143A**
Environmental Monitoring at Argonne National Laboratory - Annual Report for 1982 **85A**

Naturally

Naturally-Occurring Radioactive Materials **231A**

Naval

Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants **220A**

Navy

Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants **220A**

Neglected

Uranium Mill Tailings: Congress Addresses a Long-Neglected Problem **33A**

Neighborhood

Taking Apart Your Neighborhood Nuke **190A**

Niagara

DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site **227A**

Niederaichbach

Decommissioning of Niederaichbach Power Plant (KKN) - Containment and Removal **106A**
Investigation of Techniques for Disassembly of the Biological Shield of the Decommissioned Power Plant at Niederaichbach (KKN) **13A**
Radiological Aspects in the Planning of Disassembly and Removal of Kernkraftwerk Niederaichbach (KKN) **203A**
Functioning of the Disassembly Manipulator for the Niederaichbach Nuclear Power Plant and Its Possible Applications in LWR-Type Reactors **99A**

North

NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 **252A**

Northwest

Assay Instrumentation Support for an Electropolishing Facility at Pacific Northwest Laboratory **39A**
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983 **74A**

PERMUTED TITLE INDEX

Notice

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply **162A**

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply **163A**

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Violation and Reply **166A**

Notices

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply **168A**

Notification

Peach Bottom Atomic Power Station, Unit 1 - Notification of Final Reactor Shutdown **150A**

Enrico Fermi Atomic Power Plant, Unit 1 - Notification That Decommissioning is Essentially Complete **179A**

Notified

NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota **239A**

Notifies

DOE Notifies that Baggs, Wyoming Inactive Uranium Mill Tailings Site Is No Longer Eligible for Remedial Action **226A**

November

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, November 1974 **160A**

NRC

NRC Plan for Cleanup Operations at Three Mile Island Unit 2 **104A**

TMI Cleanup is Imperative Says NRC Staff **210A**

NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings **238A**

NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota **239A**

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**

NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois **241A**

NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility **242A**

NRC Amends Agreement with Washington Allowing the State to Continue Regulating Byproduct Material **243A**

NRC Revokes General License Allowing Possession of Byproduct Material in the Form of Uranium Mill Tailings **244A**

NRC Invites Comments on Proposal Granting Texas Authority to Regulate Byproduct Material **245A**

NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and Dispose of Component Parts **246A**

NRC Terminates License No. R-51 for Oregon State University to Dismantle AGN-201 Reactor in Corvallis, Oregon **247A**

NRC Issues Uranium Mill Operators in Agreement States General License to Possess and Dispose of Mill Tailings **248A**

PERMUTED TITLE INDEX

NRC Makes Available Draft EIS for Proposed Decommissioning of Edgemont Uranium Mill, South Dakota **249A**
NRC Invites Comments on Proposed Agreement with Washington to Permit the State to Regulate Byproduct Material **250A**
NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California **251A**
NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 **252A**
NRC Denies Trojan Decommissioning Alliance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344 **253A**
Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup **257A**

NS

Decommissioning of the Nuclear Merchant Ship "NS Otto Hahn" **103A**
Experience in the Disassembly and Packaging of Contaminated Components of the NS Otto Hahn **142A**
Experimental and Theoretical Time Period Investigations of the Dynamics of the Second Core of the NS Otto Hahn Reactor **71A**

Nuke

Taking Apart Your Neighborhood Nuke **190A**

Numbers

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply **168A**

Numerical

Computer Prediction of Subsurface Radionuclide Transport - An Adaptive Numerical Method **135A**

Obispo

NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California **251A**

October

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, October 1974 **151A**

Offsite

Use of Gamma-Ray Detection Instrumentation in ORNL Offsite Radiological Survey Program **12A**

Oldest

Oldest Nuclear Generator Retired from Service **144A**

Operated

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites **174A**
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites **49A**

Operating

Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 **155A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974 **171A**
Peach Bottom Atomic Power Station, Unit 1 - Provisional Operating License, Amendment

PERMUTED TITLE INDEX

1 **172A**
Enrico Fermi Atomic Power Plant, Unit 1 - Report EF-120, Quarterly Operating Report, April to June 1974 **177A**
Symposium on Low-Level Waste Disposal - Facility Design, Construction, and Operating Practices **263A**

Operation
Vibratory Finishing for Decontamination - Pilot Scale Operation **117A**
NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings **238A**

Operational
Generalization of an Operational Experiment in Decontaminating the Outer Surfaces of the Nuclear Plant Equipment and Buildings **11A**

Operations
NRC Plan for Cleanup Operations at Three Mile Island Unit 2 **104A**
Contamination Stabilizing Coatings for D&D Operations **116A**
Peach Bottom Atomic Power Station, Unit 1 - Operations Requalification Program, Proposed Changes **152A**

Operator
Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor **154A**
Peach Bottom Atomic Power Station, Unit 1 - Proposed Changes in Operator Requalification Program **159A**

Operators
NRC Issues Uranium Mill Operators in Agreement States General License to Possess and Dispose of Mill Tailings **248A**

Optimization
Optimization of Decontamination Strategy for CANDU-PHW Reactors **259A**

Order
Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 **155A**
Elk River Reactor - Order Authorizing Dismantling of Facility **215A**
Elk River Reactor - Condition for Action Prior to Issuance of Dismantling Order **218A**
NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility **242A**
NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California **251A**
NRC Denies Trojan Decommissioning Alliance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344 **253A**
FERC Order in Matter of Maine Yankee Atomic Power Proposed Decommissioning Charges for 830 Megawatt Nuclear Station **68A**
Status of DOE Order 5820 **96A**

Orders
Atomics International Facilities with Current Dismantling Orders **10A**
California Orders Probe on Funds to Dismantle Nuclear Power Plants **30A**

Oregon
NRC Terminates License No. R-51 for Oregon State University to Dismantle AGN-201 Reactor in Corvallis, Oregon **247A**

ORNL
Use of Gamma-Ray Detection Instrumentation in ORNL Offsite Radiological Survey Program **12A**

PERMUTED TITLE INDEX

Otto

Decommissioning of the Nuclear Merchant Ship "NS Otto Hahn" **103A**

Experience in the Disassembly and Packaging of Contaminated Components of the NS Otto Hahn **142A**

Experimental and Theoretical Time Period Investigations of the Dynamics of the Second Core of the NS Otto Hahn Reactor **71A**

Outer

Generalization of an Operational Experiment in Decontaminating the Outer Surfaces of the Nuclear Plant Equipment and Buildings **11A**

Oxide

Southwest Experimental Fast Oxide Reactor - Request for Authority to Dismantle Facility **80A**

PA

Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA **260A**

Pacific

NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility **242A**

Assay Instrumentation Support for an Electropolishing Facility at Pacific Northwest Laboratory **39A**

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983 **74A**

Packaging

Experience in the Disassembly and Packaging of Contaminated Components of the NS Otto Hahn **142A**

Concepts for Packaging Radioactive Waste Generated by Decommissioning of Nuclear Power Reactors **65A**

Page

NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois **241A**

Particle

Use of Particle Track Analysis to Measure Fissile Particle-Size Distributions in Contaminated Soils **64A**

Pathways

Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: A Report on Tasks 1 and 2 of Phase I **119A**

Relevance of Biotic Pathways to the Long-Term Regulation of Nuclear Waste Disposal: Topical Report on Reference Western Arid Low-Level Waste Sites **120A**

Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: Topical Report on Reference Eastern Humid Low-Level Sites **121A**

Peach

Peach Bottom Atomic Power Station, Unit 1 - Notification of Final Reactor Shutdown **150A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, October 1974 **151A**

Peach Bottom Atomic Power Station, Unit 1 - Operations Requalification Program, Proposed Changes **152A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, September

PERMUTED TITLE INDEX

1974 **153A**
Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor **154A**
Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 **155A**
Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor **156A**
Peach Bottom Atomic Power Station Units 1, 2, and 3 - Monthly Data Tables, August 1974 **157A**
Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Plan and Safety Analysis Report **158A**
Peach Bottom Atomic Power Station, Unit 1 - Proposed Changes in Operator Requalification Program **159A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, November 1974 **160A**
Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6 **161A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply **162A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply **163A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 78-01, Decommissioning Activities **164A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-05, Routine **165A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Violation and Reply **166A**
Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities **167A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply **168A**
Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Report No. 3, July 31 to December 31, 1976 **169A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, December 1974 **170A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974 **171A**
Peach Bottom Atomic Power Station, Unit 1 - Provisional Operating License, Amendment 1 **172A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2 **42A**
Peach Bottom Decommissioning and Component Removal **97A**

Pennsylvania

DOE Will Decommission Shippingport Atomic Power Station in Shippingport, Pennsylvania Following Defueling of Reactor **224A**
DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**
DOE Will Prepare EIS for Disposing Uranium Mill Tailings Near Canonsburg, Pennsylvania **230A**

PERMUTED TITLE INDEX

Permanent

Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants **220A**

Permit

NRC Invites Comments on Proposed Agreement with Washington to Permit the State to Regulate Byproduct Material **250A**

Petition

NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings **238A**

NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility **242A**

Phase

Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: A Report on Tasks 1 and 2 of Phase I **119A**

PHW

Optimization of Decontamination Strategy for CANDU-PHW Reactors **259A**

Pile

Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium **191A**

Modified Accumulator Method for Measuring Surface Radon Flux from a Uranium Tailings Pile **51A**

Chemical and Radioisotope Stratification in an Abandoned Uranium Tailings Pile **52A**

Radon and Radon Daughter Evaluations at an Inactive Uranium Mill Tailings Pile and at Selected Locations in Salt Lake City, Utah **59A**

Piles

Ra-226 Measurements Below Uranium Mill Tailings Piles **22A**

Pilgrim

Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 1 **16A**

Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 2 **17A**

Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 3 **18A**

Pilot

Vibratory Finishing for Decontamination - Pilot Scale Operation **117A**

Pipe

Remote Cutting, Fitup, and Welding for In-Plant Pipe Repairs **91A**

Piscataway

DOE Certifies Radiological Condition of Five Properties ssociated with the Former Middlesex Sampling Plant, Middlesex and Piscataway Counties, New Jersey **228A**

Plan

Decontamination and Decommissioning Plan for the Argonne National Laboratory Research Reactor (CP-5) **100A**

NRC Plan for Cleanup Operations at Three Mile Island Unit 2 **104A**

National DOE Plan for the Recovery and Utilization of Byproducts from the Defense Nuclear Fuel Cycle **143A**

Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Plan and Safety Analysis Report **158A**

NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota **239A**

Use Plan for Demonstration Radioactive Waste Incinerator **44A**

Planning

Radiological Aspects in the Planning of Disassembly and Removal of Kernkraftwerk Niederaichbach (KKN) **203A**

PERMUTED TITLE INDEX

Plans
NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California 251A

Plasma
The Plasma Gun and Its Applications 113A
Study of Power Distribution Over Melt Bath of Plasma Melting Furnaces Using Several Plasma Torches 98A

Plata
F 019-2(14) Durango - South La Plata County Final Environmental Impact Statement 45A

Plate
Cooling Off a Hot Plate 262A

Plateau
A Stream Survey in the Uranium Mining and Milling Area of the Colorado Plateau 128A

Plutonium
Dismantling, Cutting up, and Disposing of a Large-Capacity Furnace for Plutonium Melting 14A
Sectioning Techniques for Plutonium Contaminated Gloveboxes 70A

Policy
Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup 257A

Polishing
Electrochemical Polishing with the Removal of a Small Layer of Metal 72A
Electrolytic Polishing Bath for Stainless Steel 76A

Pollutants
Research for the Control of Radioactive Pollutants 213A

Polytechnic
NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California 251A

Pool
NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and Dispose of Component Parts 246A

Portland
NRC Denies Trojan Decommissioning Alliance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344 253A

Possess
NRC Issues Uranium Mill Operators in Agreement States General License to Possess and Dispose of Mill Tailings 248A

Possession
NRC Revokes General License Allowing Possession of Byproduct Material in the Form of Uranium Mill Tailings 244A

Post
Post-Accident Cleanup of Radioactivity at Three Mile Island 26A

Potassium
Field Calibration Facilities for Environmental Measurement of Radium, Thorium, and Potassium 81A

Potential
Potential Impact of Licensee Default on Cleanup of TMI-2: Technical Report 188A

PERMUTED TITLE INDEX

Power

Residual Radioactivity Assessments in Nuclear Power Plants: Concentrations, Distributions, and Inventories 1A
Decommissioning of Niederaichbach Power Plant (KKN) - Containment and Removal 106A
Investigation of Techniques for Disassembly of the Biological Shield of the Decommissioned Power Plant at Niederaichbach (KKN) 13A
Environmental Surveillance Program of the Decommissioned Hallam Nuclear Power Facility 133A
Decommissioning of Nuclear Power Plants 134A
Peach Bottom Atomic Power Station, Unit 1 - Notification of Final Reactor Shutdown 150A
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, October 1974 151A
Peach Bottom Atomic Power Station, Unit 1 - Operations Requalification Program, Proposed Changes 152A
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, September 1974 153A
Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor 154A
Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 155A
Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor 156A
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, August 1974 157A
Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Plan and Safety Analysis Report 158A
Peach Bottom Atomic Power Station, Unit 1 - Proposed Changes in Operator Requalification Program 159A
Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 1 16A
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, November 1974 160A
Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6 161A
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply 162A
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply 163A
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 78-01, Decommissioning Activities 164A
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-05, Routine 165A
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Violation and Reply 166A
Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities 167A
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply 168A
Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Report No. 3, July 31 to December 31, 1976 169A

PERMUTED TITLE INDEX

Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 2 **17A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, December 1974 **170A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974 **171A**
Peach Bottom Atomic Power Station, Unit 1 - Provisional Operating License, Amendment 1 **172A**
Enrico Fermi Atomic Power Plant, Unit 1 - Annual Decommissioned Report EF-122, July 1, 1975 to June 30, 1976 **175A**
Enrico Fermi Atomic Power Plant, Unit 1 - License DPR-9, Technical Specifications, Proposed Change **176A**
Enrico Fermi Atomic Power Plant, Unit 1 - Report EF-120, Quarterly Operating Report, April to June 1974 **177A**
Enrico Fermi Atomic Power Plant, Unit 1 - IE Inspection Report No. 75-01 **178A**
Enrico Fermi Atomic Power Plant, Unit 1 - Notification That Decommissioning is Essentially Complete **179A**
Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 3 **18A**
Enrico Fermi Atomic Power Plant, Unit 1 - Additional Information on Decommissioning **180A**
Boiling Nuclear Superheater Power Station Decommissioning - Final Report **181A**
Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control **200A**
Economics of Decontamination of Nuclear Power Plants **202A**
Enrico Fermi Atomic Power Plant, Unit 1 - Request for Retirement Schedule **216A**
DOE Will Decommission Shippingport Atomic Power Station in Shippingport, Pennsylvania Following Defueling of Reactor **224A**
California Orders Probe on Funds to Dismantle Nuclear Power Plants **30A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2 **42A**
Concepts for Packaging Radioactive Waste Generated by Decommissioning of Nuclear Power Reactors **65A**
FERC Order in Matter of Maine Yankee Atomic Power Proposed Decommissioning Charges for 830 Megawatt Nuclear Station **68A**
Study of Power Distribution Over Melt Bath of Plasma Melting Furnaces Using Several Plasma Torches **98A**
Functioning of the Disassembly Manipulator for the Niederaichbach Nuclear Power Plant and Its Possible Applications in LWR-Type Reactors **99A**

Practice
Current Practice of Incineration of Low-Level Institutional Radioactive Waste **43A**

Practices
Symposium on Low-Level Waste Disposal - Facility Design, Construction, and Operating Practices **263A**

Pre
Mine Tailings: Pre-Reactor Waste **186A**

Prediction
Computer Prediction of Subsurface Radionuclide Transport - An Adaptive Numerical Method **135A**

Preliminary
DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**

PERMUTED TITLE INDEX

Prepare

DOE to Prepare EIS for Inactive Uranium Mill Tailings Site Near Grand Junction, Colorado - Comments Invited 223A

DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania 225A

DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site 227A

DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981 229A

DOE Will Prepare EIS for Disposing Uranium Mill Tailings Near Canonsburg, Pennsylvania 230A

Pressure

La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel 50A

Prior

Elk River Reactor - Condition for Action Prior to Issuance of Dismantling Order 218A

Probe

California Orders Probe on Funds to Dismantle Nuclear Power Plants 30A

Processed

Effect of Electric Arc Cutting Procedures on the Properties of Processed Metal Surfaces 86A

Products

Applicability of Nuclear Track Detectors to the Measurement of Environmental Levels of Radon and Decay Products 148A

Use of Colorado Mine Waste and Mill Tailings in Ceramic Products 19A

Characterization of TMI-Type Wastes and Solid Products 208A

Progeny

Radon and Radon Progeny Concentrations in New Mexico's Uranium Mining and Milling District 27A

Progress

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983 74A

Progressed

Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor 156A

Project

Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah 217A

Supplement to the Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah 219A

Cleanup Completed at "Project Gnome" Site 222A

The Uranium Mill Tailings Remedial Actions Project (UMTRAP) 31A

La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel 50A

Remedial Action Project's Technical Measurements Center - Status 60A

Promise

Water Cannon Shows Promise for Gas Utility Trenching 38A

PERMUTED TITLE INDEX

Proposal

NRC Invites Comments on Proposal Granting Texas Authority to Regulate Byproduct Material 245A

Proposes

NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California 251A

Provisional

Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 155A

Peach Bottom Atomic Power Station, Unit 1 - Provisional Operating License, Amendment 1 172A

Public

Costs of Decommissioning as Reported to the Public to Date 204A

Joseph M. Farley Nuclear Plant, Units 1 and 2; State of Alabama, Department of Public Health's Comments on the Draft Environmental Statement 5A

Pump

Three Mile Island Nuclear Station, Unit 1 - Letter on the Delay in the DHR Pump Disassembly 123A

Radiation Exposures Associated with Dismantling a Radium-Radon Pump 20A

Pursuant

EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request 233A

Quarterly

Enrico Fermi Atomic Power Plant, Unit 1 - Report EF-120, Quarterly Operating Report, April to June 1974 177A

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983 74A

R

Update on the Impact of Federal R and D Funding on Three Mile Island Cleanup Costs 147A

NRC Terminates License No. R-51 for Oregon State University to Dismantle AGN-201 Reactor in Corvallis, Oregon 247A

NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 252A

Impact of Federal R and D Funding on Three Mile Island Cleanup Costs 79A

Ra

Ra-226 Measurements Below Uranium Mill Tailings Piles 22A

Radiation

A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Radium-226 Bearing Materials 129A

Radiation Exposures Associated with Dismantling a Radium-Radon Pump 20A

Instrument Evaluation Number 20 - Unit Inspections U3C Radiation Survey Meter 28A

Radiation Measurement Capability for Decontamination to Unrestricted Use 83A

Radioactive

Application of a Risk Assessment Method for Radioactive Waste Management 107A

In Situ Stabilization of a Low-Level Radioactive Site - A Case History 124A

Properties of Radioactive Wastes and Waste Containers 127A

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated

PERMUTED TITLE INDEX

Low-Level Radioactive Waste Disposal Sites 174A
Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium 191A
Field Solidification of Radioactive Liquid Waste 196A
Research for the Control of Radioactive Pollutants 213A
DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site 227A
Naturally-Occurring Radioactive Materials 231A
EPA Issues Control and Cleanup Standards for Residual Radioactive Materials at inactive Uranium Processing Sites 232A
Licensing Requirements for Land Disposal of Radioactive Waste 235A
The Cleanup of a Low-Level Radioactive Waste Site 258A
Current Practice of Incineration of Low-Level Institutional Radioactive Waste 43A
Use Plan for Demonstration Radioactive Waste Incinerator 44A
Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites 49A
Deadline is Set for Cleanup at Radioactive Factory Site 53A
The 1980 State-by-State Assessment of Low-Level Radioactive Waste Shipped to Commercial Disposal Sites 62A
Concepts for Packaging Radioactive Waste Generated by Decommissioning of Nuclear Power Reactors 65A
Industrial Radioactive Low-Level Waste Management in France 67A

Radioactivities

Measurement of Radon Daughters' Radioactivities by Using Single Filtering Method 35A

Radioactivity

Residual Radioactivity Assessments in Nuclear Power Plants: Concentrations, Distributions, and Inventories 1A
Post-Accident Cleanup of Radioactivity at Three Mile Island 26A

Radioisotope

Chemical and Radioisotope Stratification in an Abandoned Uranium Tailings Pile 52A

Radiological

Use of Gamma-Ray Detection Instrumentation in ORNL Offsite Radiological Survey Program 12A
Soil-to-Plant Concentration Factors for Radiological Assessments 138A
Radiological Survey of the West Lake Landfill, St. Louis County, Missouri 15A
Radiological Aspects in the Planning of Disassembly and Removal of Kernkraftwerk Niederaichbach (KKN) 203A
DOE Certifies Radiological Condition of Five Properties Associated with the Former Middlesex Sampling Plant, Middlesex and Piscataway Counties, New Jersey 228A
An Aerial Radiological Survey of the U.S. Department of Energy's Hanford Site, Richland, Washington 69A

Radionuclide

A Method for Determining Allowable Residual Contamination Levels of Radionuclide Mixtures in Soil 130A
Computer Prediction of Subsurface Radionuclide Transport - An Adaptive Numerical Method 135A
Assessment of Microbial Processes on Radionuclide Mobility in Shallow Land Burial 40A
Research Summary: Characterization of Radionuclide and Moisture Movement Through Arid Region Sediments 78A
Radionuclide Distribution and Migration Mechanisms at Shallow Land Burial Sites 95A

PERMUTED TITLE INDEX

Radionuclides

Importance of a Number of Radionuclides During and After the Dismantling and Disposal of LWR Reactors **105A**

Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry **140A**

Radium

Radium-226 in Plants and Substrates at Inactive Uranium Mill Sites in the Southwestern United States **114A**

Radium-226 in Vegetation and Substrates at Inactive Uranium Mill Sites **115A**

A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Radium-226 Bearing Materials **129A**

Disposal of Uranium Mill Tailings: A Study of Leaching of Radium-226 and Its Fate in the Environment **132A**

The Leachability of Radium-226 from Uranium Mill Waste Solids and River Sediments **197A**

Radiation Exposures Associated with Dismantling a Radium-Radon Pump **20A**

Determination of Radium Removal Efficiencies in Water Treatment Processes **23A**

Field Calibration Facilities for Environmental Measurement of Radium, Thorium, and Potassium **81A**

Radon

An Automatic Device for Radon Activity Measurements **126A**

Effect of Time-Dependent Radon Diffusion on Experimental Determinations **145A**

Applicability of Nuclear Track Detectors to the Measurement of Environmental Levels of Radon and Decay Products **148A**

Working Level Monitor for Radon Measurements Inside Houses **2A**

Radiation Exposures Associated with Dismantling a Radium-Radon Pump **20A**

Radon Diffusion Through Uranium Tailings and Earth Cover **205A**

Radon Diffusion Through Uranium Tailings and Earth Cover **206A**

Radon and Radon Progeny Concentrations in New Mexico's Uranium Mining and Milling District **27A**

Emission of Radon from Soil **3A**

Measurement of Radon Daughters' Radioactivities by Using Single Filtering Method **35A**

The Measurement of Radon Emanation Rates in a Canadian Cut and Fill Uranium Mine **36A**

Modified Accumulator Method for Measuring Surface Radon Flux from a Uranium Tailings Pile **51A**

Seismic and Radon Monitoring of Algocen Site at Elliot Lake **58A**

Radon and Radon Daughter Evaluations at an Inactive Uranium Mill Tailings Pile and at Selected Locations in Salt Lake City, Utah **59A**

Error in Working-Level Hour: Calculations When the Alpha Energy From the Radon Daughters is not Discriminated **61A**

A Method for Measuring the Exhalation of Radon from Building Materials **90A**

Comparison of Radon Diffusion Coefficients Measured by Transient-Diffusion and Steady-State Laboratory Methods **93A**

Radwaste

Radwaste Concerns During Nuclear Plant Decommissioning **77A**

Raleigh

NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-1.1 **252A**

PERMUTED TITLE INDEX

Rare

DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**

NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**

NRC Makes Available Draft EIS on Decommissioning of Rare Earths Facility in Du Page County, Illinois **241A**

Rates

The Measurement of Radon Emanation Rates in a Canadian Cut and Fill Uranium Mine **36A**

Ray

Use of Gamma-Ray Detection Instrumentation in ORNL Offsite Radiological Survey Program **12A**

A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Radium-226 Bearing Materials **129A**

Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry **140A**

A Gamma-Ray System for Field Analysis of Tailings and Soil **264A**

Reactor

Decontamination and Decommissioning Plan for the Argonne National Laboratory Research Reactor (CP-5) **100A**

Sodium Reactor Experiment Nuclear Facility Decommissioning **101A**

Reactor Vessel Cutting Demonstration **111A**

Peach Bottom Atomic Power Station, Unit 1 - Notification of Final Reactor Shutdown **150A**

Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor **154A**

Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor **156A**

Mine Tailings: Pre-Reactor Waste **186A**

Saxton Reactor - Correspondence on Status of Decommissioning **192A**

Saxton Reactor - RO Inspection Report No. 73-01 and Correspondence **193A**

Saxton Nuclear Experimental Reactor - Annual Report 1974 and Report on the Decommissioned Status of the Facility **194A**

Saxton Nuclear Experimental Reactor - License DPR-4, Technical Specifications, Proposed Change No. 51 **195A**

Elk River Reactor - Order Authorizing Dismantling of Facility **215A**

Elk River Reactor - Condition for Action Prior to Issuance of Dismantling Order **213A**

Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants **220A**

DOE Will Decommission Shippingport Atomic Power Station in Shippingport, Pennsylvania Following Defueling of Reactor **224A**

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 1, Final Staff Report **236A**

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 2 - Final Staff Report **237A**

NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and

PERMUTED TITLE INDEX

Dispose of Component Parts **246A**
NRC Terminates License No. R-51 for Oregon State University to Dismantle AGN-201 Reactor in Corvallis, Oregon **247A**
NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California **251A**
NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 **252A**
Reactor Decommissioning **29A**
Three Mile Island Unit 2 Core Status Summary: A Basis for Tool Development for Reactor Disassembly and Defueling **46A**
Dismantling a Nuclear Reactor - A First **47A**
La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel **50A**
Experimental and Theoretical Time Period Investigations of the Dynamics of the Second Core of the NS Otto Hahn Reactor **71A**
Final Shutdown of Research Reactor **73A**
Southwest Experimental Fast Oxide Reactor - Request for Authority to Dismantle Facility **80A**

Reactors
Importance of a Number of Radionuclides During and After the Dismantling and Disposal of LWR Reactors **105A**
Nuclear Reactors - Critical for the First Time in 1978, Nuclear Reactors - Decommissioning in 1978 **139A**
Optimization of Decontamination Strategy for CANDU-PHW Reactors **259A**
Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA **260A**
Consolidated Fuel Reprocessing Program - Conceptual Study for a Laser Disassembly Development Unit (Fast Reactors) **32A**
Concepts for Packaging Radioactive Waste Generated by Decommissioning of Nuclear Power Reactors **65A**
Decommissioning Commercial Reactors **75A**
Functioning of the Disassembly Manipulator for the Niederaichbach Nuclear Power Plant and Its Possible Applications in LWR-Type Reactors **99A**

Ready
Regulatory Bodies Ready for N-Plant Retirements **185A**

Reagan
Reagan's TMI Cleanup: A Smoke and Mirror Trick **182A**

Receives
NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility **242A**

Reflect
Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor **154A**

Region
Research Summary: Characterization of Radionuclide and Moisture Movement Through Arid Region Sediments **78A**

PERMUTED TITLE INDEX

Regional

The Regional Economic and Environmental Impacts of the Uranium Mining and Milling Industry **183A**

Regulate

NRC Invites Comments on Proposal Granting Texas Authority to Regulate Byproduct Material **245A**

NRC Invites Comments on Proposed Agreement with Washington to Permit the State to Regulate Byproduct Material **250A**

Regulating

NRC Amends Agreement with Washington Allowing the State to Continue Regulating Byproduct Material **243A**

Regulation

Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: A Report on Tasks 1 and 2 of Phase I **119A**

Relevance of Biotic Pathways to the Long-Term Regulation of Nuclear Waste Disposal: Topical Report on Reference Western Arid Low-Level Waste Sites **120A**

Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: Topical Report on Reference Eastern Humid Low-Level Sites **121A**

Regulations

NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings **238A**

Regulatory

Regulatory Bodies Ready for N-Plant Retirements **185A**

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983 **74A**

Release

Decontamination of Metallic Materials for Unrestricted Release **56A**

Relevance

Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: A Report on Tasks 1 and 2 of Phase I **119A**

Relevance of Biotic Pathways to the Long-Term Regulation of Nuclear Waste Disposal: Topical Report on Reference Western Arid Low-Level Waste Sites **120A**

Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: Topical Report on Reference Eastern Humid Low-Level Sites **121A**

Remain

Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup **257A**

Remedial

A Conceptual Facility Designed for Remedial Action Wastes **149A**

Remedial Action for Canonsburg **173A**

Grand Junction, Colorado Remedial Action Program **214A**

DOE Notifies that Baggs, Wyoming Inactive Uranium Mill Tailings Site Is No Longer Eligible for Remedial Action **226A**

DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981 **229A**

EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request **233A**

EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Ura-

PERMUTED TITLE INDEX

nium Processing Sites to June 15, 1981 - Hearing May 14-15, 1981 **234A**
The Uranium Mill Tailings Remedial Actions Project (UMTRAP) **31A**
Remedial Action Project's Technical Measurements Center - Status **60A**
Abbreviated Total-Count Logging Procedures for Use in Remedial Action **82A**

Remote
Remote Cutting, Fitup, and Welding for In-Plant Pipe Repairs **91A**

Removed
Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor **156A**

Repairs
Remote Cutting, Fitup, and Welding for In-Plant Pipe Repairs **91A**

Reply
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply **162A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply **163A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Violation and Reply **166A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply **168A**

Reported
Costs of Decommissioning as Reported to the Public to Date **204A**

Reprocess
Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium **191A**

Reprocessing
Consolidated Fuel Reprocessing Program - Conceptual Study for a Laser Disassembly Development Unit (Fast Reactors) **32A**
Reprocessing, Decontamination and Decommissioning Waste Management at Eurochemic **55A**

Requalification
Peach Bottom Atomic Power Station, Unit 1 - Operations Requalification Program, Proposed Changes **152A**
Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor **154A**
Peach Bottom Atomic Power Station, Unit 1 - Proposed Changes in Operator Requalification Program **159A**

Request
Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor **154A**
Enrico Fermi Atomic Power Plant, Unit 1 - Request for Retirement Schedule **216A**
EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request **233A**
NRC Denies Trojan Decommissioning Alliance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344 **253A**
Southwest Experimental Fast Oxide Reactor - Request for Authority to Dismantle Facility **80A**

PERMUTED TITLE INDEX

Research

Decontamination and Decommissioning Plan for the Argonne National Laboratory Research Reactor (CP-5) **100A**

Research for the Control of Radioactive Pollutants **213A**

NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 **252A**

Final Shutdown of Research Reactor **73A**

Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983 **74A**

Research Summary: Characterization of Radionuclide and Moisture Movement Through Arid Region Sediments **78A**

Residual

Residual Radioactivity Assessments in Nuclear Power Plants: Concentrations, Distributions, and Inventories **1A**

A Method for Determining Allowable Residual Contamination Levels of Radionuclide Mixtures in Soil **130A**

EPA Issues Control and Cleanup Standards for Residual Radioactive Materials at Inactive Uranium Processing Sites **232A**

Residues

DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site **227A**

Retired

Oldest Nuclear Generator Retired from Service **144A**

Retirement

Enrico Fermi Atomic Power Plant, Unit 1 - Request for Retirement Schedule **216A**

Retirements

Regulatory Bodies Ready for N-Plant Retirements **185A**

Retroactive

Retroactive Insurance May Fund TMI-2 Cleanup **187A**

Review

A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches **189A**

Revokes

NRC Revokes General License Allowing Possession of Byproduct Material in the Form of Uranium Mill Tailings **244A**

Richland

An Aerial Radiological Survey of the U.S. Department of Energy's Hanford Site, Richland, Washington **69A**

Risk

Application of a Risk Assessment Method for Radioactive Waste Management **107A**

Nuclear Waste Disposal - Mill Tailings and Low Level Waste Risk Comparison and Criteria Development **63A**

River

The Leachability of Radium-226 from Uranium Mill Waste Solids and River Sediments **197A**

Elk River Reactor - Order Authorizing Dismantling of Facility **215A**

Elk River Reactor - Condition for Action Prior to Issuance of Dismantling Order **218A**

NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota **239A**

PERMUTED TITLE INDEX

RO

Saxton Reactor - RO Inspection Report No. 73-01 and Correspondence **193A**

Ron

NRC Receives Ron Guenther's Petition for Order of Decommissioning of Pacific Gas and Electric Company's Humboldt Bay Facility **242A**

Rules

Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium **191A**

Safety

Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Plan and Safety Analysis Report **158A**

Salt

Fact Sheet on Salt Lake City Uranium Mill Tailings Site, Salt Lake City, Utah - Draft Environmental Impact Statement Summary **221A**

Radon and Radon Daughter Evaluations at an Inactive Uranium Mill Tailings Pile and at Selected Locations in Salt Lake City, Utah **59A**

Sampling

DOE Certifies Radiological Condition of Five Properties Associated with the Former Middlesex Sampling Plant, Middlesex and Piscataway Counties, New Jersey **228A**

San

NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California **251A**

Saxton

Saxton Reactor - Correspondence on Status of Decommissioning **192A**

Saxton Reactor - RO Inspection Report No. 73-01 and Correspondence **193A**

Saxton Nuclear Experimental Reactor - Annual Report 1974 and Report on the Decommissioned Status of the Facility **194A**

Saxton Nuclear Experimental Reactor - License DPR-4, Technical Specifications, Proposed Change No. 51 **195A**

Says

TMI Cleanup is Imperative Says NRC Staff **210A**

Scale

Vibratory Finishing for Decontamination - Pilot Scale Operation **117A**

Scanning

A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Radium-226 Bearing Materials **129A**

Schedule

Enrico Fermi Atomic Power Plant, Unit 1 - Request for Retirement Schedule **216A**

Sectioning

Sectioning Techniques for Plutonium Contaminated Gloveboxes **70A**

Sediments

The Leachability of Radium-226 from Uranium Mill Waste Solids and River Sediments **197A**

Research Summary: Characterization of Radionuclide and Moisture Movement Through Arid Region Sediments **7CA**

Seismic

Seismic and Radon Monitoring of Algocen Site at Elliot Lake **58A**

Selected

Radon and Radon Daughter Evaluations at an Inactive Uranium Mill Tailings Pile and at Selected Locations in Salt Lake City, Utah **59A**

PERMUTED TITLE INDEX

Semi

Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974 **171A**

Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2 **42A**

September

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, September 1974 **153A**

Series

NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California **251A**

Service

Oldest Nuclear Generator Retired from Service **144A**

Set

Deadline is Set for Cleanup at Radioactive Factory Site **53A**

Shallow

Low-Level Nuclear Waste Shallow Land Burial Trench Isolation **118A**

A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches **189A**

Biobarriers Used in Shallow Burial Ground Stabilization **37A**

Assessment of Microbial Processes on Radionuclide Mobility in Shallow Land Burial **40A**

Radionuclide Distribution and Migration Mechanisms at Shallow Land Burial Sites **95A**

Shaped

Linear Shaped Charges for Nuclear Decommissioning and Decontamination **110A**

Sheet

Fact Sheet on Salt Lake City Uranium Mill Tailings Site, Salt Lake City, Utah - Draft Environmental Impact Statement Summary **221A**

Shield

Investigation of Techniques for Disassembly of the Biological Shield of the Decommissioned Power Plant at Niederaichbach (KKN) **13A**

Ship

Decommissioning of the Nuclear Merchant Ship "NS Otto Hahn" **103A**

Shipped

The 1980 State-by-State Assessment of Low-Level Radioactive Waste Shipped to Commercial Disposal Sites **62A**

Shippingport

Nuclear Performance of the LWBR at Shippingport - 1977-1980 **131A**

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control **200A**

DOE Will Decommission Shippingport Atomic Power Station in Shippingport, Pennsylvania Following Defueling of Reactor **224A**

Shows

Water Cannon Shows Promise for Gas Utility Trenching **38A**

Shut

NRC Denies Trojan Decommissioning Alliance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344 **253A**

Shutdown

Peach Bottom Atomic Power Station, Unit 1 - Notification of Final Reactor

PERMUTED TITLE INDEX

Shutdown 150A
Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor 154A
Final Shutdown of Research Reactor 73A

Single
Measurement of Radon Daughters' Radioactivities by Using Single Filtering Method 35A

Situ
In Situ Stabilization of a Low-Level Radioactive Site - A Case History 124A
In Situ Electropolishing 24A

SM
Final Step in Decommissioning of SM-1A Nuclear Plant: A Close-Out Survey 92A

Smelting
Design Requirements for a Metal Smelting Facility 261A

Smoke
Reagan's TMI Cleanup: A Smoke and Mirror Trick 182A

Sodium
Sodium Reactor Experiment Nuclear Facility Decommissioning 101A

Soil
A Method for Determining Allowable Residual Contamination Levels of Radionuclide Mixtures in Soil 130A
Soil-to-Plant Concentration Factors for Radiological Assessments 138A
Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry 140A
Soil Monitoring Instrumentation 255A
A Gamma-Ray System for Field Analysis of Tailings and Soil 264A
Emission of Radon from Soil 3A
Site Characterization of Soil in Preparation for Decontamination and Decommissioning 7A

Soils
Use of Particle Track Analysis to Measure Fissile Particle-Size Distributions in Contaminated Soils 64A

Solid
Characterization of TMI-Type Wastes and Solid Products 208A

Solidification
Field Solidification of Radioactive Liquid Waste 196A

Solids
The Leachability of Radium-226 from Uranium Mill Waste Solids and River Sediments 197A

Solution
Solution for Decontamination of Surfaces of Low Alloy Steels 6A

South
NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota 239A
NRC Makes Available Draft EIS for Proposed Decommissioning of Edgemont Uranium Mill, South Dakota 249A
F 019-2(14) Durango - South La Plata County Final Environmental Impact Statement 45A

Southwest
Southwest Experimental Fast Oxide Reactor - Request for Authority to Dismantle Facility 80A

PERMUTED TITLE INDEX

Southwestern
Radium-226 in Plants and Substrates at Inactive Uranium Mill Sites in the Southwestern United States **114A**

Spaller
Concrete Spaller **88A**

Specification
Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6 **161A**

Specifications
Enrico Fermi Atomic Power Plant, Unit 1 - License DPR-9, Technical Specifications, Proposed Change **176A**
Saxton Nuclear Experimental Reactor - License DPR-4, Technical Specifications, Proposed Change No. 51 **195A**

Spectrometry
Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry **140A**

Sponsored
Uranium Recovery Research Sponsored by the Nuclear Regulatory Commission at Pacific Northwest Laboratory - Quarterly Progress Report, January-March 1983 **74A**

SRE
SRE Fuel Decladding **54A**

St
Radiological Survey of the West Lake Landfill, St. Louis County, Missouri **15A**

Stabilization
In Situ Stabilization of a Low-Level Radioactive Site - A Case History **124A**
Biobarriers Used in Shallow Burial Ground Stabilization **37A**

Stabilize
A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches **189A**

Stabilizing
Contamination Stabilizing Coatings for D&D Operations **116A**

Stable
Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup **257A**

Staff
TMI Cleanup is Imperative Says NRC Staff **210A**
Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 1, Final Staff Report **236A**
Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 2 - Final Staff Report **237A**

Stainless
Electrolytic Polishing Bath for Stainless Steel **76A**

Standards
EPA Issues Control and Cleanup Standards for Residual Radioactive Materials at Inactive Uranium Processing Sites **232A**
EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to July 15, 1981, Pursuant to American Mining Congress Request **233A**
EPA Extends Comment Deadline on Proposed Remedial Action Standards for Inactive Uranium Processing Sites to June 15, 1981 - Hearing May 14-15, 1981 **234A**

PERMUTED TITLE INDEX

Statement

Fact Sheet on Salt Lake City Uranium Mill Tailings Site, Salt Lake City, Utah - Draft Environmental Impact Statement Summary 221A

Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup 257A

F 019-2(14) Durango - South La Plata County Final Environmental Impact Statement 45A

Joseph M. Farley Nuclear Plant, Units 1 and 2; State of Alabama, Department of Public Health's Comments on the Draft Environmental Statement 5A

Station

Three Mile Island Nuclear Station, Unit 1 - Letter on the Delay in the DHR Pump Disassembly 123A

Peach Bottom Atomic Power Station, Unit 1 - Notification of Final Reactor Shutdown 150A

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, October 1974 151A

Peach Bottom Atomic Power Station, Unit 1 - Operations Requalification Program, Proposed Changes 152A

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, September 1974 153A

Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor 154A

Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 155A

Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor 156A

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, August 1974 157A

Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Plan and Safety Analysis Report 158A

Peach Bottom Atomic Power Station, Unit 1 - Proposed Changes in Operator Requalification Program 159A

Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 1 16A

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, November 1974 160A

Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6 161A

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply 162A

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply 163A

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 78-01, Decommissioning Activities 164A

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-05, Routine 165A

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Violation and Reply 166A

Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities 167A

PERMUTED TITLE INDEX

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply **168A**
Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Report No. 3, July 31 to December 31, 1976 **169A**
Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 2 **17A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, December 1974 **170A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974 **171A**
Peach Bottom Atomic Power Station, Unit 1 - Provisional Operating License, Amendment 1 **172A**
Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 3 **18A**
Boiling Nuclear Superheater Power Station Decommissioning - Final Report **181A**
Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control **200A**
DOE Will Decommission Shippingport Atomic Power Station in Shippingport, Pennsylvania Following Defueling of Reactor **224A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2 **42A**
FERC Order in Matter of Maine Yankee Atomic Power Proposed Decommissioning Charges for 830 Megawatt Nuclear Station **68A**

Status
Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor **154A**
Saxton Reactor - Correspondence on Status of Decommissioning **192A**
Saxton Nuclear Experimental Reactor - Annual Report 1974 and Report on the Decommissioned Status of the Facility **194A**
Three Mile Island Unit 2 Core Status Summary: A Basis for Tool Development for Reactor Disassembly and Defueling **46A**
Remedial Action Project's Technical Measurements Center - Status **60A**
Status of DOE Order 5820 **96A**

Steady
Comparison of Radon Diffusion Coefficients Measured by Transient-Diffusion and Steady-State Laboratory Methods **93A**

Steam
Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control **200A**

Steel
Electrolytic Polishing Bath for Stainless Steel **76A**

Steels
Solution for Decontamination of Surfaces of Low Alloy Steels **6A**

Step
Final Step in Decommissioning of SM-1A Nuclear Plant: A Close-Out Survey **92A**

Storage
DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site **227A**

Strategy
Optimization of Decontamination Strategy for CANDU-PHW Reactors **259A**

Stratification
Chemical and Radioisotope Stratification in an Abandoned Uranium Tailings Pile **52A**

PERMUTED TITLE INDEX

Stream
A Stream Survey in the Uranium Mining and Milling Area of the Colorado Plateau **128A**

Stymie
Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium **191A**

Submarine
Navy Makes Available Draft EIS Concerning Permanent Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants **220A**

Subsidence
A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches **189A**

Substrates
Radium-226 in Plants and Substrates at Inactive Uranium Mill Sites in the Southwestern United States **114A**
Radium-226 in Vegetation and Substrates at Inactive Uranium Mill Sites **115A**

Subsurface
Computer Prediction of Subsurface Radionuclide Transport - An Adaptive Numerical Method **135A**

Sued
Susquehanna Is Sued Over Uranium Tailings **48A**

Summary
Fact Sheet on Salt Lake City Uranium Mill Tailings Site, Salt Lake City, Utah - Draft Environmental Impact Statement Summary **221A**
Three Mile Island Unit 2 Core Status Summary: A Basis for Tool Development for Reactor Disassembly and Defueling **46A**
Research Summary: Characterization of Radionuclide and Moisture Movement Through Arid Region Sediments **78A**

Superheater
Boiling Nuclear Superheater Power Station Decommissioning - Final Report **181A**

Support
Assay Instrumentation Support for an Electropolishing Facility at Pacific Northwest Laboratory **39A**

Surface
Modified Accumulator Method for Measuring Surface Radon Flux from a Uranium Tailings Pile **51A**
An Integrated Decontamination System for Surface-Contaminated TRU Waste **8A**

Surfaces
Generalization of an Operational Experiment in Decontaminating the Outer Surfaces of the Nuclear Plant Equipment and Buildings **11A**
Solution for Decontamination of Surfaces of Low Alloy Steels **6A**
Effect of Electric Arc Cutting Procedures on the Properties of Processed Metal Surfaces **86A**

Surveillance
Environmental Surveillance Program of the Decommissioned Hallam Nuclear Power Facility **133A**

Survey
Use of Gamma-Ray Detection Instrumentation in ORNL Offsite Radiological Survey Program **12A**
A Stream Survey in the Uranium Mining and Milling Area of the Colorado Plateau **128A**

PERMUTED TITLE INDEX

Radiological Survey of the West Lake Landfill, St. Louis County, Missouri **15A**
Instrument Evaluation Number 20 - Unit Inspections U3C Radiation Survey Meter **28A**
An Aerial Radiological Survey of the U.S. Department of Energy's Hanford Site, Richland, Washington **69A**
Final Step in Decommissioning of SM-1A Nuclear Plant: A Close-Out Survey **92A**

Susquehanna
Susquehanna Is Sued Over Uranium Tailings **48A**

SWRI
La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel **50A**

Symposium
Symposium on Low-Level Waste Disposal - Facility Design, Construction, and Operating Practices **263A**

System
A Mobile Gamma-Ray Scanning System for Detecting Radiation Anomalies Associated with Radium-226 Bearing Materials **129A**
Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry **140A**
A Gamma-Ray System for Field Analysis of Tailings and Soil **264A**
La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel **50A**
An Integrated Decontamination System for Surface-Contaminated TRU Waste **8A**

Tables
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, October 1974 **151A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, September 1974 **153A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, August 1974 **157A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, November 1974 **160A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, December 1974 **170A**

Tailing
Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah **217A**
Supplement to the Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah **219A**

Tasks
Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: A Report on Tasks 1 and 2 of Phase I **119A**

Technical
Investigation of the Technical Micronics Control (TMC) Process for Electropolishing Various Metals **109A**
Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6 **161A**

PERMUTED TITLE INDEX

Enrico Fermi Atomic Power Plant, Unit 1 - License DPR-9, Technical Specifications, Proposed Change **176A**
Potential Impact of Licensee Default on Cleanup of TMI-2: Technical Report **188A**
Saxton Nuclear Experimental Reactor - License DPR-4, Technical Specifications, Proposed Change No. 51 **195A**
Remedial Action Project's Technical Measurements Center - Status **60A**

Technological
Technological Aspects of the Workpieces Treated by Electropolishing **89A**

Term
Relevance of Biotic Pathways to the Long-Term Regulation of Nuclear Waste Disposal: Topical Report on Reference Western Arid Low-Level Waste Sites **120A**
DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site **227A**

Terminate
NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 **252A**

Terminates
NRC Terminates License No. R-51 for Oregon State University to Dismantle AGN-201 Reactor in Corvallis, Oregon **247A**

Texas
NRC Invites Comments on Proposal Granting Texas Authority to Regulate Byproduct Material **245A**

TF
Integrating Working Level Monitor EML Type TF-11 **102A**

Theoretical
Experimental and Theoretical Time Period Investigations of the Dynamics of the Second Core of the NS Otto Hahn Reactor **71A**

Thorium
Field Calibration Facilities for Environmental Measurement of Radium, Thorium, and Potassium **81A**

Time
Nuclear Reactors - Critical for the First Time in 1978, Nuclear Reactors - Decommissioning in 1978 **139A**
Effect of Time-Dependent Radon Diffusion on Experimental Determinations **145A**
Experimental and Theoretical Time Period Investigations of the Dynamics of the Second Core of the NS Otto Hahn Reactor **71A**

TMC
Investigation of the Technical Micronics Control (TMC) Process for Electropolishing Various Metals **109A**

TMI
Reagan's TMI Cleanup: A Smoke and Mirror Trick **182A**
Retroactive Insurance May Fund TMI-2 Cleanup **187A**
Potential Impact of Licensee Default on Cleanup of TMI-2: Technical Report **188A**
TMI-2 Cooldown and Cleanup **201A**
Characterization of TMI-Type Wastes and Solid Products **208A**
TMI Cleanup is Imperative Says NRC Staff **210A**
TMI Cleanup to Cost More, Last Until 1985 **211A**
Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup **257A**

PERMUTED TITLE INDEX

Tombs
A Landscape of Nuclear Tombs **146A**

Tool
Three Mile Island Unit 2 Core Status Summary: A Basis for Tool Development for Reactor Disassembly and Defueling **46A**

Tools
Development of Working Tools Adapted to Dismantling Requirements **21A**

Topical
Relevance of Biotic Pathways to the Long-Term Regulation of Nuclear Waste Disposal: Topical Report on Reference Western Arid Low-Level Waste Sites **120A**
Relevance of Biotic Pathways to the Regulation of Nuclear Waste Disposal: Topical Report on Reference Eastern Humid Low-Level Sites **121A**

Torches
Study of Power Distribution Over Melt Bath of Plasma Melting Furnaces Using Several Plasma Torches **98A**

Town
Town Lives with Uranium Wastes and Fears **212A**

Track
Applicability of Nuclear Track Detectors to the Measurement of Environmental Levels of Radon and Decay Products **148A**
Use of Particle Track Analysis to Measure Fissile Particle-Size Distributions in Contaminated Soils **64A**

Training
NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California **251A**
NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 **252A**

Transient
Comparison of Radon Diffusion Coefficients Measured by Transient-Diffusion and Steady-State Laboratory Methods **93A**

Transport
Computer Prediction of Subsurface Radionuclide Transport - An Adaptive Numerical Method **135A**

Transuranic
Quantities and Characteristics of Transuranic Wastes from Commercial Fuel Cycles **34A**

Trench
Low-Level Nuclear Waste Shallow Land Burial Trench Isolation **118A**

Trenches
A Review of Corrective Measures to Stabilize Subsidence in Shallow-Land Burial Trenches **189A**

Trenching
Water Cannon Shows Promise for Gas Utility Trenching **38A**

Trick
Reagan's TMI Cleanup: A Smoke and Mirror Trick **182A**

Trojan
NRC Denies Trojan Decommissioning Alliance Request for Order to Shut Down and Launch Investigation of Portland General Electric's Trojan Nuclear Plant - Docket No. 50-344 **253A**

PERMUTED TITLE INDEX

Trouble
Uranium Mill Tailings - Heaps of Trouble **141A**

TRU
TRU Waste Assay Instrumentation and Applications in Nuclear Facility Decommissioning **254A**
An Integrated Decontamination System for Surface-Contaminated TRU Waste **8A**

Tube
Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control **200A**

TVA
NRC Notified of TVA's Final EIS on Plan to Decommission Edgemont Uranium Mill in Fall River County, South Dakota **239A**

Ultimate
Development of Methods and Techniques for the Decommissioning and Ultimate Disposal of Nuclear Facilities **94A**

UMTRAP
The Uranium Mill Tailings Remedial Actions Project (UMTRAP) **31A**

Union
NRC Invites Comments on Union Carbide Petition to Amend Regulations Governing Operation of Uranium Mills and Disposition of Tailings **238A**

Unit
NRC Plan for Cleanup Operations at Three Mile Island Unit 2 **104A**
Three Mile Island Nuclear Station, Unit 1 - Letter on the Delay in the DHR Pump Disassembly **123A**
Peach Bottom Atomic Power Station, Unit 1 - Notification of Final Reactor Shutdown **150A**
Peach Bottom Atomic Power Station, Unit 1 - Operations Requalification Program, Proposed Changes **152A**
Peach Bottom Atomic Power Station, Unit 1 - Request for Modification of Operator Requalification Program to Reflect the Shutdown Status of the Reactor **154A**
Peach Bottom Atomic Power Station, Unit 1 - Order Extending the Expiration Date of Provisional Operating License DPR-12 **155A**
Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor **156A**
Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Plan and Safety Analysis Report **158A**
Peach Bottom Atomic Power Station, Unit 1 - Proposed Changes in Operator Requalification Program **159A**
Peach Bottom Atomic Power Station, Unit 1 - License No. DPR-12, Technical Specification, Amendment 6 **161A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply **162A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply **163A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 78-01, Decommissioning Activities **164A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-05, Routine **165A**
Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Vio-

lation and Reply **166A**
Peach Bottom Atomic Power Station, Unit 1 - Information on License Extension Driving Decommissioning Activities **167A**
Peach Bottom Atomic Power Station, Unit 1 - Decommissioning Report No. 3, July 31 to December 31, 1976 **169A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Operating Report, July to December 1974 **171A**
Peach Bottom Atomic Power Station, Unit 1 - Provisional Operating License, Amendment 1 **172A**
Enrico Fermi Atomic Power Plant, Unit 1 - Annual Decommissioned Report EF-122, July 1, 1975 to June 30, 1976 **175A**
Enrico Fermi Atomic Power Plant, Unit 1 - License DPR-9, Technical Specifications, Proposed Change **176A**
Enrico Fermi Atomic Power Plant, Unit 1 - Report EF-120, Quarterly Operating Report, April to June 1974 **177A**
Enrico Fermi Atomic Power Plant, Unit 1 - IE Inspection Report No. 75-01 **178A**
Enrico Fermi Atomic Power Plant, Unit 1 - Notification That Decommissioning is Essentially Complete **179A**
Enrico Fermi Atomic Power Plant, Unit 1 - Additional Information on Decommissioning **180A**
Enrico Fermi Atomic Power Plant, Unit 1 - Request for Retirement Schedule **216A**
Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 1, Final Staff Report **236A**
Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 2 - Final Staff Report **237A**
Instrument Evaluation Number 20 - Unit Inspections U3C Radiation Survey Meter **28A**
Consolidated Fuel Reprocessing Program - Conceptual Study for a Laser Disassembly Development Unit (Fast Reactors) **32A**
Peach Bottom Atomic Power Station, Unit 1 - Semi-annual Decommission Report, January 1-June 30, 1976, Report No. 2 **42A**
Three Mile Island Unit 2 Core Status Summary: A Basis for Tool Development for Reactor Disassembly and Defueling **46A**
Three Mile Island Unit 2: Decontamination Program **9A**

United
Radium-226 in Plants and Substrates at Inactive Uranium Mill Sites in the Southwestern United States **114A**

Units
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, October 1974 **151A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, September 1974 **153A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, August 1974 **157A**
Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 1 **16A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, November 1974 **160A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply **168A**
Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 2 **17A**
Peach Bottom Atomic Power Station, Units 1, 2, and 3 - Monthly Data Tables, December

PERMUTED TITLE INDEX

1974 **170A**
Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 3 **18A**
Joseph M. Farley Nuclear Plant, Units 1 and 2; State of Alabama, Department of Public Health's Comments on the Draft Environmental Statement **5A**

University
NRC Terminates License No. R-51 for Oregon State University to Dismantle AGN-201 Reactor in Corvallis, Oregon **247A**
NRC Proposes Order Concerning California Polytechnic State University Plans to Dismantle AGN-210, Series 100 Training Reactor at San Luis Obispo, California **251A**
NRC Grants North Carolina State University Authority to Terminate Facility License No. R-63, and Dismantle 10 KW Research and Training Reactor in Raleigh - Docket No. 50-111 **252A**

Unresolved
Unresolved: The Front End of Nuclear Waste Disposal **207A**

Unrestricted
Decontamination of Metallic Materials for Unrestricted Release **56A**
Radiation Measurement Capability for Decontamination to Unrestricted Use **83A**

Until
TMI Cleanup to Cost More, Last Until 1985 **211A**

Update
Update on the Impact of Federal R and D Funding on Three Mile Island Cleanup Costs **147A**
Electropolishing Update **25A**
Uranium Mill Decommissioning - An Update on the Edgemont Experience **57A**

Utah
Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah **217A**
Supplement to the Report of the Monticello Mill Tailing Erosion Control Project, Monticello, Utah **219A**
Fact Sheet on Salt Lake City Uranium Mill Tailings Site, Salt Lake City, Utah - Draft Environmental Impact Statement Summary **221A**
Radon and Radon Daughter Evaluations at an Inactive Uranium Mill Tailings Pile and at Selected Locations in Salt Lake City, Utah **59A**

Utility
Water Cannon Shows Promise for Gas Utility Trenching **38A**

Utilized
Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA **260A**

U3C
Instrument Evaluation Number 20 - Unit Inspections U3C Radiation Survey Meter **28A**

Vanadium
DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981 **229A**

Vegetation
Radium-226 in Vegetation and Substrates at Inactive Uranium Mill Sites **115A**

Venture
New Joint Venture Will Dismantle Atomic Plants **136A**

PERMUTED TITLE INDEX

Vessel

Reactor Vessel Cutting Demonstration **111A**

La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel **50A**

Vibratory

Vibratory Finishing for Decontamination - Pilot Scale Operation **117A**

Violation

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-02, Notice of Violation and Reply **162A**

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 75-7, Notice of Violation and Reply **163A**

Peach Bottom Atomic Power Station, Unit 1 - IE Inspection Report No. 76-01, Notice of Violation and Reply **166A**

Peach Bottom Atomic Power Station, Units 1, 2, and 3 - IE Inspection Report Numbers 76-02 and 76-03, Notices of Violation and Reply **168A**

Vitro

DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**

Volume

Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 1 **16A**

Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 2 **17A**

Pilgrim Nuclear Power Station, Units 2 and 3 - Environmental Report, Volume 3 **18A**

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 1, Final Staff Report **236A**

Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (Final Environmental Assessment): Volume 2 - Final Staff Report **237A**

W

Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA **260A**

Washington

NRC Amends Agreement with Washington Allowing the State to Continue Regulating Byproduct Material **243A**

NRC Invites Comments on Proposed Agreement with Washington to Permit the State to Regulate Byproduct Material **250A**

An Aerial Radiological Survey of the U.S. Department of Energy's Hanford Site, Richland, Washington **69A**

Water

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites **174A**

Shippingport Atomic Power Station Steam Generator Tube Damage and Water Chemistry Control **200A**

Determination of Radium Removal Efficiencies in Water Treatment Processes **23A**

Water Cannon Shows Promise for Gas Utility Trenching **38A**

Evaluation of Isotope Migration: Land Burial - Water Chemistry at Commercially Operated Low-Level Radioactive Waste Disposal Sites **49A**

La Crosse Boiling Water Reactor, SWRI Project 17-3828-001, Special Report - Procedures for Decommissioning Failed Fuel Location System Within the Reactor Pressure Vessel **50A**

PERMUTED TITLE INDEX

Welding
Remote Cutting, Fitup, and Welding for In-Plant Pipe Repairs **91A**
West
Radiological Survey of the West Lake Landfill, St. Louis County, Missouri **15A**
NRC Extends to August 1, 1982, Comment Deadline on Draft EIS Concerning Decommissioning of Kerr-McGee Chemical Corporation's Rare Earths Facility in West Chicago, Illinois **240A**
Western
Relevance of Biotic Pathways to the Long-Term Regulation of Nuclear Waste Disposal. Topical Report on Reference Western Arid Low-Level Waste Sites **120A**
Where
Nuclear Waste Disposal: Where and How **108A**
Peach Bottom Atomic Power Station, Unit 1 - Correspondence Advising that Decommissioning Has Progressed to the Point Where All Fuel has been Removed from the Reactor **156A**
Wilcox
NRC Grants Babcock and Wilcox Authority to Dismantle the Lynchburg Pool Reactor and Dispose of Component Parts **246A**
Will
New Joint Venture Will Dismantle Atomic Plants **136A**
DOE Will Decommission Shippingport Atomic Power Station in Shippingport, Pennsylvania Following Defueling of Reactor **224A**
DOE Will Not Prepare EIS for Preliminary Clean-up Activities in Areas Contaminated by Uranium Tailings from the Former Vitro Rare Metals Plant in Canonsburg, Pennsylvania **225A**
DOE Will Prepare EIS for Long-Term Management of Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site **227A**
DOE Will Prepare EIS for Remedial Actions at Vanadium Corporation Inactive Uranium Mill Tailings Site and Vicinity Properties in Durango, Colorado - Comment Deadline July 13, 1981 **229A**
DOE Will Prepare EIS for Disposing Uranium Mill Tailings Near Canonsburg, Pennsylvania **230A**
Will TMI Remain Stable During Funding Debate: NRC Issues Policy Statement on Cleanup **257A**
Won
Durango's Albatross: A Radioactive Tailings Pile That Won't Go Away - Government Rules Stymie Efforts to Move, Reprocess It for Uranium **191A**
Working
Integrating Working Level Monitor EML Type TF-11 **102A**
Working Level Monitor for Radon Measurements Inside Houses **2A**
Development of Working Tools Adapted to Dismantling Requirements **21A**
Detailed Working Documents Utilized in Decontamination and Decommissioning of the W-ARD Fuel Laboratories at Cheswick, Attachment 5 to Final Report of Decontamination and Decommissioning of Advanced Reactors Division Fuel Laboratories at Cheswick, PA **260A**
Error in Working-Level Hour: Calculations When the Alpha Energy From the Radon Daughters is not Discriminated **61A**
Workpieces
Technological Aspects of the Workpieces Treated by Electropolishing **89A**
Wyoming
DOE Notifies that Baggs, Wyoming Inactive Uranium Mill Tailings Site Is No Longer Eligible for Remedial Action **226A**

PERMUTED TITLE INDEX

X

Evaluation of an Automated Assay System to Measure Soil Radionuclides by L X-Ray and Gamma-Ray Spectrometry 140A

Yankee

FERC Order in Matter of Maine Yankee Atomic Power Proposed Decommissioning Charges for 830 Megawatt Nuclear Station 88A

Your

Taking Apart Your Neighborhood Nuke 190A

Publication Description Index

PUBLICATION DESCRIPTION INDEX

Advances in Physics and Shielding, Proceedings of an American Nuclear Society Topical Meeting, Sun Valley, ID, September, 1980 **131A**

Agrartechnik 32(11):490-491 **21A**

American Nuclear Society 1977 Winter Meeting, Proceedings of a Conference, San Francisco, CA, November 27-December 2, 1977 **202A**

ANL-83-26 **85A**

Annals of the New York Academy of Sciences 81(365):76-85 **9A**

Archiv fuer Energiewirtschaft 35(11):908-910 **210A**

Atomwirtschaft, Atomtechnik 24(2):84 **139A**

Avtomaticheskaya Svarka 5:60-63 **86A**

Bangason Bango Hakhoe Chi 6(1):25-30 **35A**

BNL-NUREG-51409 (Vol. 1, No. 2) **49A**

BNL-NUREG-51499 (Vol. 1, No. 4) **208A**

BNL-NUREG-51499 (Vol. 2, No. 1) **4A**

BNL-NUREG-51514 **174A**

BNL-NUREG-51515 **127A**

BNL-51574 **40A**

Bulletin of the Atomic Scientists 31:43 **41A**

Bulletin of the Atomic Scientists 35(5):44 **207A**

Canadian Industrial Mining and Metallurgical Bulletin 74(285):110-118 **36A**

Canadian Institute of Mining and Metallurgy Bulletin 75(843):131-134 **51A**

Christian Science Monitor 72:9 **47A**

Christian Science Monitor 74:12 **191A**

CONF-691008 **14A**

CONF-740702 **59A, 92A**

CONF-770403 **200A**

CONF-770618 **98A**

CONF-7710187 **259A**

CONF-771109 **202A**

CONF-800313 **107A, 67A, 84A**

CONF-800386 **105A**

CONF-800424 **201A**

CONF-800942 **131A**

CONF-801115 **65A**

CONF-810153 **114A**

CONF-8109100 **126A, 148A**

CONF-811007 **205A**

CONF-8110111 **52A**

CONF-811049 **264A**

CONF-811194 **206A**

CONF-820307 **91A**

CONF-820911 **149A, 263A**

CONF-821005 **1A, 100A, 204A, 254A, 83A**

CONF-830227 **143A, 145A, 173A, 214A, 258A, 31A, 56A, 57A, 60A, 77A, 96A**

CONF-830711 **199A**

Contract No. EY-76-C-02-2097 **133A**

PUBLICATION DESCRIPTION INDEX

Czechoslovakian Patent 190200B 6A

Department of Energy Information Weekly Announcements 3(42):3 222A

DOCKET-1151-43 218A

DOCKET-1151-54 215A

DOCKET-50-111 252A

DOCKET-50-344 253A

DOCKET-50016 180A

DOCKET-50016-187 216A

DOCKET-50016-227 176A

DOCKET-50016-232 177A

DOCKET-50016-242 179A

DOCKET-50016-246 178A

DOCKET-50016-249 175A

DOCKET-50146-116 193A

DOCKET-50146-117 192A

DOCKET-50146-125 195A

DOCKET-50146-126 194A

DOCKET-50171-171 158A

DOCKET-50171-176 155A

DOCKET-50171-178 152A

DOCKET-50171-179 150A

DOCKET-50171-180 154A

DOCKET-50171-185 170A

DOCKET-50171-186 171A

DOCKET-50171-190 159A

DOCKET-50171-191 172A

DOCKET-50171-193 156A

DOCKET-50171-195 161A

DOCKET-50171-198 162A

DOCKET-50171-200 163A

DOCKET-50171-206 166A

DOCKET-50171-209 167A

DOCKET-50171-210 168A

DOCKET-50171-211 42A

DOCKET-50171-216 165A

DOCKET-50171-218 169A

DOCKET-50171-230 164A

DOCKET-50231-132 80A

DOCKET-50278-200 157A

DOCKET-50278-209 153A

DOCKET-50278-220 151A

DOCKET-50278-228 160A

DOCKET-50289-1100 123A

DOCKET-50348-140 5A

DOCKET-50364-129 5A

DOCKET-50409-125 50A

DOCKET-50471-12 16A

DOCKET-50471-13 17A

DOCKET-50471-14 18A

PUBLICATION DESCRIPTION INDEX

DOCKETS-50-094/147 **10A**

DOE News (January 1983):1-2 **221A**

DOE/EML-389 **102A**

DOE/ET/37247-1-Attach. 5 **260A**

DOE/SF/00824-T37 **54A**

DOE/TIC-11023 **26A**

EGG-WM-5116 **209A**

EGG-1183-1828 **69A**

EGG-2076 **43A**

EGG-2129 **44A**

Electric Light and Power 58(9):1-2 **211A**

Electric Light and Power 59(12):20-21 **182A**

Electric Light and Power 59(3):2-15 **187A**

Electric Light and Power 59(6):3-13 **257A**

Electrical World 190(2):19 **185A**

EMD-82-28 **79A**

EMD-82-68 **147A**

Energetik 81(2):21-22 **11A**

EPA-520/4-77-005 **231A**

EUR-2439-F **113A**

Federal Register 46(102):28774 **253A**

Federal Register 46(109):30383 **229A**

Federal Register 46(114):31394 **252A**

Federal Register 46(123):22148 **251A**

Federal Register 46(123):33148 **233A**

Federal Register 46(188):47688 **249A**

Federal Register 46(190):48351 **250A**

Federal Register 46(217):55505 **248A**

Federal Register 46(224):57208 **247A**

Federal Register 46(235):60075 **245A**

Federal Register 46(239):60875 **226A**

Federal Register 46(239):60921 **68A**

Federal Register 46(91):26356 **234A**

Federal Register 46(94):26807 **230A**

Federal Register 47(12):2802 **246A**

Federal Register 47(134):30331 **240A**

Federal Register 47(137):31061 **225A**

Federal Register 47(161):36276 **224A**

Federal Register 47(199):46001 **239A**

Federal Register 47(230):53889 **238A**

Federal Register 47(246):57085 **220A**

Federal Register 47(248):57446-57482 **235A**

Federal Register 47(33):7205 **244A**

Federal Register 47(51):11346 **243A**

Federal Register 47(65):14632 **242A**

Federal Register 47(98):21943 **241A**

Federal Register 48(15):2817 **223A**

Federal Register 48(2):326 **228A**

Federal Register 48(22):4522 **227A**

Federal Register 48(3):590 **232A**

PUBLICATION DESCRIPTION INDEX

FGWA-COLO-EIS-73-09-F **45A**

Field and Stream 189(5):44 **75A**

GEND-007 **46A**

GJ/TMC-01(82) **81A**

GJ/TMC-03(82) **82A**

GKSS-80/E/30 **71A**

Health Physics 41(3):477-481 **61A**

Health Physics 43(1):108 **15A**

Health Physics 43(1):123 **27A**

Health Physics 43(1):142 **20A, 7A**

Health Physics 43(1):157-158 **22A**

IAEA-SM-125/14 **14A**

IAEA-SM-262 **112A**

IEEE Spectrum 17(12):38-43 **108A**

INFO-0035 **58A**

INIS-MF-6530 **114A**

INIS-MF-6974 **206A**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 712 pp. **1A, 100A, 204A, 254A**

International Decommissioning Symposium - 1982, Proceedings of the U.S. Department of Energy's Remedial Action Program/OECD Nuclear Energy Agency Conference, Seattle, WA, October 10-14, 1982, 166 pp. **83A**

ISPO-181 **122A**

Jahrestagung Kerntechnik '80 (Nuclear Technology '80), Proceedings of an Annual Meeting, Berlin, Federal Republic of Germany, March 25-27, 1980 **105A**

Jahrestagung Kerntechnik '82 (Nuclear Technology '82), Proceedings of a German Nuclear Society Annual Meeting, Mannheim, Federal Republic of Germany, May 4-6, 1982 **103A, 106A, 13A, 142A, 203A, 99A**

Japanese Patent 82/05900 **76A**

Journal of Water Pollution Control Federation 35:242-259 **213A**

KFK-2435 **94A**

LA-UR-80-616 **255A**

LA-8243-PR **39A**

LA-9363-LLWM **140A**

LA-9544-M **122A**

LBL-10631 **90A**

LLWMP-11T **62A**

Low-level Waste Disposal, Facility Design, Construction, and Operating Practices, Proceeding of an NRC/ORNL Conference, Washington, DC, September 29-30, 1982, 455 pp. **149A, 263A**

Materials Technology, Proceedings of the Sixth Inter-American Conference, San Francisco, CA, August 12-15, 1980 **89A**

Metalworking Bulletin 12(2):1 **262A**

Mother Jones 6(1):29-33 **190A**

N-704-FDR-990-004 **54A**

NASA-TM-X-64516 **109A**

National Wildlife 18(2):24 **141A**

PUBLICATION DESCRIPTION INDEX

New York Times 128(A):15 **137A**

New York Times 130(A10):8 **53A**

New York Times 131(1):19 **212A**

New York Times 132:8 **144A**

Newsweek 58:28 **184A**

NRPB-IE-20 **28A**

Nuclear Instruments and Methods in Physics Research 200(3-4):411-415 **64A**

Nuclear Power Waste Technology, A.A. Moghissi, H.W. Godbee, M.S. Ozker, and M.W. Carter (Eds.), Ch. 8 **134A**

Nuclear Technology 58(2):150-153 **37A**

NUREG-0662 (Vol. 1) **236A**

NUREG-0662 (Vol. 2) **237A**

NUREG-0689 **188A**

NUREG-0698 (Rev. 1) **104A**

NUREG-0883 **66A**

NUREG/CP-0028 **149A, 263A**

NUREG/CR-2192 **49A**

NUREG/CR-2317 **4A**

NUREG/CR-2383 **95A**

NUREG/CR-2516 **208A**

NUREG/CR-2616 **174A**

NUREG/CR-2617 **127A**

NUREG/CR-2675 (Vol. 1) **119A**

NUREG/CR-2675 (Vol. 2) **120A**

NUREG/CR-2675 (Vol. 3) **121A**

NUREG/CR-2875 **93A**

NUREG/CR-2975 **138A**

NUREG/CR-3076 **135A**

NUREG/CR-3084 **118A**

ORNL/TM-6662 **32A**

ORNL/TM-8475 **129A**

ORNL/TM-8580 **34A**

ORNL/TM-8715 **189A**

ORP/TAD-76-5 **23A**

PATRAM '80, Packaging and Transporting Radioactive Material, Proceedings of the Sixth Conference, Berlin, Federal Republic of Germany, November 10, 1980 **65A**

Pipeline Industry 39(1):31-33 **38A**

PNL-SA-9215 **52A**

PNL-SA-9887 **78A**

PNL-3852 **130A**

PNL-4067 **95A**

PNL-4241 (Vol. 1) **119A**

PNL-4241 (Vol. 2) **120A**

PNL-4241 (Vol. 3) **121A**

PNL-4370 **93A**

PNL-4608-2 **74A**

Podgotovka Poverkhnosti pered Naneseniem Gal'vanich Pokrytii M. (1980):70-73 **72A**

PUBLICATION DESCRIPTION INDEX

Power Plant Construction, Operation, and Maintenance, Proceedings of the American Nuclear Society Power Division Topical Meeting, Charleston, SC, March 28-31, 1982, 87 pp. **91A**

Proceedings of an American Power Conference, Chicago, IL, April 18-20, 1977 **200A**

Proceedings of an American Power Conference, Chicago, IL, April 21-23, 1980 **201A**

Proceedings of an International Symposium, Albuquerque, NM, May 10-14, 1982. International Atomic Energy Agency, Vienna **112A**

Proceedings of the Congress of Chemical Engineering and World Chemical Exposition, Montreal, Quebec, Canada, October 4-9, 1981 **205A**

Proceedings of the Third Australian Institute of Nuclear Science and Engineering Conference, Lucas Heights, Australia, November 12-13, 1981 **206A**

Proceedings of the 19th Annual Health Physics Society Meeting, Houston, TX, July 7-11, 1974 **59A, 92A**

Progressive 41(2):30 **146A**

Radiation Hazards in Mining: Control, Measurement, and Medical Aspects, Proceedings of an International Conference, Golden, CO, October 4, 1981. Society of Mining Engineers, American Institute of M **52A**

Radiation Protection Activities - 1976 **231A**

Radiation Protection Dosimetry 1(3):221-226 **2A**

Radiation Safety Problems in the Design and Operation of Hot Facilities, Proceedings of an International Symposium, Saclay, France, October 13-17, 1969. International Atomic Energy Agency, Vienna **14A**

RAE-18-3 **93A**

RMO-3005 **217A**

RMO-3005 (Suppl.) **219A**

RP-1579-5 **63A**

Science News 114(1):441 **256A**

Science 202(5):19 **33A**

Science 216(4547):682 **29A**

SciQuest 53(2):16 **186A**

Second Semi-annual Report for 1976 **94A**

SGI-1-150/79 **3A**

Short Course on Decommissioning and Decontamination of Nuclear Facilities, Proceedings of a Seminar, Ann Arbor, MI, July 11-13, 1983 **199A**

Solid State Nuclear Track Detectors, Proceedings of the 11th International Conference, Bristol, England, September 7-12, 1981 **126A, 148A**

STI/PUB/238 **14A**

The Natural Radiation Environment, Proceedings of the Second Special Symposium, Bombay, India, January 19-23, 1981 **114A**

The Treatment and Handling of Radioactive Wastes, A.G. Blasewitz, J.M. Davis, and M.R. Smith (Eds.). Battelle Press, Columbus, OH, 656 pp. **117A, 124A, 261A, 55A, 70A, 8A, 87A**

Thesis **115A, 125A, 128A, 132A, 183A, 19A, 197A, 198A**

Transactions of the American Nuclear Society 26(1):51A **97A**

PUBLICATION DESCRIPTION INDEX

Transactions of the American Nuclear Society 41(Suppl. 1):11 **91A**

Transactions of the American Nuclear Society 41:235-236 **12A**

Uranium Mill Tailings Management, Proceedings of the Fourth Symposium, Fort Collins, CO, October 26-27, 1981, 729 pp. **264A**

Videotape, 23:00 **101A**

Videotape, 3:50 **196A**

Videotape, 4:32 **111A**

Videotape, 5:00 **116A, 24A, 25A**

Videotape, 5:12 **110A**

Videotape, 5:45 **88A**

Wall Street Journal 100:3 **136A**

Wall Street Journal 104(2):27 **30A**

Wall Street Journal 104(2):34 **48A**

Waste Management '80, the State of Waste Disposal Technology, Mill Tailings, and Risk Analysis Models, R.G. Post (Ed.), Proceedings of a Conference, Tucson, AZ, March 10, 1980, 754 pp. **107A, 67A, 84A**

Waste Management '83, M.E. Wacks (Coord.) and R.G. Post (Ed.), Proceedings of a Symposium, Tuscon, AZ, February 27-March 3, 1983 **143A, 145A, 173A, 214A, 258A, 31A, 56A, 57A, 60A, 77A, 96A**

Water Chemistry of Nuclear Reactor Systems, Proceedings of an International Conference, Bournemout, United Kingdom, October 24-28, 1977 **259A**

Welt 282:2 **73A**

World Electrotechnical Congress, Proceedings of a Conference, Moscow, USSR, June 21-25, 1977 **98A**

WRA-70-3 **181A**

563/564

APPENDIX B

Acronyms and Abbreviations

AAEC	Australian Atomic Energy Commission
ADM	action description memorandum
AEC	U.S. Atomic Energy Commission
AECB	Atomic Energy Control Board (Canada)
AECL	Atomic Energy of Canada Limited
AERE	UKAEA, Atomic Energy Research Establishment, Harwell, United Kingdom
AFL	Advanced Fuels Laboratory, Westinghouse Electric Corp., Madison, PA
AFR	annual fuel requirement
AFRIMET	African Metals
AGNS	Allied-General Nuclear Services, Barnwell, SC
AGR	advanced gas-cooled reactor
AI	Atomics International Division, Rockwell International Corporation
AIF	Atomic Industrial Forum
ALAP	as low as practical
ALARA	as low as reasonably achievable
ALRR	Ames Laboratory Research Reactor, Ames, IA
AMRAW	assessment method for radioactive waste (computer code)
AMS	Aerial Measuring Systems
ANDRA	Agence Nationale pour Question des Deschets Radioactifs (France)
ANL	Argonne National Laboratory, Argonne, IL
ANS	American Nuclear Society
ANSI	American National Standards Institute
ANSPD	Advanced Nuclear Systems and Project Division, Mound Facility, Miamisburg, OH
ARD	Advanced Reactor Division, Westinghouse, Cheswick, PA
ARVFS	Army Re-entry Vehicle Facility Site
ASNE	Assistant Secretary for Nuclear Energy, U.S. Department of Energy
ASPEN	Advanced System for Process Engineering (computer model)
B&W	Babcock and Wilcox Company, Lynchburg, VA
BAPL	Bettis Atomic Power Laboratory, West Mifflin, PA
BCL	Battelle Columbus Laboratory, Columbus, OH
BEIR	Biological Effects of Ionizing Radiation
BFEC	Bendix Field Engineering Corporation, Grand Junction, CO
BNF	Barnwell Nuclear Fuel Plant, Barnwell, SC
BNFL	British Nuclear Fuels Limited (United Kingdom)
BNI	Bechtel National, Inc.
BNL	Brookhaven National laboratory, Upton, NY
BNWL	Battelle Northwest Laboratories, Richland, WA (now PNL)
BONUS	Boiling Nuclear Superheater Power Station (Puerto Rico)
BORAX	Boiling Water Reactor Experiment
BRISC	Burns and Row Industrial Services Corporation
BWR	boiling-water reactor
CANDU	Canadian deuterium-uranium reactor
CANMET	Canada Centre for Mineral and Energy Technology
CDR	Conceptual Design Report
CEA	Commissariat a l'Energie Atomique (France)
CEC	Commission of the European Communities
CEER	Center for Energy and Environment Research (Puerto Rico)
CEGB	Central Electricity Generating Board (United Kingdom)

CEN	Centre d'Etude de l'Energie Nucleaire, Brussels, Belgium
CEVR	contaminated equipment volume reduction
CFR	Code of Federal Regulations
CIINE	Interministerial Commission for the Basic Nuclear Facilities (France)
CNEN	Comitato Nazionale per l'Energia Nucleare (Italy)
CPAF	cost plus award fee
CSU	Colorado State University, Fort Collins, CO
CY	calendar year
D&D	decontamination and decommissioning
DAO	U.S. Department of Energy, Dayton Area Office, Dayton, OH
DECON	immediate decontamination option
DEIS	draft environmental impact statement
DMA	Division of Military Application
DOC	Decommissioning Operations Contractor
DOC	U.S. Department of Commerce
DOE	U.S. Department of Energy
DOE-AL	U.S. Department of Energy, Albuquerque Operations Office, Albuquerque, NM
DOE-CH	U.S. Department of Energy, Chicago Operations Office, Argonne, IL
DOE-HDQ	U.S. Department of Energy, Headquarters, Washington, DC
DOE-ID	U.S. Department of Energy, Idaho Operations Office, Idaho Falls, ID
DOE-NV	U.S. Department of Energy, Nevada Operations Office, Las Vegas, NV
DOE-OR	U.S. Department of Energy, Oak Ridge Operations Office, Oak Ridge, TN
DOE-RL	U.S. Department of Energy, Richland Operations Office, Richland, WA
DOE-SAN	U.S. Department of Energy, San Francisco Operations Office, Oakland, CA
DOE-SR	U.S. Department of Energy, Savannah River Operations Office, Aiken, SC
DOT	U.S. Department of Transportation
DPTE	double door for hermetic transfer (French)
DRAP	U.S. Department of Energy, Division of Remedial Action Projects
DRI	Desert Research Institute, Las Vegas, NV
EA	environmental assessment
EBR	Experimental Breeder Reactor, INEL, Idaho Falls, ID
EDP	environmental development plan
EDTA	ethylene diaminetetracetic acid
EG&G	EG&G Idaho, Inc., Idaho Falls, ID
EIA	environmental impact assessment
EIR	Eidgenoessisches Institut fuer Reaktorforschung (Switzerland)
EIS	environmental impact statement
EML	Environmental Measurement Laboratory, New York, NY
ENFDP	evaluation of nuclear facility decommissior' o projects
ENTOMB	entombment option
EPA	U.S. Environmental Protection Agency
EPDM	ethylene propylene diene monomers (cover materials)
EPP	exportable pyrochemical process
EPRI	Electric Power Research Institute
ERDA	U.S. Energy Research and Development Administration
ERR	Elk River Reactor, Elk River, MN
FBDU	Ford, Bacon and Davis Utah, Inc., Salt Lake City, UT
FBR	fast breeder reactor

FGD	flue gas desulfurization
FMPC	Feed Materials Production Center, Fernald, OH (NLO)
FONSI	finding of no significant impact
FPDL	Fission Products Development Laboratory, ORNL, Oak Ridge, TN
FRG	Federal Republic of Germany
FTC	Fuels Technology Center (ANL)
FUSRAP	Formerly Utilized Sites Remedial Action Program
FY	fiscal year
GE	General Electric Co.
GEIS	generic environmental impact statement
GDR	German Democratic Republic
GJAO	U.S. Department of Energy, Grand Junction Area Office
GJRAP	Grand Junction Remedial Action Program
GJVP	Grand Junction Vicinity Properties
GKSS	Gesellschaft fur Kernenergieverwertung in Schiffbau und Schiffahrt (Federal Republic of Germany)
GMAW	gas metal (spray) arc welding
GSA	General Services Administration
GTAW	gas tungsten arc welding
HAPO	Hanford Atomic Products Operations, Richland, WA
HEDL	Hanford Engineering Development Laboratory, Richland, WA
HLW	high-level (radioactive) waste
HRE	Homogeneous Reactor Experiment, ORNL, Oak Ridge, TN
HT	high tensile
HTGR	high-temperature gas-cooled reactor
HTRE	Heat Transfer Reactor Experiment
IAEA	International Atomic Energy Agency, Vienna, Austria
ICPP	Idaho Chemical Processing Plant, Idaho Falls, ID
ICRP	International Commission of Radiation Protection
IDB	Integrated Data Base
IET	Initial Engine Test, INEL, Idaho Falls, ID
ILW	intermediate-level (radioactive) waste
INEL	Idaho National Engineering Laboratory, Idaho Falls, ID
ISFSI	independent spent fuel storage installations
JAERI	Japan Atomic Energy Research Institute
JMTR	Japan Material Testing Reactor
KAPL	Knolls Atomic Power Laboratory, Schenectady, NY
KFK	Kernforschungszentrum Karlsruhe GmbH (Federal Republic of Germany)
KKN	Kernkraftwerk Niederaichbach (Federal Republic of Germany)
KKN	Niederaichbach Nuclear Power Station (Federal Republic of Germany)
LAMPRE	Los Alamos Molten Plutonium Reactor Experiment, Los Alamos, NM
LANL	Los Alamos National Laboratory, Los Alamos, NM (formerly LASL)
LAPRE	Los Alamos Plutonium Reactor Experiment, Los Alamos, NM
LASL	Los Alamos Scientifi Laboratory, Los Alamos, NM (now LANL)
LBL	Lawrence Berkeley Laboratory, Berkeley, CA (now LBNL)
LBNL	Lawrence Berkeley National Laboratory, Berkeley, CA (formerly LBL)
LITR	Low Intensity Test Reactor, ORNL, Oak Ridge, TN
LLL	Lawrence Livermore Laboratory, Livermore, CA (now LLNL)

LLNL	Lawrence Livermore National Laboratory, Livermore, CA (formerly LLL)
LLW	low-level (radioactive) waste
LMFBR	liquid metal fast breeder reactor
LWBR	light-water breeder reactor
LWR	light-water reactor
MDC	minimum detectable concentration
MED	Manhattan Engineer District
MRF	Metal Recovery Facility, ORNL, Oak Ridge, TN
MOX	mixed oxide fuel
MRC	Monsanto Research Corporation
MSPS	Middlesex Sampling Plant Site, Middlesex, NJ
MSR	see MSRE
MSRE	Molten Salt Reactor Experiment, ORNL, Oak Ridge, TN
NAEG	Nevada Applied Ecology Group, DOE-NVO
NAEIC	Nevada Applied Ecology Information Center, ORNL, Oak Ridge, TN
NBL	New Brunswick Laboratory, New Brunswick, New Jersey
NEA	Nuclear Energy Agency, Paris, France
NEPA	National Environmental Policy Act
NERVA	Nuclear Engine for Rocket Vehicle Application
NFS	Nuclear Fuel Services
NFSS	Niagara Falls Storage Site, Niagara Falls, NY
NIS	Nuklear-Ingenieur-Service GmbH (Federal Republic of Germany)
NLO	National Lead of Ohio, Cincinnati, OH
NMEID	New Mexico Environmental Improvement Division
NRC	U.S. Nuclear Regulatory Commission
NRDS	Nuclear Rocket Development Station
NRTS	National Reactor Testing Station, Idaho Falls, ID
NS	nuclear ship
NTS	Nevada Test Site, Mercury, NV
NUKEM	Nuklear-Chemie un Metallurgie GmbH (Federal Republic of Germany)
NWVP	Nuclear Waste Vitrification Project
OECD	Organization for Economic Cooperation and Development, Paris, France
OMA	U.S. Department of Energy, Office of Military Applications
OMRE	Organic Moderated Reactor Experiment, INEL, Idaho Falls, ID
ORAU	Oak Ridge Associated Universities, Oak Ridge, TN
ORNL	Oak Ridge National Laboratory, Oak Ridge, TN
ORP	U.S. Environmental Protection Agency, Office of Radiation Programs
ORR	Oak Ridge Research Reactor, ORNL, Oak Ridge, TN
OSFM	Office of Surplus Facilities Management, UNC, Nuclear Industries, Richland, WA
OSHA	Occupational Safety and Health Administration
PAC	plasma arc cutting
PCD	polymeric carrier delivery
PDR	program requirements document
PFDL	Plutonium Fuel Division Laboratories, Westinghouse Electric Corp., Cheswick, PA
PFF	Plutonium Fabrication Facility, ANL, Argonne, IL
PFR	prototype fast reactor
PNL	Pacific Northwest Laboratory, Richland, WA (formerly BNWL)
PP	plutonium processing

PRCF	Plutonium Recycle Critical Facility, PNL, Richland, WA
PNRO	U.S. Department of Energy, Pittsburgh Naval Reactors Office, Pittsburgh, PA
PRWRA	Puerto Rico Water Resources Authority, San Juan, PR
PWR	pressurized-water reactor
R&D	research and development
R&T	research and test
RA	remedial action
RAECO	radon attenuation effectiveness and cost optimization (computer code)
RAP	Remedial Action Program
RAPIC	Remedial Action Program Information Center, ORNL, Oak Ridge, TN
RCRA	Resource Conservation and Recovery Act
RED	referencable engineering document
REECO	Reynolds Electrical and Engineering Company, Inc., Las Vegas, NV
RFP	Rocky Flats Plant, Golden, CO
RHO	Rockwell Hanford Operations, Richland, WA
RI	Rockwell International
RMDF	Radioactive Materials Disposal Facility, AI, RI, Canoga Park, CA
RPV	reactor pressure vessel
RWMC	Radioactive Waste Management Complex, INEL, Idaho Falls, ID
SAFSTOR	safe storage option followed by deferred decontamination
SAI	Science Applications, Inc.
SCA	single-channel analyzer
SEB	Source Evaluation Board
SEM	scanning electron microscopy
SER	safety evaluation report
SFMP	Surplus Facilities Management Program
SFMPO	Surplus Facilities Management Program Office (DOE-RL)
SLAPS	St. Louis Airport Site, St. Louis, MO
SLB	shallow land burial
SM	Special Metallurgical
SNAP	Systems for Nuclear Auxiliary Power (space applications)
SNEC	Saxton Nuclear Experimental Corporation (Pennsylvania)
SNL	Sandia National Laboratories, Albuquerque, NM
SNM	special nuclear materials
SNRO	U.S. Department of Energy, Schenectady Naval Reactors Office, Schenectady, NY
SPAC	surface plasma arc cutting
SPERT	Special Power Excursion Reactor Test, INEL, Idaho Falls, ID
SRE	Sodium Reactor Experiment, Canoga Park, CA
SRL	Savannah River Laboratory, Aiken, SC
SRP	Savannah River Plant, Aiken, SC
SSDP	Shippingport Station Decommissioning Project
SSFL	Santa Susana Field Laboratory, AI, RI, Canoga Park, CA
TAC	Technology Application Center (University of New Mexico)
TAN	Test Area North, INEL, Idaho Falls, ID
TEC	total estimated cost
TLD	thermoluminescent dosimeter
TMC	Technical Measurements Center, Grand Junction, CO
TMI-2	Three Mile Island, Unit-2, Middletown, PA
TRU	transuranic (containing transuranium elements such as Pu and Am)

TSF	Technical Support Facility, NTS, Mercury, NV
TVA	Tennessee Valley Authority
UCC-ND	Union Carbide Corporation, Nuclear Division, Oak Ridge, TN
UK	United Kingdom
UKAEA	United Kingdom Atomic Energy Authority
UMTRA	Uranium Mill Tailings Remedial Actions (project office for UMTRAP)
UMTRAP	Uranium Mill Tailings Remedial Action Program
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978
UNC	UNC Nuclear Industries, Inc., Richland, WA (United Nuclear Corp.)
VNC	Vallecitos Nuclear Center, Vallecitos, CA (General Electric Co.)
WAPD	Westinghouse Atomic Power Division
WBS	work breakdown structure
WDF	Waste Dismantling Facility
WEC	Westinghouse Electric Corporation
WIPP	Waste Isolation Pilot Plant (New Mexico)
WPPSS	Washington Public Power Supply System, Richland, WA
WSS	Weldon Spring Site, Weldon Spring, MO

571/572

APPENDIX C

Distribution List by Affiliation

DISTRIBUTION LIST SORTED BY CORPORATE AFFILIATION

Aare-Tessin A.G. fur Elektrizitat
E.A. Utzinger

Acres American Incorporated
John B. Berry
Richard H. Struble

Aerospace Corporation
Edmund A. Vierzba
Andrew Wallo

Agence Nationale pour la Gestion des Dechets Radioactifs
M.N. Moscardo

Airco Industrial Gases
Jack B. Wert

Alabama Department of Public Health
Aubrey V. Godwin

Allied General Nuclear Services
Richard J. Dabolt

Alphanuclear
V. Roze

American Nuclear Corporation
Niles J. Andrus

American Nuclear Energy Council
Edward M. Davis

American Nuclear Insurers
Paul E. Fuller

American Nuclear Corporation
Kenneth S. Watts

American Public Power Association
Deborah Nuttall

Ames Laboratory
Adolf F. Voigt

Amol. Limited/Cluff Mining
Thomas P. Hynes

Anaconda Minerals Company
David A. Milligan
Dean L. Roberts

Analytic Sciences Corporation
J.W. Voss

Applied Technology of Barnwell, Inc.
William M. Peterson

Arbeitsgemeinschaft Versuchsreaktor (AVR) GmbH
Gunther Ivens
Klaus J. Kruger

Argonne National Laboratory
Charles L. Cheever
Thomas L. Gilbert
Walter E. Kisieleski
J. Howard Kittel
William H. Kline
C.L. Livengood
Michael Momeni
Don Rayno
Carlyle J. Roberts
S. Savage
James H. Talboy
TIS Department
Bob Vocke
Robert A. Wynveen
Yuchien Yuan

ARIX, A Professional Corporation
J. Tell Tappan

Arizona Public Service Company
Steven C. Johnson

Arizona Radiation Regulatory Agency
Charles G. Amato

Arizona State University
George Machovec

Arkansas Department of Health
F.F. Wilson

Arkansas Power and Light Company
Daniel H. Williams

Armak Company
Jack N. Dybalski

Associated Water and Air Resources Engineers, Inc.
James H. Clarke

Associated Nuclear Services
M.A. Martin

Atlas Minerals Company
Richard E. Blubaugh

Atomic Energy of Canada Limited
C.R. Bennett
D.J. Cameron
D.H. Charlesworth
Susan Nish
R.V. Osborne
John Torok

Atomic Industrial Forum, Inc.
Elizabeth Bourg
Jerry Carroll

Australian Department of Mines and Energy
Library

Australian Atomic Energy Commission
R.J. Ring

Austrian Research Center
P. Krejsa
P. Patek

AWC, Inc.
James W. Ayres

B.C. Research
Richard W. Lawrence

B.F. Goodrich Company
Richard D. Cunningham

Babcock and Wilcox
Information Services
Dale W. Koch

Battelle Columbus Laboratories
Donald E. Clark
Kenneth D. Kok
Library

Bear Creek Uranium Company
R.L. Medlock

Bechtel National, Inc., Oak Ridge, TN
Beverly S. Ausmus
Tom S. Baer
John A. Chapin
Thomas F. Demmitt
Document Control Department
William A. Goldsmith
Gale K. Hovey
Robert G. Levesque
Ethel O. McDonald
Charles G. Miller
Joseph F. Nemec
Robert L. Rudolph
John Slater

Bechtel National, Inc., Middletown, PA
Gordon L. Dover
Glen F. Jones
William C. Lattin

Bechtel National, Inc., San Francisco, CA
Ernest M. Miholits
NFO Library
Ross C. Lovington

Bechtel Power Corporation
D.T. Dexheimer

Beck (R.W.) and Associates
E.M. Slivka

Belgonucleaire
J. Draulans

Bendix Field Engineering Corporation
Nick Abromiuk
Jim Allen
Lisa Blanchfield
Thomas E. Carter
John R. Duray
David C. George
Wayne D. Gisler
Bill Graham
Chuck Hajek
Katherine Kanaly
Nic Korte

Bergamt Goslar
Eberhard Fleisch

Bettis Atomic Power Laboratory
Richard M. Glass

Bhabha Atomic Research Centre
M. Raghavayya

Birds (Swansea) Limited
P.G.W. France

Black and Veatch Engineers and Architects
Casto O. Changho
Michael W. McClurg
Michael M. Thomas

Boeing Engineering and Construction Company
George I. Coulbourn

Brenk Systemplanung
H. Dietmar Brenk

British Columbia Ministry of Health
David Morley

British Nuclear Fuels Limited
H.A. Taylor
C.G. Weir

Brookhaven National Laboratory
M.S. Davis
Helen Todosow
Research Library, Reports Section

Bundesministerium des Innern
L. Weil

Burns and Roe, Inc.
Harley R. Victor

California Public Utilities Commission
Kevin P. Coughlan

California Department of Health Services
Kenneth B.Vess

Canada Centre for Mineral and Energy Technology
Nand K. Dave
Victor A. Haw
Joseph Howieson

Carolina Power and Light Company
Frederick A. Emerson
Robert L. Mayton

Catalytic, Inc.
Joseph W. Furlong
Victor C. Quackenbush

Central Electricity Generating Board
Alan R. Gregory
P.B. Woollam

Centre d'Etudes de l'Energie Nucleare
R. Boulenger

Centro Applicazioni Militari Energia Nucleare
Aldo Montagnini

Chamber of Mines Research Organization
Philip J. Lloyc

Chem-Nuclear Systems, Inc.
Gary A. Benda
John H. Coffman
Robin Deal
W.T. Gregory
T.C. Weeks
Mark Whittaker

Chemrad Corporation
John M. Williford

Clark University
Jeanne X. Kasperson

Cogema, Inc.
Dana Minich

Colorado Department of Health
Richard Gamewell
Albert J. Hazle

Colorado Division of Water Resources
Stephen A. Spann

Colorado State University
Shawki Ibrahim
Kathy Mickelson
John D. Nelson
Stanley A. Schumm
W. John Smith

Combustion Engineering
Harold E. Eskridge

Comision Nacional de Energia Atomica
Alejandra Marcela Nardi

Comissao Nacional de Energia Nuclear
Centro de Informacoes Nucleares

Commissariat Energie Atomique
Andre Cregut
Jean Paul Delisle
J.P. Vertut

Commission of European Communities
Joint Research Centre

Commission for the Safety of Atomic Installations
M.J.F. Zuber

Commonwealth Edison Company
R.E. Jortberg
George P. Wagner

Concord Oil Company
Eric C. Wolff

Concrete Sawing and Drilling Association
Edward R. Thorn

Connecticut Department of Environmental Protection
Kevin T.A. McCarthy

Connecticut Department of Health Services
Alan J. Siniscalchi

Consultant Services
Kenneth B. Hinerman

Consultation Services, Inc.
D.C. Goldberg

Controlled Demolition Inc.
J. Mark Loizeaux

Controls for Environmental Pollution, Inc.
Rex C. Bickmore
James J. Mueller

Converse Consultants
Robert F. Kaufmann

Cygna Energy Services
Frank S. Dombek

D'Appolonia Consulting Engineers, Inc.
Michael J. Taylor

Dames and Moore, Inc.
Larry T. Murdock
Stanley L. Plaisier
Kenneth R. Porter
B.G. Randolph
Les Skoski

Defense Apparel
Edward C. Holman

Defense Nuclear Agency
Dale F. Keller

Delaware Custom Material, Inc.
John F. Hayes

Department of Environment (United Kingdom)
F.S. Feates
J.D. Marshall

Department of Mines and Energy (Canada)
Norman Kipnis

Department of Technological Research (Netherlands)
J. Kuypers

Desert Research Institute
Forest L. Miller

DGA/Mission Atome
Bernard Labbe

Dravo Engineers, Inc.
Vic Vinych

Duke Power Company
Harriet A. Webster

EAL Corporation
Leon Leventhal
Robert A. Wessman

Ebasco Services, Inc.
Gloria Aks
Thomas J. Grant
Barry F. Moss

Eberline Instrument Corporation
Fred F. Haywood
Nels R. Johnson
Richard L. Powell
Ernest A. Sanchez

EDS Nuclear, Inc.
John H. Turney

EG & G Idaho, Inc.
B.R. Baldwin
Walt C. Bare
Robert L. Dodge
T.J. Hill
Edward Jennrich
Gary W. Johnsen
R. Jon Lynch
John W. Mandler
Richard H. Meservey
David R. Mousseau
R.L. Nitschke
D.H. Schoonen
Orval D. Simpson
Donald L. Smith
Bobbie Sneed
Kenneth C. Sumpter
E.R. White

Eldorado Resources Limited
M.P. Filion
D.G. Garratt
Duncan Moffett

Empresa Nacional del Uranio, S.A.
Joaquin Guillen

Ente Nazionale Energia Elettrica
Adolfo Bertini

Energy Consultants, Inc.
Laurance Y. Kotys

Energy Fuels Nuclear, Inc.
Larry K. Perkins
Joseph Howieson

Energy Research Group, Inc.
Betty S. Brown

Energy, Inc.
Jackie Loop
Richard Vance

Environment Canada
Bryan C. Armstrong
R. Krauel
P. Vasudev

Environmental Sciences and Engineering, Inc.
Charles L. Stratton

Envirosphere Company
Roger G. Anckison

ERM-Midwest, Inc.
Neil L. Drobny

ESA Geotechnical Consultants
W. Roger Hail

ESD Corporation
Dave Curphey

Eurochemic
Hubert Eschrich
W. Hild
Otto von Busekist

European Nuclear Energy Association
Mario Conti
Michele Laraia
G.G. Mastino
Mario Mittemperger
Giovanni Naschi
Missimo Rossi

Evaluation Research Corporation
Joann Epler

Exxon Nuclear Idaho Company
Don R. Alexander
James A. Carter
Library
J.G. Scott

Fachinformationszentrum Energie, Physik, Mathematik
Library

Federal Ministry for Research and Technology
K. Hubenthal

Federal Ministry of Health and Environment (Austria)
W. Pusch

Federal Office of Energy (Switzerland)
U. Niederer

Fisher, Harden and Fisher
Kim C. Harden
Larry McGonagle

Florida Power Corporation
D.M. O'Shea

Flow Technology Company
Michael J. Kirby

Fluor Corporation
Vincent J. Kavlick

Fluor Engineers, Inc.
Mark Fortsch

Fluor Mechanical Services
Tom A.R. Morton

Ford, Bacon and Davis Utah, Inc.
Robert D. Baird
James J. Keithley
Robert F. Overmyer
Vern Winkler

Fox and Associates
Paul V. Rosasco

G.W. Collier Associates
George W. Collier

GA Technologies, Inc.
Richard J. Tommey

Gardinier, Inc.
G.E. Wilkinson

GECR, Inc.
Kathryn J. Bush
Gergely Markos

General Electric Company (United Kingdom)
Kenneth F. Clayton

General Electric Company
E.F. Kurtz
Library
John M. Skarpelos
Herbert R. Strickler
Marion L. Thompson
Harry E. Wagner

Genshi-Ryoku Daiko Company, Limited
Kaoru Ito
Takayoshi Tanaka

Georgia Department of Human Resources
Radioactive Materials Unit;

Georgia Institute of Technology
Melvin W. Carter
D.W. Tedder

Getty Minerals Company
Brian W. Buck

Getty-Petrotomics
Stephen J. Pfaff

Gibbs & Hill, Inc.
Kathleen Cushman
M. Siva Kumar

Gilbert/Commonwealth Associates, Inc.
William H. Randall

GPU Nuclear
Joan Slavin

Ground/Water Technology, Inc.
B. Tod Delaney

Gundle Lining Systems, Inc.
Fred A. Staab

H & R Technical Associates, Inc.
William R. Rhyne

Hanford Engineering Development Laboratory
Dennis R. Arter

Harza Engineering Company
William A. Rettberg

Hazama-Gumi Limited
Takashi Inoue

Health and Welfare Canada
Subodh K. Ghosh

Health Physics Systems, Inc.
James T. McVey

Hitachi Works of Hitachi Limited
Hisao Itow

Hitachi Zosen Corporation
Jun-ichi Miyakoshi

Hittman Nuclear and Development Corporation
Charles W. Mallory
John E. Razor

Hovater-Way Engineers, Inc.
Library

Hydro Nuclear Services
Robin R. Shult

Hydro-Quebec
Louise Marcil

Idaho Department of Health and Welfare
Robert D. Funderburg

IEC-BECK Consultants Limited
D.L. Lush

Illinois Commerce Commission
Marvin Farmer
Gary L. Hunt

Illinois Department of Nuclear Safety
David G. Dolan
Milton Zukor

Illinois Legislative Council
John Ahlen

Indiana Board of Health
Hal S. Stocks

Institute of the Ironworking Industry
Stephen Cooper

Institute of Nuclear Energy Research (Taiwan)
Fan-Yu Hsueh

Institute of Radiation Protection (Finland)
Seppo Vaisanen

Instituto de Investigaciones Mineras (Argentina)
Jose Agustin Matar

Institutt for Energiteknikk (Norway)
Library

Intera Environmental Consultants, Inc.
Clifford J. Noronha

International Research and Evaluation
R. Danford

International Atomic Energy Agency
Sekiya Mukai

International Engineering Company
Don R. Poindexter
E.S. Smith

International Energy Associates Limited
Robert S. Walker

Interstate Nuclear Services
George J. Bakevich

Iowa Department of Heath
John A. Eure

Iowa Geological Survey
Donald L. Koch

IRT Corporation
Kenneth R. Alvar

IT Nuclear Services
David E. Harmer

J.A. Jones Construction Company
Library
D. Neil Venart

Jacobs Engineering Group, Inc.
Kenneth R. Baker
Bob R. Bearden
Adele Dunham
Louise W. Hall
W.C. Mason
Reta E. Petersen

James A. Fitzpatrick Power Authority
Roger Locy
Len Wasniak

Japan Atomic Energy Research Institute
Naoji Ito

Japan Society of Civil Engineering
Kenji Kor ɔ

Johns Hopkins University
William J. Snodgrass

Junta de Energia Nuclear
Margarita Rodriguez Parra
M. Perarnau
Julio Petrement

Kaiser (Henry J.) Company
L.J. Giunchigliani

Kajima Corporation
Masaklini Kobayashi

Kansas Department of Health and Environment
Gerald W. Allen

Kansas Electric Power Cooperative, Inc.
Joseph W. Mullholland

Kentucky Department of Environmental Protection
Doyle Mills

Kernforschungsanlage Julich GmbH
Gerd Brinkmann

Kernforschungszentrum Karlsruhe GmbH
Walter Diefenbacher
Hersh K. Manaktala
Wolfgang Zimmermann

Kernkraftwerke Gundremmingen
Wolfgang Stang

Kerr-McGee Corporation
Tom W. Harrison
Edwin T. Still
Garet E. Van De Steeg

Keuring van Electrotechnische Materialen, N.V.
Theo van der Plns

Key Lake Mining Corporation
Peter Courtney

KLM Engineering, Inc.
Library

Klohn Leonoff Limited
Vinod K. Garga

Knolls Atomic Power Laboratory
Joseph L. Flacke

Kraftwerk Union Aktiengesellschaft
Dr. von Koch

Laborelec
R.L.A. Roofthooft

Lanson Industries, Inc.
Roger C Humphrey

Law Engineering Testing Company
James L. Grant
F.J. Steinbrenner

Lawrence Livermore National Laboratory
Charles L. Folkers

Legislative Research Commission
Peggy Hyland

Life Cycle Engineering, Inc.
Larry C. Hargrove

Lockwood Greene Engineers, Inc.
M. Lane Fowler

London Nuclear Services Inc.
R.L. Hemmings

Long Island Lighting Company
Kathleen K. Taylor

Los Alamos Technical Associates
Flo Butler

Los Alamos National Laboratory
Gerald L. DePoorter
David R. Dreesen
Edward H. Essington
Wayne R. Hansen
K.K.S. Pillay
Allen Valentine
John L. Warren

Louisiana Nuclear Energy Division
William H. Spell

MacLaren Engineers, Inc.
E.J. Chart

Maeda Construction Company, Limited
Takeo Ikeda

Marline Uranium Corporation
Mark S. Fetzer

Maryland Department of Health and Mental Hygiene
Robert E. Corcoran

Massachusetts Department of Public Health
Robert M. Hallisey

Massachusetts Institute of Technology
Science Library

McMaster University
Marios Tsezos

Michigan Department of Public Health
George W. Bruchmann

Milwaukee School of Engineering
M. Schmidt

Mining Environment Consultants
P.F. Pullan

Ministry of Housing, Physical Planning (Netherlands)
H.D.K. Codee

Ministry of Defense (United Kingdom)
S.D. Hunter
M.D. Jordan

Ministry of the Environment (Canada)
G.J. LaHaye

Ministry of Public Health and Environmental Hygiene (Netherlands)
J. Weber

Minnesota Geological Survey
Library

Mississippi State University
C.T. Carley

Mississippi State Department of Health
Eddie S. Fuente

Missouri Division of Health
Kenneth V. Miller

Mitsubishi Heavy Industries, Limited
Kazuo Aoki

Monsanto Research Corporation, Mound Facility
A.B. Combs
William P. Davis
Douglas G. Draper
Toby C. Elswick
Joseph M. Garner
Jack R. Geichman
Harold Honious

Morgan Engineering
Joseph V. Cadile

Morrison-Knudsen Company, Inc.
Bruce H. Peterson

Morse Associates, Inc.
Jerome G. Morse

Motor Columbus Consulting Engineers, Inc.
M. Anthony Playfair

NAGRA
Jean-Claude Alder

National Aeronautics and Space Administration
Earl C. Boitel
Thomas L. Junod

National Academy of Sciences
John T. Holloway
John S. Sieg

National Board for Spent Nuclear Fuel (Sweden)
Nils Rydell

National Conference of State Legislatures
Deborah Bernau

National Energy Information Center
Kathy Keil

National Institutes of Health
R.J. Augustine

National Institute of Radiation Protection (Sweden)
Ragnar Boge

National Nuclear Corporation, Limited (United Kingdom)
Walter John Cairns
A.C. Littlejohn
J.D. Regan

National Radiological Protection Board (United Kingdom)
I.F. White

National Solid Wastes Management Association
Reva Rubenstein

Nebraska Department of Health
H. Ellis Simmons

Netherlands Energy Research Foundation
M. Joustra

New Jersey Bureau of Radiation Protection
Jeanette Eng

New Mexico Department of Health and Environment
Samuel N. Simpson
Alphonso A. Topp

New Mexico Institute of Mining and Technology
Arpad E. Torma

New Mexico State University
Edward F. Thode

New York City Health Department
Leonard R. Solon

New York State Department of Labor
F.J. Bradley

New York State Department of Environmental Conservation
Thomas J. Cashman

New York State Department of Health
John M. Matuszek
Karim Rimawi

New York State Energy Research and Development Authority
T.K. DeBoer
John P. Spath

New York State Federation for Safe Energy
A.E. Wasserbach

Niagara Mohawk Power Corporation
Thomas E. Lempges

Niigata Engineering Company, Limited (Japan)
Tetsuo Meguro

NL Industries, Inc.
Adelbert J. Potter

NLO, Inc.
W.C. Hill
Reports Library
Timothy A. Poff
G.L. Stukenbroeker

Noell GmbH
Hans-Joachim Viecent

North Carolina Radiation Protection Commission
Dayne H. Brown

Northeast Utilities
Lawrence H. Levy

Norwegian Nuclear Energy Safety Authority
Kaare Oefjord

Nuclear Environmental Engineering Company, Limited
Toshio Koguchi

Nuclear Energy Agency
Eli Maestas

Nuclear Energy Services, Inc.
Charles J. Marino
Robert W. Ramsey

Nuclear Fuel Services, Inc.
James R. Clark
J.E. Kirkpatrick

Nuclear Installations Inspectorate
R.D. Anthony
R. Eeles

Nuclear Metals, Inc.
Frank J. Vumbaco

Nuclear News
Editor

Nucleco
Andrea Gandellini

NUKEM GmbH
Hans-Dicter Fricke

NUS Corporation
Paul G. Delozier
S.B. Gerges
N. Barrie McLeod
G.W. Sieving
Susan J. Thomas
Daniel Threlfall

NUSAC, Inc.
Ralph F. Lumb

Oak Ridge Associated Universities
Harry Burn

Oak Ridge National Laboratory
John F. Alexander
C.D. Berger
Barry A. Berven
J.O. Blomeke
William J. Boegly
William L. Carter
F.N. Case
Central Research Library
J.H. Coobs
W.D. Cottrell
J.S. Drury
Sidney P. duMont
J.T. Ensminger
R.A. Faust
J.M. Fielden
C.S. Fore
C.W. Forsberg
H.B. Gerstner
Donald C. Hampson
Hazardous Materials Information Center
R.E. Helms
Shilling F. Huang
Dale D. Huff
ICC Publications Office
ICC Resource Center
N.P. Knox
Laboratory Records
T.F. Lomenick
Robert S. Lowrie
Lance J. Mezga
Timothy E. Myrick
K.J. Notz
F.R. O'Donnell
T.W. Oakes
ORNL Patent Office
P.T. Owen
F.J. Peretz
Francois G. Pin
Malcolm L. Randolph
C.R. Richmond
A.L. Rivera
G.D. Robbins
Michael T. Ryan
A.R. Sadlowe
David R. Simpson
John H. Sorensen
Brian P. Spalding
Tsuneo Tamura
John P. Witherspoon
A.A. Walls
C.H. Wodtke
H.E. Zittel

Ohbayashi-Gumi, Limited
Akira Kutsumizu

Ohio Department of Health
Robert M. Quillin

OKG AB
Bertil Mandahl

Oklahoma Department of Health
Dale McHard

Oklahoma State University
Arthur W. Hounslow

Okumura Corporation
Mikio Takeuchi

Omaha Public Power District
Dayton D. Wittke

Ontario Hydro
Silvia Ernesaks
P.K.M. Rao
Alan P. Shetler
V.R. Sligl

Orange County Health Care Agency
James W. Hartranft

Oregon State University
Brian Dodd

Organization for Economic Co-operation and Development
Jean-Pierre Olivier

Outokumpu Oy (Finland)
Raimo Leimala

Pacific Gas and Electric Company
Robert T. Nelson

Pacific Northwest Laboratory
Keith H. Abel
Richard P. Allen
Thomas J. Bander
Peter A. Beedlow
W.F. Bonner

Ron L. Brodzinski
Roberta Bush
Larry L. Cadwell
Robert L. Clark
F.T. Cross
R.L. Dillon
James R. Divine
James M. Doesburg
Michael G. Foley
H.D. Freeman
Thomas E. Gates
G.W. Gee
Richard O. Gilbert
Mike Halter
J.N. Hartley
Richard F. Hazelton
Greg M. Holter
W.E. Kennedy, Jr.
George J. Konzek
Lawrence T. Lakey
Sidney Marks
Donald H. Mitchell
Emmett Moore
L.F. Munson
E. Smith Murphy
Richard I. Smith
Vivian W. Thomas
Wallace H. Walters
E.C. Watson
Walter C. Weimer
Eugene M. Woodruff

Palmetto Alliance, Inc.
Library

Pathfinder Mines Corporation
Tom Hinton
Robert W. Poyser

Pechiney Ugine Kuhlmann
Jacques M. Blum
M.C. Maillet
R.J. Romano

Penhall International Company
Ronald G. Mooers

Pennsylvania Power and Light Company
Thomas E. Gangloff

Pennsylvania State University
Rodger W. Granlund
Library

Pennsylvania Public Utility Commission
Witold M. Pachul

Pennsylvania Bureau of Radiation Protection
James G. Yusko

Power Cutting, Inc.
R. Jon Stouky

Preussische Elektrizitaets F.A.
Juergen Essmann

Public Service Electric and Gas
Richard Bater

Quadrex Corporation
H.W. Arrowsmith
Stuart L. Clark
Howard R. Gardner
James William Jones
George E. Krauter
John F. Remark
Lawrence J. Verley

R.N. College (United Kingdom)
J.R.A. Lakey

RAD CON Consultants
William H. Button

Ralph M. Parsons Company
Robert W. Kee

RAMPAC, Inc.
Ferd Bondy

Raymond Kaiser Engineers, Inc.
L.T. Brighton
Stephen L. Brown
Wallace J. Dodson
Edward M. Saunders

Research Triangle Institute
Steve A. Johnson

Retech, Inc.
William B. Thelen

Reuter-Stokes, Inc.
Joseph D. Skarupa

Reynolds Electric and Engineering Company, Inc.
C.E. Rosenberry

Rio Algom Corporation
Robert S. Pattison

Rio Algom Limited
Albert J. Vivyurka

Riteway Machine and Specialty Company, Inc.
Marshall E. Hollender

Rockwell Hanford Operations
Al N. Gallegos
W.M. Hayward
W.F. Heine
Ron Rowell

Rockwell International, Rocky Flats Plant
Carol J. Barker
Charles E. Wickland

Rockwell International, Atomics International Division
C.C. Conners
James M. Harris
W.D. Kittinger
B.F. Ureda

Rocky Mountain Energy Company
Robert J. Coppin
Patrick Spieles
John A. Yellich

Rogers and Associates Engineering Corporation
Vern C. Rogers
Arthur A. Sutherland

Rolls-Royce and Associates, Limited
D. Beecroft
P.R. Roberts

Roman Z. Pyrih and Associates, Inc.
Roman Z. Pyrih

S.A. l'Energie de l'Ouest Suisse
Jean Paul Buclin

S.M. Stoller Corporation
Albert A. Weinstein

Sacramento Municipal Utility District
William J.Renard

Sandia National Laboratories
Lial W. Brewer
Laurence H. Brush
Richard P. Burke
Don Diego Gonzalez
Stuart Kupferman
Technical Library

Sargent and Lundy Engineers
Robert A. Nelson

Saskatchewan Mining Development Corporation
P. Moen

Saskatchewan Environment
C.L. Potter

Savannah River Laboratory
E.L. Albenesius

Savignac (Noel), Inc.
Noel Savignac

Science and Technology Agency
Koji Asano
Kiyoshi Kagimoto

Science Applications, Inc.
Larry J. Coe

Science University of Tokyo
Kinichi Torikai

Scottish Development Department
G. Stott

SCPRI
Pierre Pellerin

SEA, Inc.
Jerry A. Riehl

Senes Consultants Limited
Douglas B. Chambers

Sergent, Hauskins, and Beckwith Geotechnical Engineers, Inc.
Robert D. Booth

Service Technique Mistere Industrie
Pierre Cohen

Shea and Gardner
Library

Shimizu Construction Company, Limited
Tetsuo Nagase

Sludgemaster, Inc.
Library
Frank Manchak, Jr.

South Australian Health Commission
Jill Fitch

South Dakota Department of Water and Natural Resources
Dana C. Ward

Southern Company Services, Inc.
James N. McLeod

Southern States Energy Board
J.F. Clark

Southwest Research and Information Center
Paul Robinson
Chris Shuey

St. Charles Countians Against Hazardous Waste
Ann Hood

Standard Oil Company of Indiana
John J. Kuruc

Stearns-Roger
Veryl G. Eschen
Janna Jantz

Steffen, Robertson and Kirsten
A. Mac G. Robertson

Stone and Webster Engineering Corporation
David F. Greenwood
George L. Hefter
Stephen Unks

Studsvik Energiteknik AB
Jan Arvesen
Shankar Menon

Supervising Scientist for the Alligator Rivers Region
Deirdre Irwin

Swedish Nuclear Fuel Supply Company
Hans G. Forsstrom

Swedish Nuclear Power Inspectorate
Alf Larsson

Swedish State Power Board
Krister Egner
Stig Pettersson

Swiss Federal Institute for Reactor Research
Willi M. Francioni
Library

Sybron Corporation
Francis X. McGarvey

Sydkraft
Library

Synergic Resources Corporation
Michele Skivo

Systems Management and Engineering Corporation
Richard Balsam

TACA Corporation
Thomas A. Colbert

Tailing Technology Pty., Limited
Carlos Sorentino

Technical University of Prague
Petr Benes

Technischer Uberwachungs-Verein
H.G. Fendler

Technology for Energy Corporation
Susan C. Golden

Teknekron Research, Inc.
Douglas K. Vogt

Teledyne Isotopes
Steven Black

Tennessee Valley Authority
Thomas A. Shelton

Terradex Corporation
James E. Gingrich

Texas A and M University
Carl A. Erdman

Texas Department of Health
Edgar D. Bailey
David K. Lacker
M. Lynn Marple
William C. Price
S. David Shearer
Warren D. Snell

The New Yorker Magazine
Fred Shapiro

ThermoElectron Corporation
Bahman Heshmatpour

Thomas W. Ward Limited
William T. Lawton

TLG Engineering, Inc.
Thomas S. LaGuardia

Tokyo Electric Power Services Company, Limited
Mamoru Ichinose

Toledo Edison Company
Erik H. Neilson

Tractionel
Paul A. Dozinel

Transnuclear, Inc.
Bill R. Teer

TRW
Steven L. Salem

Tun Ismail Atomic Research Centre
Ahmad Tajuddin-Ali

TVO Power Company (Finland)
Hannu Harkonen

U.S. Department of Agriculture
John S. Dersch

U.S. Department of Energy, Albuquerque Operations Office
W. John Arthur
John R. D'Antonio
James A. Morley
John G. Themelis
George J. Werkema

U.S. Department of Energy, Chicago Operations Office
Frank F. Gorup
Gary C. Marshall
Jerry Nelsen

U.S. Department of Energy, Dayton Area Office
Robert Grandfield

U.S. Department of Energy, Grand Junction Area Office

Larry Ball
Michael K. Tucker

U.S. Department of Energy, Headquarters

Nathanial F. Barr
John E. Baublitz
Franklin E. Coffman
Edward Delaney
Antony F. Kluk
William E. Mott
Alex Perge
Mary G. White

U.S. Department of Energy, Idaho Operations Office

Maggie A. Widmayer

U.S. Department of Energy, Los Alamos Area Office

William Crismon

U.S. Department of Energy, Nevada Operations Office

Cynthia Ortiz

U.S. Department of Energy, Oak Ridge Operations Office

William Bibb
Lowell F. Campbell
Paul Dunaway
Kathleen F. Harer
E.L. Keller
Stanley Stief

U.S. Department of Energy, Pittsburgh Naval Reactor Office

Carl K. Gaddis

U.S. Department of Energy, Richland Operations Office

Jack Collins
Clarence E. Miller
J. Michael Usher
Jerry D. White

U.S. Department of Energy, San Francisco Operations Office

Len Lanni

U.S. Department of Energy, TMI Site Office

James Reilly

U.S. Department of Energy, West Valley Demonstration Project

Robert E. Stiens

U.S. Environmental Protection Agency

William E. Belanger
Wayne Bliss
William L. Brinck
David L. Duncan
Joyce Feldman
John R. Giedt
Joseph M. Hans
Larry Jensen
Byron E. Keene
Andrew J. Leiter
Stanley Lichtman
A. Alan Moghissi
Audrey Thomas

U.S. General Accounting Office

Robert B. Arthur

U.S. Geological Survey

Robert W. Hull
E.R. Landa

U.S. Liaison Office

Henri de la Bassetiere

U.S. Nuclear Regulatory Commission

George Birchard
William T. Crow
John G. Davis
Harold R. Denton
Claude A. Flory
Daniel M. Gillen
Giorgio N. Gnugnoli
Craig Z. Gordon
Don F. Harmon
Charles S. Hinson
G. Wayne Kerr
Library
Dan E. Martin
James R. Miller
Robert B. Minogue
Donald A. Nussbaumer
Roger Pennifill
R. Dale Smith

UNC Nuclear Industries, Inc.

John S. Brehm
Richard N. Coy
Thomas E. Dabrowski
A.J. Sash Eirich
W.K. Kratzer
W. Jean Kyriazis
Art W. Larson
Bruce Link
Sarah J. Mickelson
Robert L. Miller
Robert A. Paasch
Ed Powers
Garry L. Quinn

Union Carbide Corporation

R.L. Beethe
Robert G. Beverly
T.J. Kagetsu
C.T. Wentzel
Tom Wong

UNITECH

Dennis Anthony

United Engineers and Constructors, Inc.

Edward D. McDevitt
C.Q. Miller
Carlos Murawczyk

United Kingdom Atomic Energy Agency
Central Library
J.S. Harper
K.J. Henry
J.R. Thomas

United Nuclear Corporation
Thomas M. Hill
Elmer D. Martinez

University of Arizona
James G. McCray
Dirk Van Zyl

University of British Columbia
Leslie Smith

University of California
Evan Romney

University of Colorado at Denver
Willard R. Chappell

University of Denver
Philip A. Russell

University of Florida
W. Emmett Boles

University of Idaho
Roy E. Williams

University of Michigan
Margaret Bean

University of Missouri at Columbia
W.R. Kimel
Philip K. Lee

University of New Mexico
Bruce M. Thomson

University of Nottingham
David R. Cope

University of Puerto Rico
Nimia Irazarry

University of Saskatchewan
S.L. Barbour
R.J. Woods

University of Texas
David E. Daniel

University of Tokyo
Mamoru Akiyama

University of Toronto
M. Kalin

University of Wisconsin
John Strasma

US Ecology, Inc.
Ronald K. Gaynor

Utah Department of Health
Larry F. Anderson

Utah Natural Resources and Energy
Thomas N. Tetting

Utility Data Institute
Fred Yost

Vanderbilt University
Frank L. Parker

Vikem Industries
Val Bouchard

Virginia Electric and Power Company
Stephen B. Eisenhart
E.R. Smith, Jr.

Virginia State Corporation Commission
W. Timothy Lough

Vitrex Corporation
R.C. Ropp

Volpe (R.L.) and Associates
Richard L. Volpe

W.K. Summers and Associates, Inc.
W.K. Summers

Wahler Associates
Dennis Buranek
James McClure
John Reiss

Washington State Department of Social and Health Services
Clarence E. Ingersoll

Washington Public Power Supply System
W.C. Wolkenhaver

West Valley Nuclear Services Company, Inc.
William R. Jacoby
Erich J. Mayer

Westec Services, Inc.
Gary J. Overbeck

Westinghouse Electric Corporation
Patrick Felice
Charles S. Klanian
George Toto

Worcester Polytechnic Institute
L.C. Wilbur

Wyoming Department of Environmental Quality
Gary Beach

ORNL/EIS-154/V4
(RLO-SFM-80/5)

INTERNAL DISTRIBUTION

1. J.F. Alexander
2. C.D. Berger
3. B.A. Berven
4. J.O. Blomeke
5. W.J. Boegly
6. W.L. Carter
7. F.N. Case
8. J.H. Coobs
9. W.D. Cottrell
10. J.S. Drury
11. S.P. du Mont
12. J.T. Ensminger
13. R.A. Faust
14. J.M. Fielden
15. C.S. Fore
16. C.W. Forsberg
17. H.B. Gerstner
18. R.E. Helms
19. S.F. Huang
20. D.D. Huff
21. N.P. Knox
22. T.F. Lomenick
23. R.S. Lowrie
24. L.J. Mezga
25. T.E. Myrick
26. K.J. Notz
27. F.R. O'Donnell
28. T.W. Oakes
29. P.T. Owen
30. F.J. Peretz
31. F.G. Pin
32. C.R. Richmond
33. A.L. Rivera
34. G.D. Robbins
35. M.T. Ryan
36. A.R. Sadlowe
37. D.R. Simpson
38. J.H. Sorenson
39. B.P. Spalding
40. T. Tamura
41. A.A. Walls
42. J.P. Witherspoon
43. C.H. Wodtke
44. H.E. Zittel
45. Biology Library

46–47. Central Reseach Library
48. Document Reference Section
49.–348. Remedial Action Program Information Center
349. ICC Publications Office
350–355. ICC Resource Center
356–357. Laboratory Records
358. Laboratory Records, RC
359. ORNL Patent Office

EXTERNAL DISTRIBUTION

360. Keith H. Abel, Pacific Northwest Laboratory, Radiological Sciences Department, P.O. Box 999, 329 Building/300 Area, Richland, WA 99352
361. Nick Abromiuk, Bendix Field Engineering Corporation, Project Operations, P.O. Box 1569, Grand Junction, CO 81502
362. John Ahlen, Illinois Legislative Council, Science Unit, 107 Stratton Building, Springfield, IL 62706
363. Mamoru Akiyama, University of Tokyo, Department of Nuclear Engineering, 7-3-1, Hongo, Bunkyo-ku, Tokyo 113, Japan
364. Gloria Aks, Ebasco Services, Inc., Technical Library, 2 World Trade Center, 91st Floor, New York, NY 10048
365. E.L. Albenesius, Savannah River Laboratory, P.O. Drawer A, Aiken, SC 29808
366. Jean-Claude Alder, NAGRA, Parkstrasse 23, CH 5401 Baden, Switzerland
367. Don R. Alexander, Exxon Nuclear Idaho Company, Radiation and Environmental Safety, P.O. Box 2800, CPP630, Idaho Falls, ID 83401
368. Gerald W. Allen, Kansas Department of Health and Environment, Bureau of Radiation Control, Forbes Field, Building 321, Topeka, KS 66620
369. Jim Allen, Bendix Field Engineering Corporation, P.O. Box 1569, Grand Junction, CO 81502
370. Richard P. Allen, Pacific Northwest Laboratory, Materials Department, P.O. Box 999, Richland, WA 99352

371. Kenneth R. Alvar, IRT Corporation, Program Development Department, P.O. Box 85317, San Diego, CA 92138-5317
372. Charles G. Amato, Arizona Radiation Regulatory Agency, 925 South 52nd Street, Suite 2, Tempe, AZ 85281
373. Roger G. Anckison, Envirosphere Company, 400 112th Avenue, NE, Bellevue, WA 98004
374. Larry F. Anderson, Utah Department of Health, Division of Environmental Health, P.O. Box 2500, Salt Lake City, UT 84010
375. Niles J. Andrus, American Nuclear Corporation, Operations Division, P.O. Box 2713, 314 West Midwest Avenue, Casper, WY 82602
376. Dennis Anthony, UNITECH, 2720 U.S. Highway 22, Union, NJ 07083
377. R.D. Anthony, Nuclear Installations Inspectorate, Thames House North, Milbank, London, United Kingdom SW1P 4QJ
378. Kazuo Aoki, Mitsubishi Heavy Industries, Limited, Pittsburgh Representative Office, Penn Center, Building 3, Room 600, P.O. Box 355, Pittsburgh, PA 15230
379. Argonne National Laboratory, TIS Department, Report Section, 9700 South Cass Avenue, Argonne, IL 60439
380. Bryan C. Armstrong, Environment Canada, Environmental Protection Service, 804, 9942-108 Street, Edmonton, Alberta, Canada T5K 2J5
381. H.W. Arrowsmith, Quadrex Corporation, Recycle and Restoration Division, 8103 SW 5th Avenue, Gainesville, FL 32607
382. Dennis R. Arter, Hanford Engineering Development Laboratory, Nuclear QA Program Office, P.O. Box 1970, Mail Stop B-110, Richland, WA 99352
383. Robert B. Arthur, U.S. General Accounting Office, 1500 Plaza Building, Room 414, 1500 NE Irving Street, Portland, OR 97232
384. W. John Arthur, U.S. Department of Energy, Albuquerque Operations Office, Uranium Mill Tailings Project Office, 5301 Central Avenue, NE, Suite 1700, Albuquerque, NM 87115
385. Jan Arvesen, Studsvik Energiteknik AB, S-61182, Nykoping, Sweden
386. Koji Asano, Science and Technology Agency, Research Reactor Regulation Division, Nuclear Safety Bureau, 2-2-1, Kasumigaseki, Chiyoda-ku, Tokyo, Japan
387. R.J. Augustine, National Institutes of Health, Radiation Safety, Building 21, Bethesda, MD 20205
388. Beverly S. Ausmus, Bechtel National, Inc., P.O. Box 350, Oak Ridge, TN 37830
389. Australian Department of Mines and Energy, P.O. Box 2901, Darwin, N.T., Australia 5794
390. Austrian Research Centre, Institute for Mathematics and Information, 2444 Seibersdorf, Austria
391. James W. Ayres, AWC, Inc., 4335 West Tropicana Avenue, Las Vegas, NV 89103
392. Babcock and Wilcox, Information Services, Utility Power Generation Department, P.O. Box 1260, Lynchburg, VA 24505
393. Tom S. Baer, Bechtel National, Inc., Nuclear Fuel Operations, Decontamination and Restoration, Department, P.O. Box 350, Oak Ridge, TN 37830
394. Edgar D. Bailey, Texas Department of Health, Bureau of Radiation Control, Division of Licensing, Registration, and Standards, 1100 West 49th Street, Austin, TX 78756
395. Robert D. Baird, Ford, Bacon and Davis Utah, Inc., Utah Division, Nuclear Programs, P.O. Box 8009, Salt Lake City, UT 84118
396. Kenneth R. Baker, Jacobs Engineering Group, Inc., Jacobs/Weston Team, UMTRAP Project, 5301 Central Avenue, NE, Suite 1700, Albuquerque, NM 87108
397. George J. Bakevich, Interstate Nuclear Services, 295 Parker Street, Indian Orchard, MA 01151
398. B.R. Baldwin, EG&G Idaho, Inc., Safety Division, P.O. Box 1625, Idaho Falls, ID 83415
399. Larry Ball, U.S. Department of Energy, Grand Junction Office, P.O. Box 2567, Grand Junction, CO 81502
400. Richard Balsam, Systems Management and Engineering Corporation, Marketing Department, 360 N. Sequlveda Boulevard, Suite 3000, El Sequendo, CA 90245
401. Thomas J. Bander, Pacific Northwest Laboratory, G&RE, P.O. Box 999, Richland, WA 99352
402. S.L. Barbour, University of Saskatchewan, Department of Civil Engineering, Saskatoon, Saskatchewan, Canada S7N 0W0
403. Hector Barcelo, University of Puerto Rico, Center for Energy and Environment Research, College Station, Mayaguez, PR 00708
404. Walt C. Bare, EG&G Idaho, Inc., Quality Engineering Division, P.O. Box 1625, WCB-W-3, Idaho Falls, ID 83415
405. Carol J. Barker, Rockwell International, Rocky Flats Plant, Environmental Analysis, P.O. Box 464, Golden, CO 80401

406. Nathanial F. Barr, U.S. Department of Energy, Room E-232, MS ER-73, (Germantown), Washington, DC 20545
407. Richard Bater, Public Service Electric and Gas, Nuclear Training Center Library, 244 Chestnut Street, Salem, NJ 08079
408. Battelle Columbus Laboratories, BPMD Library, Office of Nuclear Waste Isolation, 505 King Avenue, Columbus, OH 43201
409. John E. Baublitz, U.S. Department of Energy, Office of Nuclear Energy, Division of Remedial Action Projects, NE-24, Washington, DC 20545
410. Gary Beach, Wyoming Department of Environmental Quality, Land Quality Division, 401 West 19th Street, Cheyenne, WY 82002
411. Margaret Bean, University of Michigan, North Engineering Library, 1002 I.S.T., Ann Arbor, MI 48109
412. Bob R. Bearden, Jacobs Engineering Group, Inc., Advanced Systems Division, 5301 Central Avenue, NE, Suite 1700, Albuquerque, NM 87108
413. Bechtel National, Inc., Document Control Department, P.O. Box 350, 800 Oak Ridge Turnpike, Oak Ridge, TN 37830
414. Bechtel National, Inc., NFO Library (45/16/D18), P.O. Box 3965, San Francisco, CA 94119
415. D. Beecroft, Rolls-Royce and Associates, Limited, P.O. Box 31, Derby, England, United Kingdom DE2 8BJ
416. Peter A. Beedlow, Pacific Northwest Laboratory, Environmental Sciences Department, P.O. Box 999, Richland, WA 99352
417. R.L. Beethe, Union Carbide Corporation, Metals Division, P.O. Box 1029, Grand Junction, CO 81502
418. William E. Belanger, U.S. Environmental Protection Agency, 3AW12, Regional Radiation Office, 6th and Walnut Streets, Philadelphia, PA 19106
419. Gary A. Benda, Chem-Nuclear Systems, Inc., Corporate Development Division, P.O. Box 1866, Bellevue, WA 98009
420. Petr Benes, Technical University of Prague, Facility of Nuclear Science and Physical Engineering, 115 19 Prague 1, Brehova 7, Czechoslovakia
421. C.R. Bennett, Atomic Energy of Canada Limited, Sheridan Park Research Community, Mississauga, Ontario, Canada L5K 1B2
422. Deborah Bernau, National Conference of State Legislatures, 1125 17th Street, Suite 1500, Denver, CO 80202
423. John B. Berry, Acres American Inc., Industrial Division, Liberty Bank Building, Main and Court Streets, Buffalo, NY 14202
424. Adolfo Bertini, ENEL, Ente Nazionale Energia Elettrica, DPT - Generation and Transmission Division, 3, Via g.B. Martini, I-00198 Rome, Italy
425. Robert G. Beverly, Union Carbide Corporation, Metals Division, Environmental Affairs Department, P.O. Box 1029, Grand Junction, CO 81502
426. William Bibb, U.S. Department of Energy, Oak Ridge Operations Office, Building 2714-G, P.O. Box E, Oak Ridge, TN 37830
427. Rex C. Bickmore, Controls for Environmental Pollution, Inc., P.O. Box 5351, Santa Fe, NM 87502
428. George Birchard, U.S. Nuclear Regulatory Commission, MS 1130-SS, Washington, DC 20555
429. Steven Black, Teledyne Isotopes, Radiological Services, 50 Van Buren Avenue, Westwood, NJ 07675
430. Lisa Blanchfield, Bendix Field Engineering Corporation, Mining Division, P.O. Box 1569, Grand Junction, CO 81502
431. Wayne Bliss, U.S. Environmental Protection Agency, Office of Radiation Programs, P.O. Box 18416, Las Vegas, NV 89114
432. Richard E. Blubaugh, Atlas Minerals Company, Regulatory Affairs Department, P.O. Box 1207, Moab, UT 84532
433. Jacques M. Blum, Uranium Pechiney Ugine Kuhlmann, Development Division, 6 Av. Bertie Albrecht, 75008 Paris, France
434. Ragnar Boge, National Institute of Radiation Protection, Nuclear Energy Department, Box 60204, S-10401 Stockholm, Sweden
435. Earl C. Boitel, National Aeronautics and Space Administration, Lewis Research Center, Plum Brook Reactor Facility, Facilities Engineering Division, 21000 Brookpart Road, MS/21-10, Cleveland, OH 44135
436. W. Emmett Boles, University of Florida, Department of Health Physics, 110 A.P. Black Hall, Gainesville, FL 32611
437. Ferd Bondy, RAMPAC, Inc., 1916 South Washington, Tacoma, WA 98405
438. W.F. Bonner, Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352
439. Robert D. Booth, Sergent, Hauskins and Bechwith Geotechnical Engineers, Inc., 4700 Lincoln Road, NE, Albuquerque, NM 87109

440. Val Bouchard, Vikem Industries, Technical and Operation, 12 Mulliken Way, Newburyport, MA 01950
441. R. Boulenger, Centre d'Etudes de l'Energie Nucleaire, SCK, Controle-Radioprotection, Boeretang 200, Mol 2400, Belgium
442. Elizabeth Bourg, Atomic Industrial Forum, Inc., Library, 7101 Wisconsin Avenue, Bethesda, MD 20814
443. F.J. Bradley, New York State Department of Labor, Radiological Health Unit, Two World Trade Center, Room 69-89, New York, NY 10047
444. Lisa Bratton, Mill Road, R.D. #5, West Chester, PA 19380
445. John S. Brehm, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, P.O. Box 490, Richland, WA 99352
446. H. Dietmar Brenk, Brenk Systemplanung, Ingenieurburo fur Wissenschaft, Technische Umweltschutz, Heinrichsallee 38, D-5100 Aachen, Federal Republic of Germany
447. Lial W. Brewer, Sandia National Laboratories, Department 3310, P.O. Box 5800, Albuquerque, NM 87185
448. L.T. Brighton, Raymond Kaiser Engineers, Inc., Business Development Department, 1100 Jadwin Avenue, Suite 450, Richland, WA 99352
449. William L. Brinck, U.S. Environmental Protection Agency, 324 East 11th Street, Kansas City, MO 64106
450. Gerd Brinkmann, Kernforschungsanlage Julich GmbH, Abteilung Anlagenplanung und Bautechnik, Postfach 1913, 5170 Julich, Federal Republic of Germany
451. Ron L. Brodzinski, Pacific Northwest Laboratory, Radiological Sciences Department, P.O. Box 999, Richland, WA 99352
452. Brookhaven National Laboratory, Research Library, Reports Section, Upton, NY 11973
453. Betty S. Brown, Energy Research Group, Inc., Library, 400-1 Totten Pond Road, Wiltham, MA 02154
454. Dayne H. Brown, North Carolina Radiation Protection Commission, Department of Human Resources, P.O. Box 12200, Raleigh, NC 27605-2200
455. Stephen L. Brown, Raymond Kaiser Engineering, Business Development Department, P.O. Box 23210, Oakland, CA 94623
456. George W. Bruchmann, Michigan Department of Public Health, Radiological Health Services Division, 3500 North Logan Street, P.O. Box 30035, Lansing, MI 48909
457. Laurence H. Brush, Sandia National Laboratories, P.O. Box 5800, Division 9734, Albuquerque, NM 87185
458. Brian W. Buck, Getty Minerals Company, Administration, P.O. Box 7900, Salt Lake City, UT 84107
459. Jean Paul Buclin, S.A. l'Energie de l'Ouest Suisse, Nuclear Division, Place de la Gare 12, Lausanne, CH-1003, Switzerland
460. Dennis Buranek, Wahler Associates, P.O. Box 10023, 1023 Corporation Way, Palo Alto, CA 94303
461. Richard P. Burke, Sandia National Laboratories, Division 9415, Safety and Environmental Studies, P.O. Box 5800, Albuquerque, NM 87123
462. Harry Burn, Oak Ridge Associated Universities, MERT Division Library, P.O. Box 117, Oak Ridge, TN 37830
463. Kathryn J. Bush, GECR, Inc., P.O. Box 725, One Concourse Drive, Rapid City, SD 57709
464. Roberta Bush, Pacific Northwest Laboratory, Technical Information Section, P.O. Box 999, Richland, WA 99352
465. Flo Butler, Los Alamos Technical Associates, Library, P.O. Box 410, Los Alamos, NM 87544
466. William H. Button, RAD CON Consultants, P.O. Box 227, Galway, NY 12074
467. Joseph V. Cadile, Morgan Engineering, Nuclear Projects, 947 East Broadway, Alliance, OH 44601
468. Larry L. Cadwell, Pacific Northwest Laboratory, Environmental Sciences Department, P.O. Box 999, 6652-I Building, Richland, WA 99352
469. Walter John Cairns, National Nuclear Corporation Limited, Special Projects Department, Warrington Road, Risley, Warrington, Cheshire, England, United Kingdom WA3 6BZ
470. D.J. Cameron, Atomic Energy of Canada Limited, 275 Slater Street, Ottawa, Canada K1A 1E5
471. Lowell F. Campbell, U.S. Department of Energy, Oak Ridge Operations Office, Technical Services Division, P.O. Box E, Oak Ridge, TN 37830
472. C.T. Carley, Mississippi State University, Department of Nuclear Engineering, Drawer NE, Mississippi State, MS 39762
473. Jerry Carroll, Atomics International Division, Rockwell International, Energy Systems Group, 8900 DeSoto Avenue, Canoga Park, CA 91304
474. James A. Carter, Exxon Nuclear Idaho Company, Inc., Projects Division, P.O. Box 2800, Idaho Falls, ID 83401
475. Melvin W. Carter, Georgia Institute of Technology, School of Nuclear Engineering and Health Physics, Atlanta, GA 30332

476. Thomas E. Carter, Bendix Field Engineering Corporation, Project Operations Division, P.O. Box 1569, Grand Junction, CO 81502
477. Thomas J. Cashman, New York State Department of Environmental Conservation, 50 Wolf Road, Room 132, Albany, NY 12233
478. Douglas B. Chambers, Senes Consultants Limited, Nuclear Physics Division, 499 McNicoll Avenue, Willowdale, Ontario, Canada M2H 2C9
479. Casto O. Changho, Black and Veatch Engineers and Architects, Industrial/Special Projects Department, P.O. Box 8405, 1500 Meadowlake Parkway, Kansas City, MO 64114
480. John A. Chapin, Bechtel National, Inc., P.O. Box 350, Oak Ridge, TN 37830
481. Willard R. Chappell, University of Colorado at Denver, Center for Environmental Sciences, 1100 14th Street, Campus Box 136, Denver, CO 80206
482. D.H. Charlesworth, Atomic Energy of Canada Limited, Chalk River Environmental Authority, Chalk River Nuclear Laboratories, Chalk River, Ontario, Canada K0J 1J0
483. E.J. Chart, MacLaren Engineers, Inc., Waste Management Division, 33 Yonge Street, Toronto, Ontario, Canada M5E 1E7
484. Charles L. Cheever, Argonne National Laboratory, 9700 South Cass Avenue, PFS-WMO, Building 201, Argonne, IL 60439
485. Donald E. Clark, Battelle Columbus Laboratories, Project Management Division, Office of Nuclear Waste Isolation, 505 King Avenue, Columbus, OH 43201
486. J.F. Clark, Southern States Energy Board, Information Services, One Exchange Place, Suite 1230, 2300 Peachford Road, Atlanta, GA 30338
487. James R. Clark, Nuclear Fuel Services, Inc., Quality Assurance and Licensing, 6000 Executive Boulevard, Rockville, MD 20852
488. Robert L. Clark, Pacific Northwest Laboratory, CR&E, 3720/300, P.O. Box 999, Richland, WA 99352
489. Stuart L. Clark, Quadrex Corporation, Recycle and Restoration Services Division, P.O. Box 4100, Gainesville, FL 32607
490. James H. Clarke, Associated Water and Air Resources Engineers, Inc., P.O. Box 40284, Nashville, TN 37204
491. Kenneth F. Clayton, General Electric Company, Energy Systems Limited, Fuel Group, Cambridge Road, Whetstone, Leichester, England, United Kingdom
492. H.D.K. Codee, Ministry of Housing, Physical Planning, and the Environment, Radiation Department, P.O. Box 5811, Rijswijk, The Netherlands 2280 HV
493. Larry J. Coe, Science Applications, Inc., Nuclear Environmental Services Division, 3 Choke Cherry Road, Rockville, MD 20850
494. Franklin E. Coffman, U.S. Department of Energy, NE-20, Washington, DC 20545
495. John H. Coffman, Chem-Nuclear Systems, Inc., Field Services and Decommissioning Department, 240 Stoneridge Drive, Suite 100, Columbia, SC 29210
496. Pierre Cohen, Service Technique Mistere Industrie, DSRI Division, 9 rue Fernand-Leger, 91190 Gif sur Yvette, France
497. Thomas A. Colbert, TACA Corporation, 538 South Clarkson, Denver, CO 80209
498. George W. Collier, Collier (G.W.) Associates, 235 Ridgewood Drive, Mystic, CT 06355
499. Jack Collins, U.S. Department of Energy, Richland Operations Office, Surplus Facilities Management Program Office, P.O. Box 550, Richland, WA 99352
500. A.B. Combs, Monsanto Research Corporation, Mound Facility, P.O. Box 32, Miamisburg, OH 45342
501. Comissao Nacional de Energia Nuclear, Centro de Informacoes Nucleares, Rua General Severiano, 90 Terreo, Rio de Janeiro, Brazil 22294
502. Commission of European Communities, Joint Research Centre, Chemical Engineering, Essor Reactor, Building 80, 21020 CCR Ispra, Italy
503. C.C. Conners, Rockwell International, Atomics International Division, 8900 DeSoto Avenue, Canoga Park, CA 91304
504. Mario Conti, European Nuclear Energy Association, PAS/SMAIMP, Casella Postale 2400, 00100 Rome AD, Italy
505. Gary M. Cook, University of Michigan, Ford Nuclear Reactor, 2301 Bonisteel Boulevard, Ann Arbor, MI 48109
506. Stephen Cooper, Institute of the Ironworking Industry, 1750 New York Avenue, Washington, DC 20006
507. David R. Cope, University of Nottingham, University Park, Nottingham, England, United Kingdom NG7 2RD
508. Robert J. Coppin, Rocky Mountain Energy Company, Design Engineering Department, 10 Longs Peak Drive, P.O. Box 2000, Broomfield, CO 80020

509. Robert E. Corcoran, Maryland Department of Health and Mental Hygiene, Office of Environmental Programs, Division of Radiation Control, 201 West Preston Street, Baltimore, MD 21201
510. Kevin P. Coughlan, California Public Utilities Commission, Revenue Requirements Division, 350 McAllister Street, San Francisco, CA 94102
511. George I. Coulbourn, Boeing Engineering and Construction Company, Nuclear Power Systems, Mail Stop 9A-73, P.O. Box 3707, Seattle, WA 98124
512. Peter Courtney, Key Lake Mining Corporation, Operations Division, 229 Fourth Avenue, South, Saskatoon, Saskatchewan, Canada S7K 4K3
513. Richard N. Coy, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, P.O. Box 490, Richland, WA 99352
514. Andre Cregut, Institut de Protection, et de Surete Nucleaire, Commissariat a l'Energie Atomique, CEN - Valrho, B.P 171, Bagnols/Ceze, Gard, France 30 200
515. William Crismon, U.S. Department of Energy, Albuquerque Operations Office, Los Alamos Area Office, Los Alamos, NM 87544
516. F.T. Cross, Pacific Northwest Laboratory, Biology and Chemistry Department, P.O. Box 999, Richland, WA 99352
517. William T. Crow, U.S. Nuclear Regulatory Commission, Division of Fuel Cycle and Material Safety, NMSS, Mail Stop SS-396, Washington, DC 20555
518. Richard D. Cunningham, B.F. Goodrich Company, Environmental Products Division, D1914, 500 South Main Street, Akron, OH 44318
519. Dave Curphey, ESD Corporation, Business Development Department, 600 Meridian Avenue, San Jose, CA 95126
520. Kathleen Cushman, Gibbs and Hill, Inc., 1250 14th Street, Denver, CO 80202
521. John R. D'Antonio, U.S. Department of Energy, Albuquerque Operations Office, Facility and Construction Management Division, P.O. Box 5400, Albuquerque, NM 87115
522. Richard J. Dabolt, Allied General Nuclear Services, Production Engineering, P.O. Box 847, Barnwell, SC 29812
523. Thomas E. Dabrowski, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, P.O. Box 490, Richland, WA 99352
524. R. Danford, International Research and Evaluation, Waste Management Information Database, 21098 IRE Control Center, Eagan, MN 55121
525. David E. Daniel, University of Texas, Department of Civil Engineering, Austin, TX 78712
526. Nand K. Dave, Canada Centre for Mineral and Energy Technology, Energy, Mines and Resources Canada, Elliot Lake Laboratory, P.O. Box 100, Elliot Lake, Ontario, Canada P5A 2J6
527. Edward M. Davis, American Nuclear Energy Council, 410 First Street, SE, Washington, DC 20003
528. John G. Davis, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, DC 20555
529. M.S. Davis, Brookhaven National Laboratory, Department of Nuclear Energy, Building 830, Upton, NY 11973
530. William P. Davis, Monsanto Research Corporation, Mound Facility, Nuclear Operations, P.O. Box 32, Miamisburg, OH 45342
531. Henri de la Bassetiere, U.S. Liaison Office, SGN, 2550 M Street, NW, Suite 400, Washington, DC 20037
532. Robin Deal, Chem-Nuclear Systems, Inc., 240 Stoneridge Drive, Suite 100, Columbia, SC 29210
533. T.K. DeBoer, New York State Energy Research and Development Authority, West Valley/Radioactive Waste Management Program, 2 Rockefeller Plaza, Albany, NY 12223
534. B. Tod Delaney, Ground/Water Technology, Inc., 100 Ford Road, Suite C-5, Denville, NJ 07834
535. Edward Delaney, U.S. Department of Energy, NE-24, Washington, DC 20545
536. Jean Paul Delisle, Commissariat Energie Atomique, CEN Cadarache, Service d'Exploitation de Rapsodie, B.P. 1, Saint Paul lez Durance, France 13115
537. Paul G. Delozier, NUS Corporation, Engineering Group, 910 Clopper Road, Gaithersburg, MD 20878
538. Thomas F. Demmitt, Bechtel National, Inc., Decontamination and Restoration Department, P.O. Box 350, Oak Ridge, TN 37830
539. Harold R. Denton, U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, DC 20555
540. Gerald L. DePoorter, Los Alamos National Laboratory, P.O. Box 1663, Group LS-6, MS-K495, Los Alamos, NM 87545
541. John S. Dersch, U.S. Department of Agriculture, Forest Service, Watershed, Soils and Minerals Area Management, 11177 West 8th Avenue, P.O. Box 25127, Lakewood, CO 80225
542. D.T. Dexheimer, Bechtel Power Corporation, SF Power Division/Nuclear, 50 Beale Street, San Francisco, CA 94105

543. Walter Diefenbacher, Kernforschungszentrum Karlsruhe GmbH, Projecktträger UB/SN, Postfach 3640, Weberstrasse 5, D-7500 Karlsruhe 1, Federal Republic of Germany
544. R.L. Dillon, Pacific Northwest Laboratory, Materials Department, P.O. Box 999, Richland, WA 99352
545. James R. Divine, Pacific Northwest Laboratory, Materials Department, P.O. Box 999, Richland, WA 99352
546. Brian Dodd, Oregon State University, Nuclear Engineering Department, Radiation Center, Corvallis, OR 97331
547. Robert L. Dodge, EG&G Idaho, Inc., Waste Programs Division, Low-Level Waste Program, P.O. Box 1625, Idaho Falls, ID 83415
548. Wallace J. Dodson, Raymond Kaiser Engineers, Advanced Technology Division, P.O. Box 23210, BB-4, 300 Lakeside Drive, Oakland, CA 94623
549. James M. Doesburg, Pacific Northwest Laboratory, Geosciences Department, P.O. Box 999, Richland, WA 99352
550. David G. Dolan, Illinois Department of Nuclear Safety, Office of Waste and Transportation, 5813 Elm Avenue, Berkeley, CA 60163
551. Frank S. Dombek, Cygna Energy Services, 225 Stevens Street, Suite 110, Solana Beach, CA 92075
552. Gordon L. Dover, Bechtel National, Inc., NFO/Decontamination and Restoration, P.O. Box 72, Middletown, PA 17057
553. Paul A. Dozinel, Tractionel, Nuclear Department, Rue de la Science 31, Brussels, Belgium B-1040
554. Douglas G. Draper, Monsanto Research Corporation, Mound Facility, SMPP Area, P.O. Box 32, Miamisburg, OH 45342
555. J. Draulans, Belgonucleaire, Fuel Fabrication Plant, Europalaan 20, Dessel, Belgium B-2480
556. David R Dreesen, Los Alamos National Laboratory, Environmental Sciences Group, P.O. Box 1665, MS-K495, Los Alamos, NY 87545
557. Neil L. Drobny, ERM-Midwest, Inc., 4621 Reed Road, Columbus, OH 43220
558. Paul Dunaway, U.S. Department of Energy, Oak Ridge Operations, P.O. Box E, Oak Ridge, TN
559. David L. Duncan, U.S. Environmental Protection Agency, Region 9 Radiation Office, 215 Fremont Street, P-3-2, San Francisco, CA 94105
560. Adele Dunham, Jacobs Engineering Group, Inc., Advanced Systems Division, 5301 Central Avenue, Suite 1700, Albuquerque, NM 87108
561. John R. Duray, Bendix Field Engineering Corporation, Technical Measurements Center, P.O. Box 1569, Grand Junction, CO 81502
562. Jack N. Dybalski, Armak Company, Highway Chemical Research Department, 8401 West 47th Street, McCook, IL 60525
563. R. Eeles, Nuclear Installations Inspectorate, Library, Room 244A, Thames House North, London, United Kingdom SW1P 40J
564. Krister Egner, Swedish State Power Board, Thermal Power Production, Ringhals Nuclear Power Station, S-430 22 Varobacka, Sweden
565. A.J. Sash Eirich, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, P.O. Box 490, Richland, WA 99352
566. Stephen B. Eisenhart, Virginia Electric and Power Company, North Anna Power Station, P.O. Box 402, Mineral, VA 23117
567. Toby C. Elswick, Monsanto Research Corporation, Mound Facility, Nuclear Operations, P.O. Box 32, Miamisburg, OH 45342
568. Frederick A. Emerson, Carolina Power and Light Company, Brunswick Steam Electric Plant, Onsite Nuclear Safety Division, P.O. Box 10429, Southport, NC 28461
569. Jeanette Eng, New Jersey Bureau of Radiation Protection, Department of Environmental Protection, 380 Scotch Road, Trenton, NJ 08628
570. Environment Canada, Nuclear Coordinator, External Strategy Branch, EPS, 351 St. Joseph Boulevard, 15th Floor, Hull, Quebec, Canada K1A 1C8
571. Joann Epler, Evaluation Research Corporation, Information Services Department, 800 Oak Ridge Turnpike, Suite 501, Oak Ridge, TN 37830
572. Carl A. Erdman, Texas A and M University, Nuclear Engineering Department, College Station, TX 77843
573. Silvia Ernesaks, Ontario Hydro, Corporate Library Services, 700 University Avenue, Toronto, Ontario, Canada M5G 1X6
574. Veryl G. Eschen, Stearns-Roger, Nuclear Fuel Cycle Engineering Division, 4500 Cherry Creek Drive South, P.O. Box 5888, Denver, CO 80217
575. Hubert Eschrich, Eurochemic, Management Division, Boeretang, B-2400, Mol, Belgium
576. Harold E. Eskridge, Combustion Engineering, Nuclear Licensing and Safety, P.O. Box 107, Hematite, MO 63047

577. Edward H. Essington, Los Alamos National Laboratory, Environmental Sciences Division, P.O. Box 16, Los Alamos, NM 87545
578. Juergen Essmann, Prenssische Elektrizitaets F.A., Department of Physics, Postfach 4849, D 3000 Hannover 1, Federal Republic of Germany
579. John A. Eure, Iowa Department of Heath, Environmental Health Division, Lucas State Office Building, Des Moines, IA 50319
580. Executive Director, Oak Ridge Associated Universities, P.O. Box 117, Oak Ridge, TN 37830
581. Exxon Nuclear Company, Inc., Research and Technology Center, Library, 2101 Horn Rapids Road, Richland, WA 99352
582. Fachinformationszentrum Energie, Physik, Mathematik, 7514 Eggenstein Leopoldshafen 2, Federal Republic of Germany
583 Marvin Farmer, Illinois Commerce Commission, Public Utilities Division, 527 East Capitol Avenue, Springfield, IL 62706
584. F.S. Feates, Department of Environment, Radioactive Waste Division, Romney House, 43 Marsham Street, London, United Kingdom SW1P 3PY
585. Joyce Feldman, U.S. Environmental Protection Agency, Air and Waste Management Division, 26 Federal Plaza, New York, NY 10278
586. Patrick Felice, Westinghouse Electric Corporation, Research and Development Center, 1310 Beulah Road, Pittsburgh, PA 15235
587. H.G. Fendler, Technischer Uberwachungs-Verein, Abteilung Kerntechnik und Struhlensch, Dudenstrasse 28, Mannheim 1, D-6800, Federal Republic of Germany
588. Mark S. Fetzer, Marline Uranium Corporation, Land and Public Affairs Department, P.O. Box 1626, Danville, VA 24543
589. M.P. Filion, Eldorado Resources Limited, Corporate Technology Department, 255 Albert Street, Suite 400, Ottawa, Ontario, Canada K1P 6A9
590. Jill Fitch, South Australian Health Commission, Radiation Control Section, Box 1313, G.P.O., Adelaide, South Australia, Australia 5001
591. Joseph L. Flacke, General Electric Company, Knolls Atomic Power Laboratory, Facilities Deactivation Department, P.O. Box 1072, Building Q-5, Room 160, Schenectady, NY 12301
592. Eberhard Fleisch, Bergamt Goslar, Postfach 1240, D-3380 Goslar 1, Federal Republic of Germany
593. Claude A. Flory, U.S. Nuclear Regulatory Commission, Division of Waste Management, SS-623, 7915 Eastern Avenue, Silver Spring, MD 20910
594. Michael G. Foley, Pacific Northwest Laboratory, Geosciences Research and Engineering Department, P.O. Box 999, Richland, WA 99352
595. Charles L. Folkers, Lawrence Livermore National Laboratory, Mechanical Engineering Department, P.O. Box 808, Mail Stop L-362, Livermore, CA 94550
596. Hans G. Forstrom, Swedish Nuclear Fuel Supply Company, KBS Division, P.O. Box 5864, S-10248 Stockholm, Sweden
597. Mark Fortsch, Fluor Engineers, Inc., Advanced Technology Division, Nuclear Technology Department, 2801 Kelvin, Irvine, CA 92714
598. M. Lane Fowler, Lockwood Greene Engineers, Inc., P.O. Box 3561, Jackson Plaza, Oak Ridge, TN 37830-3561
599. P.G.W. France, Birds (Swansea) Limited, Nuclear Decommissioning Division, St. Maur, Beaufort Square, Chepstow, Gwent, England, United Kingdom NP6 5XQ
600. Willi M. Francioni, Swiss Federal Institute for Reactor Research, CH 5303, Wurenlingen, Switzerland
601. H.D. Freeman, Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352
602. Hans-Dieter Fricke, NUKEM GmbH, Postfach 110080, D-6450 Hanau 9, Hessen, Federal Republic of Germany
603. Eddie S. Fuente, Mississippi State Department of Health, Division of Radiological Health, P.O. Box 1700, 2423 North State Street, Jackson, MS 39205
604. Paul E. Fuller, American Nuclear Insurers, Nuclear Engineering Department, The Exchange Building, 270 Farmington Avenue, Farmington, CT 06032
604. Robert D. Funderburg, Idaho Department of Health and Welfare, Radiation Control Section, Statehouse, Boise, ID 83720
605. Joseph W. Furlong, Catalytic, Inc., Power Construction and Maintenance Division Centre Square West, 1500 Market Street, Philadelphia, PA 19102
606. Carl K. Gaddis, U.S. Department of Energy, Pittsburgh Naval Reactor Office, P.O. Box 109, West Mifflin, PA 15122-0109
607. Al N. Gallegos, Rockwell Hanford Operations, D&D Group, P.O. Box 800, 271-T/Room, 212/200 West, Richland, WA 99352

608. Richard Gamewell, Colorado Department of Health, Radiation Control Division, 4210 East 11th Avenue, Denver, CO 80220
609. Andrea Gandellini, Nucleco, V.le Brenta, 27 Milan, Italy
610. Thomas E. Gangloff, Pennsylvania Power and Light Company, Nuclear Licensing Division, Two North Ninth Street, Allentown, PA 18101
611. Howard R. Gardner, Quadrex Corporation, 451 Hills Street, Richland, WA 99352
612. Vinod K. Garga, Klohn Leonoff Limited, 10180 Shellbridge Way, Richmond, British Columbia, Canada V6X 2WF
613. Joseph M. Garner, Monsanto Research Corporation, Mound Facility, Health Physics Operations, P.O. Box 32, Miamisburg, OH 45342
614. D.G. Garratt, Eldorado Resources Limited, R&D Division, 400-255 Albert Street, Ottawa, Ontario, Canada K1P 6A9
615. Thomas E. Gates, Pacific Northwest Laboratory, Applied Mechanics and Structures, Engineering Physics, P.O. Box 999, Richland, WA 99352
616. Ronald K. Gaynor, US Ecology, Inc., Technical Services and Safety, 9200 Shelbyville Road, Louisville, KY 40222
617. G.W. Gee, Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352
618. Jack R. Geichman, Monsanto Research Corporation, Mound Facility, P.O. Box 32, Miamisburg, OH 45342
619. General Electric Company, Library, 175 Curtner Avenue, San Jose, CA 95125
620. David C. George, Bendix Field Engineering Corporation, Technical Measurements Center, P.O. Box 1569, Grand Junction, CO 81502
621. Georgia Department of Human Resources, Radioactive Materials Unit, Radiological Health Section, 1256 Briarcliff Road, NE, GMHI - Room 4255, Atlanta, GA 30306
622. S.B. Gerges, NUS Corporation, Engineering Division, 910 Clopper Road, Gaithersburg, MD 20878
623. Subodh K. Ghosh, Health and Welfare Canada, Radiation Protection Bureau, Health Protection Branch, Ottawa, Ontario, Canada K1A 1C1
624. John R. Giedt, U.S. Environmental Protection Agency, Radiation Programs Office, 8AW-RC, 1860 Lincoln Street, Denver, CO 80295
625. Richard O. Gilbert, Pacific Northwest Laboratory, Energy Systems Department, P.O. Box 999, Richland, WA 99352
626. Thomas L. Gilbert, Argonne National Laboratory, Environmental Impact Studies Department, 9700 South Cass Avenue, Argonne, IL 60439
627. Daniel M. Gillen, U.S. Nuclear Regulatory Commission, Division of Waste Management, Uranium Recovery Licensing Section, Mail Stop 623-SS, Washington, DC 20555
628. James E. Gingrich, Terradex Corporation, 460 North Wiget Lane, Walnut Creek, CA 94598
629. Wayne D. Gisler, Bendix Field Engineering Corporation, P.O. Box 1569, Grand Junction, CO 81502
630. L.J. Giunchigliani, Kaiser (Henry J.) Company, Construction Department, One Kaiser Plaza, Suite 601, Oakland, CA 94612
631. Richard M. Glass, Westinghouse Electric Corporation, Bettis Atomic Power Laboratory, Decontamination Engineering Department, P.O. Box 79, West Mifflin, PA 15122
632. Giorgio N. Gnugnoli, U.S. Nuclear Regulatory Commission, Division of Waste Management, Mail Stop SS-623, Washington, DC 20555
633. Aubrey V. Godwin, Alabama Department of Public Health, Bureau of Radiological Health, State Office Building, Montgomery, AL 36130-1701
634. D.C. Goldberg, Consultation Services, Inc., 2241 Edgewater Drive, Port Charlotte, FL 33952
635. Susan C. Golden, Technology for Energy Corporation, Operation Support, One Energy Center, Pellissippi Parkway, Knoxville, TN 37922
636. William A. Goldsmith, Bechtel National, Inc., Decontamination and Restoration Department, P.O. Box 350, Oak Ridge, TN 37830
637. Don Diego Gonzalez, Sandia National Laboratories, Earth Sciences Division, Organization 9731, P.O. Box 5800, Albuquerque, NM 87185
638. Craig Z. Gordon, U.S. Nuclear Regulatory Commission, Office of State Programs, Washington, DC 20555
639. Frank F. Gorup, U.S. Department of Energy, Chicago Operations Office, Technology Management Division, 9800 South Cass Avenue, Argonne, IL 60439
640. Bill Graham, Bendix Field Engineering Corporation, Technical Library, P.O. Box 1569, Grand Junction, CO 81502
641. Robert Grandfield, U.S. Department of Energy, Dayton Area Office, P.O. Box 66, Miamisburg, OH 45342
642. Rodger W. Granlund, Pennsylvania State University, 228 Academic Projects Building, University Park, PA 16802

643. James L. Grant, Law Engineering Testing Company, 181 Inverness Drive West, Suite 100, Englewood, 80112
644. Thomas J. Grant, Ebasco Services, Inc., 2 World Trade Center, New York, NY 10048
645. David F. Greenwood, Stone and Webster Engineering Corporation, Nuclear Technology Division, 245 Summer Street, P.O. Box 2326, Boston, MA 02107
646. Alan R. Gregory, Central Electricity Generating Board, Generation Development and, Construction Division, Barnwood, Gloucester, United Kingdom GL4 7RS
647. W.T. Gregory, Chem-Nuclear Systems, Inc., One Greystone West Building, 240 Stoneridge Drive, Columbia, SC 29210
648. Joequin Guillen, Empresa Nacional del Uranio, S.A., Servicio de Documentacion, Santiago Rusinol, 12, Madrid 3, Spain
649. W. Roger Hail, ESA Geotechnical Consultants, Mining Division, Drake Executive Plaza, Suite 325, 2625 Redwing Road, Fort Collins, CO 80526
650. Chuck Hajek, Bendix Field Engineering Corporation, P.O. Box 1569, Grand Junction, CO 81502
651. Louise W. Hall, Jacobs Engineering Group, Inc., Advanced Systems Division, 251 South Lake Avenue, Pasadena, CA 91101
652. Robert M. Hallisey, Massachusetts Department of Public Health, Radiation Control Program, 600 Washington Street, Room 770, Boston, MA 02111
653. Mike Halter, Pacific Northwest Laboratory, Engineering Physics Department (2400), P.O. Box 999, Richland, WA 99352
654. Joseph M. Hans, U.S. Environmental Protection Agency, Office of Radiation Programs, P.O. Box 18417, Las Vegas, NV 89128
655. Wayne R. Hansen, Los Alamos National Laboratory, Environmental Surveillance Department, P.O. Box 1663, MS K-490, Los Alamos, NM 87545
656. Kim C. Harden, Fisher, Harden and Fisher, 2904 Leopard Street, Corpus Christi, TX 78408
657. Larry C. Hargrove, Life Cycle Engineering, Inc., 615 Wesley Drive, Charleston, SC 29407
658. Hannu Harkonen, TVO Power Company, Kutojantie 8, SF-02630 Espoo 63, Finland
659. David E. Harmer, IT Nuclear Services, 314 Eastman Road, Midland, MI 48640
660. Don F. Harmon, U.S. Nuclear Regulatory Commission, DHSWM, Office of Research, Washington, DC 20555
661. J.S. Harper, United Kingdom Atomic Energy Authority, Central Library, AEE Winfrith, Dorchester, Dorset, England, United Kingdom DT2 8D4
662. Kathleen F. Harer, U.S. Department of Energy, Oak Ridge Operations Office, Technical Services Division, P.O. Box E, Oak Ridge, TN 37830
663. James M. Harris, Atomics International Division, Rockwell International, Energy Systems Group, 8900 DeSoto Avenue, Canoga Park, CA 91304
664. Tom W. Harrison, Kerr-McGee Corporation, Information Division, P.O. Box 25861, Oklahoma City, OK 73125
665. J.N. Hartley, Pacific Northwest Laboratory, Chemical Technology Division, P.O. Box 999, Richland, WA 99352
666. James W. Hartranft, Orange County Health Care Agency, Environmental Health Division, Radiological Health Section, P.O. Box 355, Santa Ana, CA 92702
667. Victor A. Haw, Canada Centre for Mineral and Energy Technology, Department of Energy, Mines and Resources, 555 Booth Street, Ottawa, Ontario, Canada K1A 0G1
668. John F. Hayes, Delaware Custom Material, Inc., Nuclear Waste Management Division, 444 East College Avenue, State College, PA 16801
669. W.M. Hayward, Rockwell Hanford Operations, Health, Safety and Environment Department, P.O. Box 800, 2750-E Building, Richland, WA 99352
670. Fred F. Haywood, Eberline Instrument Corporation, P.O. Box 350, 800 Oak Ridge Turnpike, Oak Ridge, TN 37830
671. Richard F. Hazelton, Pacific Northwest Laboratory, Materials Department, P.O. Box 999, Richland, WA 99352
672. George L. Hefter, Stone and Webster Engineering Corporation, Decontamination and Decommissioning Technology, P.O. Box 2325, Boston, MA 02107
673. W.F. Heine, Rockwell Hanford Operations, Waste Management Program Office, P.O. Box 800, Richland, WA 99352
674. R.L. Hemmings, London Nuclear Services, Inc., 2 Buffalo Avenue, Niagara Falls, NY 14303
675. K.J. Henry, United Kingdom Atomic Energy Authority, Research Reactor Division, Harwell, Oxon, England, United Kingdom 0X11 ORA

676. Bahman Heshmatpour, ThermoElectron Corporation, Metals Division, 115 Eames Street, P.O. Box 132, Wilmington, MA 01887
677. W. Hild, Eurochemic, Plant Operation Department, B-2400, Mol, Belgium
678. T.J. Hill, EG&G Idaho, Inc., NPR Project Office, P.O. Box 1625, Idaho Falls, ID 83415
679. Thomas M. Hill, United Nuclear Corporation, Mining and Milling Division, 2935 San Joaquin, SE, Albuquerque, NM 87106
680. W.C. Hill, NLO, Inc., Engineering Department, P.O. Box 39158, Cincinnati, OH 45239
681. Kenneth B. Hinerman, Consultant Services, P.O. Box 5509, Rockville, MD 20855
682. Charles S. Hinson, U.S. Nuclear Regulatory Commission, NRR/RAB, Room P-712, Washington, DC 20555
683. Tom Hinton, Pathfinder Mines Corporation, Shirley Basin Mine, Shirley Basin, WY 82615
684. Marshall E. Hollender, Riteway Machine and Specialty Company, Inc., Engineering Department, P.O. Box 948, Barnwell, SC 29812
685. John T. Holloway, National Academy of Sciences, Committee on Radioactive Waste Management, JH826, 2101 Constitution Avenue, NW, Washington, DC 20418
686. Edward C. Holman, Defense Apparel, 285 Murphy Road, Hartford, CT 06114
687. Greg M. Holter, Pacific Northwest Laboratory, Energy Systems Department, P.O. Box 999, Sigma-3 Building, Richland, WA 99352
688. Harold Honious, Monsanto Research Corporation, Mound Facility, P.O. Box 32, Miamisburg, OH 45342
689. Ann Hood, 3760 Highway K, St. Charles, MO 63301
690. Arthur W. Hounslow, Oklahoma State University, Department of Geology, Stillwater, OK 74078
691. Hovater-Way Engineers, Inc., 23175 La Cadena Drive, Laguna Hills, CA 92653
692. Gale K. Hovey, Bechtel National, Inc., Decontamination and Restoration Department, P.O. Box 350, 800 Oak Ridge Turnpike, Oak Ridge, TN 37830
693. Joseph Howieson, Canada Centre for Mineral and Energy Technology, Energy Mines and Resources Canada, Uranium and Nuclear Section, 580 Booth Street, Ottawa, Ontario, Canada K1A 0E4
694. Fan-Yu Hsueh, Institute of Nuclear Energy Research, Technical Information Center, P.O. Box 3-15, Lung-Tan, Taiwan, Republic of China 325
695. K. Hubenthal, Federal Ministry for Research and Technology, Postfach 200706, 5300 Bonn 2, Federal Republic of Germany
696. Robert W. Hull, U.S. Geological Survey, Water Resources Division, 505 Marquette, NW, Room 720, Albuquerque, NM 87102
697. Roger C. Humphrey, Lanson Industries, Inc., Marketing Department, 2131 Old Hanceville Highway, P.O. Box 1107, Cullman, AL 35055
698. Gary L. Hunt, Illinois Commerce Commission, Public Utilities Division, 527 East Capital Avenue, Springfield, IL 62706
699. S.D. Hunter, Ministry of Defense, A.W.R.E., Waste Management Group, Building A12H, Aldermaston, Reading, Berk, United Kingdom RA7 4PR
700. Peggy Hyland, Legislative Research Commission, State Capitol, Frankfort, KY 40601
701. Thomas P. Hynes, Amok Limited/Cluff Mining, Environmental Section, 3125 Dieppe Street, Saskatoon, Saskatchewan, Canada S7M 3S3
702. Shawki Ibrahim, Colorado State University, Radiology and Radiation Biology Department, Fort Collins, CO 80523
703. Mamoru Ichinose, Tokyo Electric Power Services Company, Limited, Hibiya Chunichi Building, 1-4 Uchisaiwai-Cho, 2-Chome, Chiyoda-Ku, Tokyo, Japan 100
704. Takeo Ikeda, Maeda Construction Company, Limited, Technical Research Institute, 1-39-16, Asaki-cho, Nerima-ku, Tokyo, Japan 176
705. Clarence E. Ingersoll, Washington State Department of Social, and Health Services, Radiation Control Section, Mail Stop LF-13, Olympia, WA 98504
706. Takashi Inoue, Hazama-Gumi Limited, Technical Research Institute, 4-17-23 Honmashi-nishi, Yono-shi, Saitama-ken, Japan 338
707. Institutt for Energiteknikk, P.O. Box 40, 2007 Kjeller, Norway
708. Nimia Irazarry, University of Puerto Rico, Center for Energy and Environment Research, College Station, Mayaguez, PR 00708
709. Deirdre Irwin, Supervising Scientist for the Alligator Rivers Region, Library, P.O. Box 387, Bondi Junction, NSW, Australia 2032
710. Kaoru Ito, Genshiryoku Daiko Company, Limited, Hiroshima Office, 4-19 Takara-Machi, Hiroshima-Shi, Hiroshima, Japan 730
711. Naoji Ito, Japan Atomic Energy Research Institute, Tokai Research Establishment, Department of JPDR, Tokai-mura, Naka-gun, Ibaraki-ken, Japan 319-11

712. Hisao Itow, Hitachi Works of Hitachi Limited, Nuclear Equipment Design Department, 3-1-1 Saiwai-c Hitachi-shi, Ibaraki-ken, Japan 317
713. Gunther Ivens, Arbeitsgemeinschaft Versuchs-Reaktor GmbH, Luisenstrasse 104, Postfach 1411,Dusseldorf, NRW, Federal Republic of Germany 4000
714. J.A. Jones Construction Company, 2821 Northup Way, Bellevue, WA 98004
715. William R. Jacoby, West Valley Nuclear Services Company, Inc., P.O. Box 191, West Valley, NY 14171-0191
716. Janna Jantz, Stearns-Roger, Mining and Metallurgical Division, P.O. Box 5888, Denver, CO 80217
717. Edward Jennrich, EG&G Idaho, Inc., Low-Level Radioactive Waste, Management Program, P.O. Box 1625, Idaho Falls, ID 83401
718. Larry Jensen, U.S. Environmental Protection Agency, Region V Radiation Program, 230 South Dearborn, 5AP-26, Chicago, IL 60604
719. Gary W. Johnsen, EG&G Idaho, Inc., Water Reactor Research Test Facilities, P.O. Box 1625, Idaho Falls, ID 83415
720. Nels R. Johnson, Eberline Instrument Corporation, Services Division, P.O. Box 3874, Albuquerque, NM 87190
721. Steve A. Johnson, Research Triangle Institute, Energy and Environmental Research, Division, P.O. Box 12194, Research Triangle Park, NC 27709
722. Steven C. Johnson, Arizona Public Service Company, Nuclear Projects, P.O. Box 21666, Phoenix, AZ 85035
723. Glen F. Jones, Bechtel National, Inc., P.O. Box 72, Middletown, PA 17057
724. James William Jones, Quadrex Corporation, Recycling and Restoration Services Division, 1940 NW 67th Place, Gainesville, FL 32606
725. M.D. Jordan, Ministry of Defense, D.P.T. 18 (PE), Foxhill, Bath, United Kingdom BA1 5AB
726. R.E. Jortberg, Commonwealth Edison Company, Nuclear Safety Department, P.O. Box 767, Chicago, IL 60690
727. M. Joustra, Netherlands Energy Research Foundation, TWI - Acquisitions Department, Order No. S0 83-4, P.O. Box 1, 1755 ZG Petten, The Netherlands
728. Thomas L. Junod, National Aeronautics and Space Administration, Lewis Research Center, 21000 Brookpark Road, Mail Stop 49-4, Cleveland, OH 44139
729. T.J. Kagetsu, Union Carbide Corporation, Metals Division, Technology Department, P.O. Box 97, Niagara Falls, NY 14302
730. Kiyoshi Kagimoto, Science and Technology Agency, Atomic Energy Bureau, 2-2-1, Kasumigaseki, Chiyoda-ku, Tokyo, Japan
731. M. Kalin, University of Toronto, Institute for Environmental Studies, Haultain Building, Toronto, Ontario, Canada M5S 1A4
732. Katherine Kanaly, Bendix Field Engineering Corporation, Remedial Action Department, P.O. Box 1569, Grand Junction, CO 81502
733. Jeanne X. Kasperson, Clark University, Research Library, CENTED, Worcester, MA 01610
734. Robert F. Kaufmann, Converse Consultants, Geology Department, 7265 West Coley Avenue, Las Vegas, NV 89117
735. Vincent J. Kavlick, Fluor Corporation, Government Sales Division, 1627 K Street, NW, Suite 200, Washington, DC 20006
736. Robert W. Kee, Ralph M. Parsons Company, 100 West Walnut Street, Mail Drop A2-04-2, Pasadena, CA 91124
737. Byron E. Keene, U.S. Environmental Protection Agency, Technical Support Branch, Air Management Division, J.F. Kennedy Federal Building, Boston, MA 02203
738. Kathy Keil, National Energy Information Center, 2500 Central Avenue SE, Albuquerque, NM 87131
739. James J. Keithley, Ford, Bacon & Davis Utah, Inc., P.O. Box 8009, 375 Chipeta Way, Salt Lake City, UT 84108
740. Dale F. Keller, Defense Nuclear Agency, Public Affairs Office, Washington, DC 20305
741. E.L. Keller, U.S. Department of Energy, Oak Ridge Operations Office, Technical Services Division, P.O. Box E, Oak Ridge, TN 37830
742. W.E. Kennedy, Jr., Pacific Northwest Laboratory, Environmental Dosimetry and Surveillance, P.O. Box 999, Richland, WA 99352
743. G. Wayne Kerr, U.S. Nuclear Regulatory Commission, Office of State Programs, Washington, DC 20555
744. W.R. Kimel, University of Missouri at Columbia, College of Engineering, Columbia, MO 65211
745. Norman Kipnis, Department of Mines and Energy, P.O. Box 4750, St. John's, Newfoundland, Canada A1C 5T7
746. Michael J. Kirby, Flow Technology Company, 21414 68th Avenue South, Kent, WA 98031

747. J.E. Kirkpatrick, Nuclear Fuel Services, Inc., P.O. Box 218, Erwin, TN 37650
748. Walter E. Kisieleski, Argonne National Laboratory, EIS Department, 9700 South Cass Avenue, Argonne, IL 60439
749. J. Howard Kittel, Argonne National Laboratory, Office of Waste Management Programs, 9700 South Cass Avenue, Argonne, IL 60439
750. W.D. Kittinger, Rockwell International, Atomics International Division, Decommissioning Program Office, 8900 DeSoto Avenue, Canoga Park, CA 91304
751. Charles S. Klanian, Westinghouse Electric Corporation, Advanced Energy Systems Division, P.O. Box 10864, Pittsburgh, PA 15236
752. William H. Kline, Argonne National Laboratory, 9700 South Cass Avenue, Building 201, Argonne, IL 60439
753. KLM Engineering, Inc., 1776 Ygnacio Valley Road, Suite 200, Walnut Creek, CA 94598
754. Antony F. Kluk, U.S. Department of Energy, DP-122, Office of Nuclear Materials, Washington, DC 20545
755. Masaklini Kobayashi, Kajima Corporation, Nuclear Power Department, Shintuku Mitsui Building 30th, 1-1 Nishi-shinjuku, 2-Chome, Shinjuku-ku, Tokyo, 160, Japan
756. Dale W. Koch, Babcock and Wilcox, Utility Power Generation Division, P.O. Box 1260, Lynchburg, VA 24505
757. Donald L. Koch, Iowa Geological Survey, Administration Department, 123 North Capitol Street, Iowa City, IA 52242
758. Toshio Koguchi, Nuclear Environmental Engineering Company, Limited, 3-21-2 Miyasaka, Setagaya-ku, Tokyo 156, Japan
759. Kenneth D. Kok, Battelle Columbus Laboratories, Nuclear Systems Section, 505 King Avenue, Columbus, OH 43201
760. Kenji Kondo, Japan Society of Civil Engineering, Technology Division, Technology Section No. 3, 2 Sanbancho, Chiyoda-ku, Tokyo 102, Japan
761. George J. Konzek, Pacific Northwest Laboratory, Energy Systems Department, P.O. Box 999, Sigma-3 Building, Richland, WA 99352
762. Nic Korte, Bendix Field Engineering Corporation, Geochemical Support Department, P.O. Box 1569, Grand Junction, CO 81502
763. Laurance Y. Kotys, Energy Consultants, Inc., Corporate Marketing Department, 121 Seventh Street, Pittsburgh, PA 15222-3487
764. W.K. Kratzer, UNC Nuclear Industries, Inc., Technology Division, P.O. Box 490, Richland,
765. R. Krauel, Environment Canada, Environmental Protection Service, Ontario Region, 25 St. Clair Avenue, E., 7th Floor, Toronto, Ontario, Canada M4T 1M2
766. George E. Krauter, Quadrex Corporation, Project Management Division, 1130 Queensbridge Way, San Jose, CA 95120
767. P. Krejsa, Austrian Research Center, Department of Waste Management, Lenaugasse 10, A-1082 Vienna, Austria
768. Klaus J. Kruger, Arbeitsgemeinschaft Versuchs-Reaktor, Stetternicher Forst, 5170 Julich, Federal Republic of Germany
769. M. Siva Kumar, Gibbs and Hill, Inc., Nuclear Engineering Division, 11 Penn Plaza, New York, NY 10001
770. Stuart Kupferman, Sandia National Laboratories, Department 9734, P.O. Box 5800, Albuquerque, NM 87185
771. E.F. Kurtz, General Electric Company, Advanced Reactor Systems Department, S-32, P.O. Box 508, 310 Deguigne Drive, Sunnyvale, CA 94086
772. John J. Kuruc, Standard Oil Company of Indiana, Environmental Affairs and Safety Department, 20 East Randolph Drive, Chicago, IL 60601
773. Akira Kutsumizu, Ohbayashi-Gumi, Limited, Nuclear Facilities Department, 2-3 Kanda Tsukasa-cho, Chiyoda-ku, Tokyo, Japan 101
774. J. Kuypers, Department of Technological Research, Utrechtseweg 310, Postbus 9035, Arnhem 6800ET, The Netherlands
775-784. W. Jean Kyriazis, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, P.O. Box 490, Richland, WA 99352
785. Bernard Labbe, DGA/Mission Atome, Ministere de la Defense, 14, rue Saint-Dominique, 75997 Paris Armees, France
786. David K. Lacker, Texas Department of Health, Bureau of Radiation Control, Attention: Reference Room, 1100 West 49th Street, Austin, TX 78756

787. Thomas S. LaGuardia, TLG Engineering, Inc., 640 Federal Road, Brookfield, CT 06804
788. G.J. LaHaye, Ministry of the Environment, 445 Albert Street East, Sault Sainte Marie, Ontario, Canada P6A 2J9
789. J.R.A. Lakey, R.N. College, Department of Nuclear Science and Technology, Greenwich, London, United Kingdom SE10 9NN
790. Lawrence T. Lakey, Pacific Northwest Laboratory, Nuclear Waste Technology Program Office, P.O. 999, Richland, WA 99352
791. E.R. Landa, U.S. Geological Survey, Water Resources Division, Box 25046, Mail Stop 424, Denver, CO 80225
792. Len Lanni, U.S. Department of Energy, San Francisco Operations Office, Magnetic Fusion and Nuclear Division, 1333 Broadway, Oakland, CA 94612
793. Michele Laraia, European Nuclear Energy Association, DISP, Viale Regina Margherita, 125, Rome, Italy 00198
794. Art W. Larson, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, P.O. Box 490, Richland, WA 99352
795. Alf Larsson, Swedish Nuclear Power Inspectorate, Box 27 106, S-102 52 Stockholm, Sweden
796. William C. Lattin, Bechtel National, Inc., Decontamination and Restoration Planning, P.O. Box 72, Middletown, PA 17057
797. Richard W. Lawrence, B.C. Research, Division of Extractive Metallurgy, 3650 Wesbrook Mall, Vancouver, British Columbia, Canada V6S 2L2
798. William T. Lawton, Thomas W. Ward Limited, Albion Works, Savile Street, Sheffield, South Yorkshire, England, United Kingdom S4 7UL
799. Philip K. Lee, University of Missouri, Health Physics Services, 1 Research Park Development Building, Columbia, MO 65211
800. Raimo Leimala, Outokumpu Oy, Pori Works, P.O. Box 60, 28100 Pori 1, Finland
801. Andrew J. Leiter, U.S. Environmental Protection Agency, Office of Radiation, ANR-461, 401 M Street, SW, Washington, DC 20460
802. Thomas E. Lempges, Niagara Mohawk Power Corporation, Nuclear Generation Department, 300 Erie Boulevard, West, Syracuse, NY 13202
803. Leon Leventhal, EAL Corporation, 2030 Wright Avenue, Richmond, CA 94804
804. Robert G. Levesque, Bechtel National, Inc., Remedial Engineering Division, P.O. Box 350, Oak Ridge, TN 37830
805. Lawrence H. Levy, Northeast Utilities, Nuclear Engineering and Operations Division, P.O. Box 270, Hartford, CT 06101
806. Stanley Lichtman, U.S. Environmental Protection Agency, Office of Radiation Programs, ANR-460, 401 M Street, SW, Washington, DC 20460
807. Bruce Link, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, P.O. Box 490, Richland, WA 99352
808. A.C. Littlejohn, National Nuclear Corporation, Limited, R&D Technology Department, Cambridge Road, Whetstone, Leicester, United Kingdom LE8 3LH
809. C.L. Livengood, Argonne National Laboratory, EBR II Project, P.O. Box 2528, Idaho Falls, ID 83401
810. Philip J. Lloyd, Chamber of Mines Research Organization, Metallurgy Laboratory, P.O. Box 91230, Auckland Park, South Africa 2006
811. Roger Locy, P.O. Box 41, Lycoming, NY 13093
812. J. Mark Loizeaux, Controlled Demolition, Inc., 2737 Merryman's Mill Road, Phoenix, MD 21131-0326
813. Jackie Loop, Energy, Inc., Technical Information Center, P.O. Box 736, Idaho Falls, ID 83402
814. W. Timothy Lough, Virginia State Corporation Commission, Division of Energy Regulation, P.O. Box 1197, Richmond, VA 23209
815. Ross C. Lovington, Bechtel National, Inc., Nuclear Fuel Operations, P.O. Box 3965, San Francisco, CA 94119
816. Ralph F. Lumb, NUSAC, Inc., 1850 Samuel Morse Drive, Reston, VA 22090
817. D.L. Lush, IEC-BECK Consultants Limited, Environmental Sciences Department, 6870 Goreway Drive, Mississauga, Ontario, Canada L4V 1P1
818. R. Jon Lynch, EG&G Idaho, Inc., LTSD Fuel Engineering and Operations, P.O. Box 1625, Idaho Falls, ID 83415
819. George Machovec, Arizona State University, Library, Science Reference Department, Tempe, AZ 85287
820. Eli Maestas, Nuclear Energy Agency, Radiation Protection & Waste Management Division, 38 Boulevard Suchet, F-75016 Paris, France
821. M.C. Maillet, Uranium Pechiney Ugine Kuhlmann, 23 bis rue Balzac, 75008 Paris, France
822. Charles W. Mallory, Hittman Nuclear and Development, Corporation, 9151 Rumsey Road, Columbia, MD 21045

823. Hersh K. Manaktala, Kernforschungszentrum, IMF-I, Postfach 3540, 7500 Karlsruhe 1, Federal Republic of Germany
824. Frank Manchak, Jr., TMSI/Sludgemaster, Inc., P.O. Box 30737, Santa Barbara, CA 93105
825. Bertil Mandahl, OKG AB, Box 17 46, S-111 87 Stockholm, Sweden
826. John W. Mandler, EG&G Idaho, Inc., Physics Department, P.O. Box 1625, Idaho Falls, ID 83415
827. Louise Marcil, Hydro-Quebec, Library, Thermal and Nuclear Division, 855 Ste-Catherine Est, 10th Floor, Montreal, Quebec, Canada H2L 4P5
828. Charles J. Marino, Nuclear Energy Services, Inc., Waste Management Services, 1000 Shelter Rock Road, Danbury, CT 06810
829. Gergely Markos, GECR, Inc., P.O. Box 725, One Concourse Drive, Rapid City, SD 57709
830. Sidney Marks, Pacific Northwest Laboratory, Environment, Health, and Safety Research Program Office, P.O. Box 999, Richland, WA 99352
831. M. Lynn Marple, Texas Department of Health, Bureau of Radiation Control, 1100 West 49th Street, Austin, TX 78756
832. Gary C. Marshall, U.S. Department of Energy, Chicago Operations Office, Technology Management Division, 9800 South Cass Avenue, Argonne, IL 60439
833. J.D. Marshall, Department of the Environment, Romney House, 43 Marsham Street, London, United Kingdom SW1P 3PY
834. Dan E. Martin, U.S. Nuclear Regulatory Commission, Division of Waste Management, Low-Level Waste Licensing Branch, Mail Stop SS-623, Washington, DC 20555
835. M.A. Martin, Associated Nuclear Services, Environmental Safety Group, 123 High Street, Epsom, Surrey, United Kingdom KT19 8EB
836. Elmer D. Martinez, United Nuclear Corporation, Mining and Milling Division, P.O. Drawer QQ, Gallup, NM 87301
837. W.C. Mason, Jacobs Engineering Group, Inc., UMTRAP Project, 5301 Central Avenue, NE, Suite 1700, Albuquerque, NM 87108
838. Massachusetts Institute of Technology, Science Library, 77 Massachusetts Avenue, Cambridge, MA 02139
839. G.G. Mastino, ENEA, PAS/Impattamb, CRE - Casaccia, P.O. Box 2400, Rome, Italy 00100
840. Jose Agustin Matar, Instituto de Investigaciones Mineras, Av. San Martin 1109-oeste-, San Juan, Argentina 5400
841. John M. Matuszek, New York State Department of Health, Radiological Sciences Institute, Center for Laboratories and Research, Empire State Plaza, Albany, NY 12201
842. Erich J. Mayer, West Valley Nuclear Services Company, Inc., Technical Library, P.O. Box 191, West Valley, NY 14171-0191
843. Robert L. Mayton, Carolina Power and Light Company, Corporate Nuclear Safety and Research Division, P.O. Box 1551, Raleigh, NC 27602
844. Kevin T.A. McCarthy, Connecticut Department of Environmental Protection, Radiation Control Unit, 165 Capitol Avenue, Hartford, CT 06106
845. James McClure, Wahler Associates, P.O. Box 10023, Palo Alto, CA 94303
846. Michael W. McClurg, Black & Veatch, Power Division/Systems Department, P.O. Box 8405, Kansas City, MO 64114
847. James G. McCray, University of Arizona, Department of Nuclear and Energy, Engineering, Tucson, AZ 85721
848. Edward D. McDevitt, United Engineers and Constructors, Inc., Operating Plant Services, Test and Start-up, P.O. Box 460, MD 888, Richland, WA 99352
849. Ethel O. McDonald, Bechtel National, Inc., Library, P.O. Box 350, Oak Ridge, TN 37830
850. Francis X. McGarvey, Sybron Corporation, Chemical Division, 39 Woodbury Court, Cherry Hill, NJ 08003
851. Larry McGonagle, Fisher, Harden and Fisher, 2904 Leopard Street, Corpus Christi, TX 78408
852. Dale McHard, Oklahoma Department of Health, Radiation and Special Hazards Service, P.O. Box 53551, Oklahoma City, OK 73152
853. James N. McLeod, Southern Company Services, Inc., Nuclear Safety and Licensing Department, P.O. Box 2625, Birmingham, AL 35202
854. N. Barrie McLeod, NUS Corporation, 910 Clopper Road, Gaithersburg, MD 20878
855. James T. McVey, Health Physics Systems, Inc., 1940 NW 67th Place, P.O. Box 4100, Gainesville, FL 32601
856. R.L. Medlock, Bear Creek Uranium Company, Environmental Department, P.O. Box 2654, Casper, WY 82602
857. Tetsuo Meguro, Niigata Engineering Company, Limited, Nuclear Energy Division, Energy Center, 9-3, Kamatahoncho 1-Chome, Ohta-ku, Tokyo 144, Japan

858. Shankar Menon, Studsvik Energiteknik AB, Waste Technology Department, S-611 82 Nykoping, Sweden
859. Richard H. Meservey, EG&G Idaho, Inc., Waste Management Programs Division, P.O. Box 1625, Idaho Falls, ID 83402
860. Kathy Mickelson, Colorado State University, 211 Weber Building, Ft. Collins, CO 80523
861–870. Sarah J. Mickelson, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, P.O. Box 490, Richland, WA 99352
871. Ernest M. Miholits, Bechtel National, Inc., Nuclear Fuels Operation, P.O. Box 3965, San Francisco, CA 94119
872. C.Q. Miller, United Engineers and Constructors, Inc., Power Division, P.O. Box 460, Richland, WA 99352
873. Charles G. Miller, Bechtel National, Inc., FUSRAP, P.O. Box 350, Oak Ridge, TN 37830
874. Clarence E. Miller, U.S. Department of Energy, Richland Operations Office, P.O. Box 550, Richland, WA 99352
875. Forest L. Miller, Desert Research Institute, Water Resources Center, 1500 East Tropicana Avenue, Suite 201, Las Vegas, NV 89109
876. James R. Miller, U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, DC 20555
877. Kenneth V. Miller, Missouri Division of Health, Department of Social Services, Bureau of Radiological Health, P.O. Box 570, 1511 Christy Land, Jefferson City, MO 65102
878. Robert L. Miller, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, P.O. Box 490, Richland, WA 99352
879. David A. Milligan, Anaconda Minerals Company, Research Department, P.O. Box 27007, Tucson, AZ 85726
880. Doyle Mills, Kentucky Department of Environmental Protection, Maxey Flats Branch, 18 Reilly Road, Frankfort, KY 40601
881. Dana Minich, Cogema, Inc., 2550 M Street, NW, Suite 400, Washington, DC 20037
882. Minnesota Geological Survey, 1633 Eustis Street, St. Paul, MN 55108
883. Robert B. Minogue, U.S. Nuclear Regulatory Commission, Office Nuclear Regulatory Research, Washington, DC 20555
884. Donald H. Mitchell, Pacific Northwest Laboratory, Nuclear Waste Process Development Section, P.O. Box 999, Richland, WA 99352
885. Mario Mittemperger, European Nuclear Energy Association, Via le Regina Margherita, Dipartimento Protezione del 'Ambiente e Salute, 125 Rome, Italy
886. Jun-ichi Miyakoshi, Hitachi Zosen Corporation, New Energy Sources and, Nuclear Engineering Department, 1-1-1 Hitotsubashi, Palaceside Building, Chiyoda-ku, Tokyo, Japan 100
887. P. Moen, Saskatchewan Mining Development Corporation, Library, 122 3rd Avenue, North, Saskatoon, Saskatchewan, Canada S7K 2H6
888. Duncan Moffett, Eldorado Resources Limited, 255 Albert Street, Suite 400, Ottawa, Ontario, Canada K1P 6A9
889. A. Alan Moghissi, U.S. Environmental Protection Agency, P.O. Box 7166, Alexandria, VA 22307
890. Michael Moineni, Argonne National Laboratory, EIS Division, 9700 South Cass Avenue, Argonne, IL 60439
891. Aldo Montagnini, Centro Applicazioni Militari Energia Nucleare, Ministero Difesa, Via Della Bigattiera, S. Piero A. Grado, Italy 56010
892. Ronald G. Mooers, Penhall International, Nuclear Services Division, 1801 Penhall Way, P.O. Box 4069, Anaheim, CA 92801
893. Emmett Moore, Pacific Northwest Laboratory, Energy Systems Department, P.O. Box 999, Richland, WA 99352
894. David Morley, British Columbia Ministry of Health, Radiation Protection Service, 101 - 828 West 8th Avenue, Vancouver, British Columbia, Canada V5Z 1E2
895. James A. Morley, U.S. Department of Energy, Uranium Mill Tailings Project Office, Albuquerque Operations Office, P.O. Box 5400, Albuquerque, NM 87115
896. Jerome G. Morse, Morse Associates, Inc., 3000 Youngfield Street, Suite 153, Lakewood, CO 80215
897. Tom A.R. Morton, Fluor Mechanical Services, 3333 Michelson Drive, Irvine, CA 92730
898. M.N. Moscardo, Agence Nationale pour la Gestion des Dechets Radioactifs, Commissariat a l'Energie Atomique, 31-33 Rue de la Federation, 75752 Paris, France
899. Barry F. Moss, Ebasco Services, Inc., Princeton Office, Building 8-A, Forrestal Campus, Box CN59, Princeton, NJ 08544
900. William E. Mott, U.S. Department of Energy, Office of Operational Safety, EP-32, Washington, DC 20545

901. David R. Mousseau, EG&G Idaho, Inc., Test Reactors Facilities Division, P.O. Box 1625, Idaho Falls, ID 83401
902. James J. Mueller, Controls for Environmental Pollution, Inc., 1925 Rosina Street, P.O. Box 5351, Santa Fe, NM 87502
903. Sekiya Mukai, International Atomic Energy Agency, Waste Management Section, P.O. Box 100, Wagrammerstrasse 5, 1400 Vienna, Austria
904. Joseph W. Mullholland, Kansas Electric Power Cooperative, Inc., Power Supply and Engineering, P.O. Box 4877, Topeka, KS 66604
905. L.F. Munson, Pacific Northwest Laboratory, Radiological Sciences Department, P.O. Box 999, RTL Building, Richland, WA 99352
906. Carlos Murawczyk, United Engineers, 30 South 17th Street, MS-8M5, Philadelphia, PA 19101
907. Larry T. Murdock, Dames and Moore, 250 East Broadway, Suite 200, Salt Lake City, UT 84111
908. E. Smith Murphy, Pacific Northwest Laboratory, Energy Systems Department, P.O. Box 999, Richland, WA 99352
909. Tetsuo Nagase, Shimizu Construction Company, Limited, Nuclear Power Division, 16-1, Kyobashi 2-chome, Chuo-ku, Tokyo, Japan 104
910. Alejandra Marcela Nardi, Comision Nacional de Energia Atomica, Gcia. Proteccion Radiologica y Seg., Capacitacion e Informacion Tecnica, Casilla de Correo 40, 1802 Aeropuerto Internacioual de Eteiza, Argentina
911. Giovanni Naschi, European Nuclear Energy Association, Via le Regina Margherita, Direzione Centrale Sicurezza e Controlli, 125 Rome, Italy
912. Erik H. Neilson, Toledo Edison Company, Nuclear Services Division, Stop 3055, 300 Madison Avenue, Toledo, OH 43652
913. Jerry Nelsen, U.S. Department of Energy, Chicago Operations Office, Operational and Environmental Safety Division, 9800 South Cass Avenue, Argonne, IL 60439
914. John D. Nelson, Colorado State University, Ft. Collins, CO 80523
915. Robert A. Nelson, Sargent and Lundy Engineers, Radwaste Division, 55 East Monroe Street, Chicago, IL 60603
916. Robert T. Nelson, Pacific Gas and Electric Company, Humboldt Bay Power Plant, 1034 6th Street, Eureka, CA 95501
917. Joseph F. Nemec, Bechtel National, Inc., Decontamination and Restoration, P.O. Box 350, Oak Ridge, TN 37830
918. Ueli Niederer, Swiss Federal Office of Energy, Nuclear Safety Division, CH-5303 Waste Management Section, CH-5303, Wuerenlingen, Switzerland
919-920. Susan Nish, Atomic Energy of Canada Limited, Library, 1600 Dorchester Boulevard, West, 3rd Floor, Montreal, Quebec, Canada H3H 1P9
921. R.L. Nitschke, EG&G Idaho, Inc., Physics Department, P.O. Box 1625, Idaho Falls, ID 83415
922. NLO, Inc., Reports Library, P.O. Box 39158, Cincinnati, OH 45239
923. Clifford J. Noronha, Intera Environmental Consultants, Inc., 11999 Katy Freeway, Suite 610, Houston, TX 77084
924. Nuclear News, 555 North Kensington Avenue, La Grange Park, IL 60525
925. Donald A. Nussbaumer, U.S. Nuclear Regulatory Commission, Office of State Programs, Washington, DC 20555
926. Deborah Nuttall, American Public Power Association, Library, 2301 M Street, NW, Washington, DC 20037
927. D.M. O'Shea, Florida Power Corporation, Nuclear Operations Division, P.O. Box 14042, MAC H-2, St. Petersburg, FL 33733
928. Kaare Oefjord, Norwegian Nuclear Energy Safety Authority, P.O. Box 2495 Solli, Oslo 2, Norway
929. Office of Assistant Manager, Department of Energy, Oak Ridge Operations Office, Oak Ridge, TN 37830
930. Jean-Pierre Olivier, Organization for Economic Co-operation and Development, Nuclear Energy Agency, Radiation Protection and Waste Management Division, 38 Boulevard Suchet, Paris, France F-75016
931. Cynthia Ortiz, U.S. Department of Energy, Nevada Operations Office, Technical Library, P.O. Box 14100, Las Vegas, NV 89114
932. R.V. Osborne, Atomic Energy of Canada Limited, Health Sciences Division, Chalk River Nuclear Laboratories, Chalk River, Ontario, Canada K0J 1J0
933. Gary J. Overbeck, Westec Services, Inc., 100 North 20th Street, Suite 201, Philadelphia, PA 19103
934. Robert F. Overmyer, Ford, Bacon and Davis Utah, Inc., Nuclear, Environmental, and Geotechnical Department, P.O. Box 8009, 375 Chipeta Way, Salt Lake City, UT 84108
935. Robert A. Paasch, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, P.O. Box 490, Richland, WA 99352

936. Witold M. Pachul, Pennsylvania Public Utility Commission, Electric Division, Bureau of Rates, P.O. Box 3265, Harrisburg, PA 17120
937. Palmetto Alliance, Inc., 2135 1/2 Devine Street, Columbia, SC 29205
938. Frank L. Parker, Vanderbilt University, Environmental and Water Resources, Engineering Department, P.O. Box 1596, Station B, Nashville, TN 37235
939. P. Patek, Austrian Research Center, Leanugasse 10, A-1082 Wien, Austria
940. Robert S. Pattison, Rio Algom Corporation, Lisbon Mine, LASAL Route, Moab, UT 84532
941. Pierre Pellerin, SCPRI - Ministere de la Sante, B.P 35, 78100 le Vesinet, France
942. Roger Pennifill, U.S. Nuclear Regulatory Commission, Waste Management Division, M.S. 623SS, Washington, DC 20555
943. Pennsylvania State University, Pattee Library, Document Section, University Park, PA 16802
944. M. Perarnau, Jefe de Division Junta de Energia, Nuclear Fabrica de Uranio G.H.V., Apartado, 88, Andujar, Spain
945. Alex Perge, U.S. Department of Energy, NE-30, Office of Nuclear Energy, Washington, DC 20545
946. Larry K. Perkins, Energy Fuels Nuclear, Inc., Radiation Safety, P.O. Box 787, Blanding, UT 84511
947. Reta E. Petersen, Jacobs Engineering Group, Inc., Advanced Systems Division, 5301 Central Avenue, NE, Suite 1700, Albuquerque, NM 87108
948. Bruce H. Peterson, Morrison-Knudsen Company, Inc., Safety Department, P.O. Box 7808, Boise, ID 83729
949. William M. Peterson, Applied Technology of Barnwell, Inc., P.O. Box 1204, Barnwell, SC 29812
950. Julio Petrement, Junta de Energia Nuclear, Advisor Commite, Ciudad Universitaria, Madrid 03, Spain
951. Stig Pettersson, Swedish State Power Board, S-162 87 Vallingby, Sweden
952. Stephen J. Pfaff, Getty-Petrotomics, Radiation Coordinator, P.O. Box 8509, Shirley Basin, WY 82615
953. K.K.S. Pillay, Los Alamos National Laboratory, P.O. Box 1663, Group Q-4, MS-E541, Los Alamos, NM 87545
954. Stanley L. Plaisier, Dames and Moore, Engineering Department, 250 East Broadway, Suite 210, Salt Lake City, UT 84111
955. M. Anthony Playfair, Motor Columbus Consulting Engineers Inc., 5401 Baden, Switzerland
956. Timothy A. Poff, NLO, Inc., Engineering Division, P.O. Box 39158, Cincinnati, OH 45239
957. Don R. Poindexter, International Engineering Company, Earth Sciences Division, 180 Howard Street, San Francisco, CA 94105
958. Kenneth R. Porter, Dames and Moore, 1626 Cole Boulevard, Golde, CO 80401
959. Adelbert J. Potter, NL Industries, Inc., Health and Safety Department, 1130 Central Avenue, Albany, NY 12205
960. C.L. Potter, Saskatchewan Environment, Mines Pollution Control Branch, 12th Floor, McIntosh Mall, 800 Central Avenue, Box 3003, Prince Albert, Saskatchewan, Canada S6V 4V1
961. Richard L. Powell, Eberline Instrument Corporation, 3807 Academy Parkway South, NE, Albuquerque, NM 87109
962. Ed Powers, UNC Nuclear Industries, Inc., Office of Surplus Facilities Management, P.O. Box 490, Richland, WA 99352
963. Robert W. Poyser, Pathfinder Mines Corporation, 550 California Street, San Francisco, CA 94104
964. William C. Price, Texas Department of Health, Environmental Programs Division, Bureau of Radiation Control, 8909 Briardale Road, Austin, TX 78758
965. P.F. Pullan, 274 Riverside Drive, Oakville, Ontario, Canada L6K 3N4
966. W. Pusch, Federal Ministry of Health and Environment, Stubenring 1, A-1010, Vienna, Austria
967. Roman Z. Pyrih, Roman Z. Pyrih and Associates, Inc., 416-B Violet Street, Golden, CO 80401
968. Victor C. Quackenbush, Catalytic, Inc., Marketing and Sales Department, Centre Square West, 1500 Market Street, Philadelphia, PA 19102
969. Robert M. Quillin, Ohio Department of Health, Radiological Health Program, P.O. Box 118, Columbus, OH 43216
970. Garry L. Quinn, UNC Nuclear Industries, Inc., 2900 George Washington Way, Richland, WA 99352
971. M. Raghavayya, Bhabha Atomic Research Centre, Health Physics Unit, P.O. Jaduguda Mines, Singhbhum, Bihar, India 832102
972. Robert W. Ramsey, Nuclear Energy Services, Inc., New Business Development, Shelter Rock Road, Danbury, CT 06810
973. William H. Randall, Gilbert/Commonwealth Associates, Inc., Licensing Information Center, 209 East Washington Avenue, Jackson, MI 49201
974. B.G. Randolph, Dames and Moore, Inc., Project Management, 1626 Cole Boulevard, Golden, CO 80401
975. P.K.M. Rao, Ontario Hydro, Nuclear Materials Management Department, 700 University Avenue, Toronto, Ontario, Canada M5G 1X6

976. Don Rayno, Argonne National Laboratory, OHS Division, 9700 South Cass Avenue, Building 202, Room A321, Argonne, IL 60439
977. John E. Razor, Hittman Nuclear and Development Corporation, Maxey Flats SLBF, Route 2 Box 238A, Hillsboro, KY 40351
978. J.D. Regan, National Nuclear Corporation Limited, Heysham II/Torness Systems, Department, Booths Hall, Chelford Road, Knutsford, Cheshire, England, United Kingdom WA16 8QZ
979. James Reilly, U.S. Department of Energy, TMI Site Office, P.O. Box 88, Middletown, PA 17057
980. John Reiss, Wahler Associates, 12477 West Cedar Drive, Suite 206, Lakewood, CO 80228
981. John F. Remark, Quadrex Corporation, Radiological Services, P.O. Box 4100, Gainesville, FL 32613
982. William J. Renard, Sacramento Municipal Utility District, Engineering Department, P.O. Box 15830, MS-30, Sacramento, CA 95813
983. William A. Rettberg, Harza Engineering Company, 7108 South Alton Way, Building G, Ste. 103, Denver, CO 80112
984. William R. Rayne, H&R Technical Associates, Inc., P.O. Box 215, 977 Oak Ridge Turnpike, Oak Ridge, TN 37830
985. Jerry A. Riehl, SEA, Inc., Nuclear Waste Technology Department, 9315 Fauntleroy Way, SW, Seattle, WA 98136
986. Karim Rimawi, New York State Department of Health, ESP Tower Building, Room 1754, Albany, NY 12237
987. R.J. Ring, Australian Atomic Energy Commission, Environmental Sciences Division, Private Mail Bag, Sutherland, Sydney, NSW, 2232, Australia
988. Carlyle J. Roberts, Argonne National Laboratory, Environmental Impact Studies Division, 9700 South Cass Avenue, Building 214, Argonne, IL 60439
989. Dean L. Roberts, Anaconda Minerals Company, Environmental Engineering Department, P.O. Box 638, Grants, NM 87020
990. P.R. Roberts, Rolls-Royce and Associates, Limited, Radioactive Materials Department, P.O. Box 31, Raynesway, Derby, Derbyshire, United Kingdom DE7 3PN
991. A. Mac G. Robertson, Steffen, Robertson and Kirsten, 500-1281 West Georgia Street, Vancouver, British Columbia, Canada V6G 3J7
992. Paul Robinson, Southwest Research and Information Center, P.O. Box 4524, Albuquerque, NM 87106
993. Margarita Rodriguez Parra, Jefe Proyecto Almacenamiento Combustibles Irradiados, Combustibles Irradiados Division, Junta de Energía Nuclear, Ciudad Universitaria, Madrid-3, Spain
994. Vern C. Rogers, Rogers and Associates Engineering Corporation, P.O. Box 330, Salt Lake City, UT 84110
995. R.J. Romano, Pechiney Ugine Kuhlmann, Comurhex, 16 rue de Monceau, 75008 Paris, France
996. Evan Romney, University of California, Environmental Biology Department, Laboratory of Biomedical and, Environmental Sciences, 800 Veteran Avenue, Los Angeles, CA 90024
997. R.L.A. Roofthooft, Laborelec, Section 5, BP-11, Rhode-St-Genese, Belgium B-1640
998. R.C. Ropp, Vitrex Corporation, 138 Mountain Avenue, Warren, NJ 07060
999. Paul V. Rosasco, Fox and Associates, Division II, 4765 Independence Street, Wheat Ridge, CO 80033
1000. C.E. Rosenberry, Reynolds Electric and Engineering Company, Inc., Environmental Sciences Department, P.O. Box 14400, Las Vegas, NV 89114
1001. Missimo Rossi, European Nuclear Energy Association, Comb-Bapu-Impianto Plutonio, Via Anguillarese, Room 1500, Rome, Italy
1002. Ron Rowell, Rockwell Hanford Operations, P.O. Box 250, Richland, WA 99352
1002. V. Roze, Alphanuclear, 6380B Viscount Road, Mississauga, Ontario, Canada L4V 1H3
1003. Reva Rubenstein, National Solid Wastes Management Association, Institute of Chemical Waste Management, 1120 Connecticut Avenue, NW, Suite 930, Washington, DC 20036
1004. Robert L. Rudolph, Bechtel National, Inc., Nuclear Fuel Operations/Decontamination and Restoration Department, P.O. Box 350, Oak Ridge, TN 37830
1005. Philip A. Russell, University of Denver, Denver Research Institute, Chemical and Materials Sciences Division, University Park, Denver, CO 80208
1006. Nils Rydell, National Board for Spent Nuclear Fuel, Kungsgatan 35, 3 tr, S-111 56 Stockholm, Sweden
1007. Steven L. Salem, TRW, Energy Technology Division, EDG, R1/2128, One Space Park, Redondo Beach, CA 90278
1008. Ernest A. Sanchez, Eberline Instrument Cororation, Services Division, 3807 Academy Parkway South, NE, P.O. Box 3874, Albuquerque, NM 87190
1009. Sandia National Laboratories, Technical Library, Division 3141, P.O. Box 5800, Albuquerque, NM 87185
1010. Edward M. Saunders, Raymond Kaiser Engineers, Field Operations Division, 300 Lakeside Drive, P.O. Box 23210, Oakland, CA 94618

1011. S. Savage, Argonne National Laboratory, TIS Department, Reports Section, 9700 South Cass Avenue, Argonne, IL 60439
1012. Noel Savignac, Savignac (Noel), Inc., 130 Louisiana, NE, Albuquerque, NM 87108
1013. M. Schmidt, Milwaukee School of Engineering, Library, P.O. Box 644, Milwaukee, WI 53201
1014. D.H. Schoonen, EG&G Idaho, Inc., P.O. Box 1625, Idaho Falls, ID 83415
1015. Stanley A. Schumm, Colorado State University, Department of Earth Resources, Fort Collins, CO 80523
1016. J.G. Scott, Exxon Nuclear Idaho Company, Inc., Production and Special Services Department, P.O. Box 2800, CPP 624, Idaho Falls, ID 83401
1017. Fred Shapiro, The New Yorker Magazine, 25 West 43rd Street, New York, NY 10036
1018. Shea and Gardner, Library/JRB, 1800 Massachusetts Avenue, NW, Suite 800, Washington, DC 20036
1019. S. David Shearer, Texas Department of Health, Bureau of Radiation Control, 1100 West 49th Street, Austin, TX 78756
1020. Thomas A. Shelton, Tennessee Valley Authority, Nuclear Engineering Department, 400 West Summit Hill, Mail Code W10B100C-K, Knoxville, TN 37902
1021. Alan P. Shetler, Ontario Hydro, Design and Development Division. Nuclear Materials Management Department, 700 University Avenue, Toronto, Ontario, Canada M5G 1X6
1022. Chris Shuey, Southwest Research and Information Center, Water and Mining Project, P.O. Box 4524, Albuquerque, NM 87106
1023. Robin R. Shult, Hydro Nuclear Services, Radiological Services Division, 1009 West Ninth Avenue, King of Prussia, PA 19406
1024. John S. Sieg, National Academy of Science, Board on Radioactive Waste Management, 2101 Constitution Avenue, NW, Washington, DC 20418
1025. G.W. Sieving, NUS Corporation, 4200 Massachusetts Avenue, NW, Washington, DC 20016
1026. H. Ellis Simmons, Nebraska Department of Health, 301 Centennial Mall South, P.O. Box 95007, Lincoln, Nebraska 68509-5007
1027. Orval D. Simpson, EG&G Idaho, Inc., Applied Physics Branch, P.O. Box 1625, Idaho Falls, ID 83415
1028. Samuel N. Simpson, New Mexico Radiation Protection Bureau, P.O. Box 968, 725 St. Michaels Drive, Sante Fe, NM 87504-0968
1029. Alan J. Siniscalchi, Connecticut Department of Health Services, Toxic Hazards Section, 79 Elm Street, Hartford, CT 06106
1030. John M. Skarpelos, General Electric Company, 175 Curtner Avenue, MC 783, San Jose, CA 95125
1031. Joseph D. Skarupa, Reuter-Stokes, Inc., 18530 S. Miles Parkway, Cleveland, OH 44128
1032. Michele Skivo, Synergic Resources Corporation, Three Bala Plaza East, Suite 555, P.O. Box 1506, Bala Cynwyd, PA 19004-3406
1033. Les Skoski, Dames and Moore, 20 Haarlem Avenue, White Plains, NY 10603
1034. John Slater, Bechtel National, Inc., P.O. Box 350, Oak Ridge, TN 37830
1035. Joan Slavin, GPU Nuclear, Technical Library, P.O. Box 480, Middletown, PA 17057
1036. V.R. Sligl, Ontario Hydro, 700 University Avenue, Toronto, Ontario, Canada M5G 1X6
1037. E.M. Slivka, Beck (R.W.) and Associates, Library, Tower Building, 7th Avenue at Olive Way, Seattle, WA 98101
1038. Sludgemaster, Inc., 1650 Chambers Road, Suite 104, Aurora, CO 80011
1039. Donald L. Smith, EG&G Idaho, Inc., D&D Projects Waste Management, WCB E-2, P.O. Box 1625, Idaho Falls, ID 83415
1040. E.R. Smith, Jr., Virginia Electric and Power Company, Nuclear Operations Division, P.O. Box 26666, Richmond, VA 23261
1041. E.S. Smith, International Engineering Company, Earth Sciences Division, 180 Howard Street, San Francisco, CA 94105
1042. Leslie Smith, University of British Columbia, Department of Geological Sciences, 6339 Stores Road, Vancouver, British Columbia, Canada V6T ZB4
1043. R. Dale Smith, U.S. Nuclear Regulatory Commission, Uranium Recovery Field Office, RIV, P.O. Box 25325, Denver, CO 80225
1044. Richard I. Smith, Pacific Northwest Laboratory, Energy Systems Department, P.O. Box 999, Sigma-3 Building, Richland, WA 99352
1045. W. John Smith, Colorado State University, Department of Radiation Biology, Fort Collins, CO 80523
1046. Bobbie Sneed, EG&G Idaho, Inc., Mechanical Engineering Division, WCB-W2, P.O. Box 1625, Idaho Falls, ID 83415
1047. Warren D. Snell, Texas Department of Health, Bureau of Radiation Control, 1100 West 49th Street, Austin, TX 78756
1048. William J. Snodgrass, Johns Hopkins University, Department of Geography and Environmental Engineering, 34th and Charles, Baltimore, MD 21218

1049. Leonard R. Solon, New York City Health Department, Bureau for Radiation Control, 65 Worth Street, New York, NY 10013
1050. C. Sorentino, Tailing Technology Pty., Limited, 100 Miller Street, Floor 23, North Sydney, NSW, 2060, Australia
1051. Stephen A. Spann, Colorado Division of Water Resources, Dam Safety Department, 1313 Sherman Street, Room 818, Denver, CO 80203
1052. John P. Spath, New York State Energy Research and Development Authority, Radioactive Waste Management Program, 2 Rockefeller Plaza, Albany, NY 12223
1053. William H. Spell, Louisiana Nuclear Energy Division, Department of Natural Resources, P.O. Box 14690, Baton Rouge, LA 70898
1054. Patrick Spieles, Rocky Mountain Energy Company, ISLCO Division, P.O. Box 3719, Casper, WY 82602
1055. Fred A. Staab, Gundle Lining Systems, Inc., Marketing Division, 1340 E. Richey Road, Houston, TX 77073
1056. Wolfgang Stang, Kernkraftwerke Gundremmingen Betriebsgesellschaft, Postfach 8871, Gundremmingen, Federal Republic of Germany
1057. F.J. Steinbrenner, Law Engineering Testing Company, 2749 Delk Road, SE, Marietta, GA 30067
1058. Stanley Stief, U.S. Department of Energy, Oak Ridge Operations Office, Safety and Environmental Control Division, Environmental Protection Brasch, P.O. Box E, MS G-108, Oak Ridge, TN 37830
1059. Robert E. Stiens, U.S. Department of Energy, West Valley Demonstration Project, P.O. Box 191, West Valley, NY 14171
1060. Edwin T. Still, Kerr-McGee Corporation, Environment and Health Management Division, T-2103, P.O. Box 25861, Oklanoma City, OK 73125
1061. Hal S. Stocks, Indiana Board of Health, Division of Industrial Hygiene and Radiological Health, 1330 West Michigan Street, P.O. Box 1964, Indianapolis, IN 46206-1964
1062. G. Stott, Scottish Development Department, Pentland House, 47 Robb's Loan, Edinburgh, Scotland, United Kingdom EH14 1TY
1063. R. Jon Stouky, Power Cutting, Inc., One Energy Drive, P.O. Box 3000, Lake Bluff, IL 60044
1064. John Strasma, University of Wisconsin, Agricultural Economics Department, 427 North Lorch Street, Madison, WI 53706
1065. Charles L. Stratton, Environmental Sciences and Engineering, Inc., P.O. Box ESE, Gainesville, FL 32602
1066. Herbert R. Strickler, General Electric Company, Nuclear Fuel and Special Projects Division, 7555 East Collins Road, Morris, IL 60450
1067. Richard H. Struble, Acres American, Inc., 800 Liberty Building, Main at Court Streets, Buffalo, NY 14202
1068. G.L. Stukenbroeker, NLO, Inc., Decontamination and Decommissioning Division, P.O. Box 39158, Cincinnati, OH 45239
1069. W.K. Summers, W.K. Summers and Associates, Inc., P.O. Box 684, Socorro, NM 87801
1070. Kenneth C. Sumpter, EG&G Idaho, Inc., TMI-2 Technical Support and Projects Office, P.O. Box 1625, Idaho Falls, ID 83415
1071. Arthur A. Sutherland, Rogers and Associates Engineering Corporation, P.O. Box 330, Salt Lake City, UT 84110
1072. Swiss Federal Institute for Reactor, Research, Library, CH 5303, Wurenlingen, Switzerland
1073. Sydkraft, FACK, S-200 70 Malmo, Sweden
1074. Ahmad Tajuddin-Ali, Tun Ismail Atomic Research Centre, Operations Division, Bangi, Selangor, Malaysia
1075. Mikio Takeuchi, Okumura Corporation, Nuclear Power Department, 1-3-10, Motoakasaka, Minato-ku, Tokyo, Japan 107
1076. James H. Talboy, Argonne National Laboratory, Office of International Energy Development Programs, 9700 South Cass Avenue, Argonne, IL 60439
1077. Takayoshi Tanaka, Genshiryoku Daiko Company, Limited, Osaka Regional Office, 2-1-8, Dokimahama, Kita-ku, Osaka-City, Japan
1078. J. Tell Tappan, ARIX, Radiological Assessments Department, 1005 North 12th Street, Suite 202, Grand Junction, CO 81501
1079. H.A. Taylor, British Nuclear Fuels Limited, Reprocessing Division, R&D, Risley, Warrington, Cheshire, England, United Kingdom WA3 6AS
1080. Kathleen K. Taylor, Long Island Lighting Company, Nuclear Engineering Department, 175 East Old Country Road, Hicksville, NY 11801
1081. Michael J. Taylor, D'Appolonia Consulting Engineers, Inc., 7400 South Altom Court, Englewood, CO 80112
1082-1108. Technical Information Center, Department of Energy, Oak Ridge, TN 37830

1109. D.W. Tedder, Georgia Institute of Technology, Chemical Engineering Department, Bunger/Henry Roc Atlanta, GA 30332
1110. Bill R. Teer, Transnuclear, Inc., One North Broadway, Suite 700, White Plains, NY 10601
1111. Thomas N. Tetting, Utah Natural Resources and Energy, Oil, Gas and Mining Division, 4241 State Office Building, Salt Lake City, UT 84114
1112. William B. Thelen, Retech, Inc., Sales Division, P.O. Box 997, Ukiah, CA 95482
1113. John G. Themelis, U.S. Department of Energy, Albuquerque Operations Office, P.O. Box 5400, Albuquerque, NM 87115
1114. Edward F. Thode, New Mexico State University, Center for Business Services, Box 3CR, Las Cruces, NM 88003
1115. Audrey Thomas, U.S. Environmental Protection Agency, FAMB/Library, 26 Federal Plaza, New York, NY 10278
1116. J.R. Thomas, United Kingdom Atomic Energy Authority, Risley Nuclear Power Development Establishment, Warrington, United Kingdom WA3 6AT
1117. Michael M. Thomas, Black and Veatch Engineers-Architects, Industrial/Special Projects Division, P.O. Box 8405, Kansas City, MO 64114
1118. Susan J. Thomas, NUS Corporation, Government Operations, 910 Clopper Road, Gaithersburg, MD 21701
1119. Vivian W. Thomas, Pacific Northwest Laboratory, Radiological Sciences Department, P.O. Box 999, Richland, WA 99352
1120. Marion L. Thompson, General Electric Company, Advanced Reactor Systems Department, 310 DeGuigne Drive, P.O. Box 508, Sunnyvale, CA 94086
1121. Bruce M. Thomson, University of New Mexico, Department of Civil Engineering, Albuquerque, NM 87131
1122. Edward R. Thorn, Concrete Sawing and Drilling Association, 3130 Maple Drive, Atlanta, GA 30327
1123. Daniel Threlfall, NUS Corporation, PEC Division, Park West Two, Cliff Mine Road, Pittsburgh, PA 15275
1124. Helen Todosow, Brookhaven National Laboratory, Department of Nuclear Energy, Nuclear Safety Library, Building 130, Upton, Ny 11973
1125. Richard J. Tommey, GA Technologies, Inc., Library, P.O. Box 85608, 10955 John Jay Hopkins Drive, San Diego, CA 92138
1126. Alphonso A. Topp, New Mexico Department of Health and Environment, Radiation Protection Bureau, P.O. Box 968, Santa Fe, NM 87504-0968
1127. Kinichi Torikai, Science University of Tokyo, Department of Mechanical Engineering, (278) Chiba-ken, Noda-shi, Yamazaki Higashi-Kameyama 2641, Japan
1128. Arpad E. Torma, New Mexico Institute of Mining and Technology, Department of Metallurgy, Socorro, NM 87801
1129. John Torck, Atomic Energy of Canada Limited, Chalk River Nuclear Laboratories, Chalk River, Ontario, Canada K0J 1J0
1130. George Toto, Westinghouse Electric Corporation, Nuclear Service Division, P.O. Box 2728, Pittsburgh, PA 15230
1131. Marios Tsezos, McMaster University, Chemical Engineering Department, Hamilton, Ontario, Canada L8S 4L7
1132. Michael K. Tucker, U.S. Department of Energy, Grand Junction Area Office, P.O. Box 2567, Grand Junction, CO 81502
1133. John H. Turney, EDS Nuclear, Inc., Systems Engineering Division, 350 Lennon Lane, Walnut Creek, CA 94598
1134. U.S. Environmental Protection Agency, Eastern Environmental Radiation Facility, P.O. Box 3009, Montgomery, AL 36193
1135. U.S. Nuclear Regulatory Commission, Library, Washington, DC 20555
1136. Stephen Unks, Stone and Webster Engineering Corporation, Project Management, P.O. Box 5406, Denver, CO 80217
1137. B.F. Ureda, Rockwell International, Atomics International Division, 8900 DeSoto Avenue, Canoga Park, CA 91304
1138. J. Michael Usher, U.S. Department of Energy, Richland Operations Office, P.O. Box 550, Richland, WA 99352
1139. E.A. Utzinger, Aare-Tessin A.G. fur Elektrizitat, Nuclear Department, Bahnhofquai 12, Olten, Solothurn, Switzerland CH-4600
1140. Seppo Vaisanen, Institute of Radiation Protection, P.O. Box 268, SF-00101 Helsinki 10, Finland

1141. Allen Valentine, Los Alamos National Laboratory, P.O. Box 1663, MS-P229, Health Physics Department, Los Alamos, NM 87545
1142. Garet E. Van De Steeg, Kerr-McGee Corporation, Technical Center, P.O. Box 25861, Oklahoma City, OK 73125
1143. Theo van der Pins, Keuring van Electrotechnische Materialen, N.V., DOO, P.O Box 9035, NL-6800ET Arnhem, The Netherlands
1144. Dirk Van Zyl, University of Arizona, Department of Civil Engineering, Tucson, AZ 85721
1145. Richard Vance, Energy, Inc., E&TS/Consulting Services, P.O. Box 736, Idaho Falls, ID 83402
1146. P. Vasudev, Environment Canada, Oil, Gas and Energy Division, Industrial Programs Branch, Ottawa, Ontario, Canada K1A 1C8
1147. D. Neil Venart, J.A. Jones Construction Company, Energy Division, P.O. Box 850, Richland, WA 99352
1148. Lawrence J. Verley, Quadrex Corporation, Recycle and Reformation Services Division, 140 NW 67th Place, Gainesville, FL 32606
1149. J.P. Vertut, Commissariat a l'Energie Atomique, DPR/STEP, B.P. 6, Fontenay aux Roses, France F-92260
1150. Kenneth B.Vess, California Department of Health Services, Radiological Health Branch, 714 P Street, Sacramento, CA 95814
1151. Harley R. Victor, Burns and Roe, Inc., Clinch River Breeder Reactor Division, Licensing and Procurement, 700 Kinderkamack Road, Oradell, NJ
1152. Hans-Joachim Viecent, Noell GmbH, Nuclear Projects, International Operations, P.O. Box 6260, Schweinfurter Strasse 28, D-8700 Wuerzberg, Federal Republic of Germany
1153. Edmund A. Vierzba, Aerospace Corporation, Eastern Technical Division, 955 L'Enfant Plaza, SW, Suite 4000, Washington, DC 20024
1154. Vic Vinych, Dravo Engineers, Inc., Environmental Engineering Department, 1250 14th Street, Denver, CO 80202
1155. Albert J. Vivyurka, Rio Algom Limited, Environmental Control Department, P.O. Box 1500, Elliot Lake, Ontario, Canada P5A 2K1
1156. Bob Vocke, Argonne National Laboratory, Division of Environmental Impact Studies, 9700 South Cass Avenue, Building 214, Argonne, IL 60439
1157. Douglas K. Vogt, Teknekron Research, Inc., Applied Research and Engineering, 7315 Wisconsin Avenue, Suite 702, North Tower, Bethesda, MD 20874
1158. Adolf F. Voigt, Ames Laboratory, Reactor Division, 219 Orhut Laboratory Building, Iowa State University, Ames, IA 50011
1159. Richard L. Volpe, Volpe (R.L.) and Associates, 110 Atwood Court, Los Gatos, CA 95030
1160. Otto von Busekist, Eurochemic, Legal Office, B - 2400, Mol, Belgium
1161. Dr. von Koch, Kraftwerk Union Aktiengesellschaft, Berliner Strasse 295 - 299, 6050 Offenbach/Main, Hessen, Federal Republic of Germany
1162. J.W. Voss, Analytic Sciences Corporation, 2950 Northup Way, Bellevue, WA 98004
1163. Frank J. Vumbaco, Nuclear Metals, Inc., Health and Radiation Safety Division, 2229 Main Street, Concord, MA 01742
1164. George P. Wagner, Commonwealth Edison Company, Technical Services Department, P.O. Box 767, Chicago, IL 60690
1165. Harry E. Wagner, General Electric Company, P.O. Box 780, Mail Code K-34, Wilmington, NC 28402
1166. Robert S. Walker, International Energy Associates Limited, 600 New Hampshire Avenue, NW, Suite 600, Washington, DC 20037
1167. Andrew Wallo, Aerospace Corporation, Controls and Analyses, 955 L'Enfant Plaza, SW, Suite 4000, Washington, DC 20024
1168. Wallace H. Walters, Pacific Northwest Laboratory, Geosciences Research and Engineering Department, P.O. Box 999, Richland, WA 99352
1169. Dana C. Ward, South Dakota Department of, Water and Natural Resources, Joe Foss Building, Pierre, SD 57501
1170. John L. Warren, Los Alamos National Laboratory, Group H-7, Waste Management, P.O. Box 1663, MS-E516, Los Alamos, NM 87545
1171. Len Wasniak, James A. Fitzpatrick Power Authority, 8300 Radian Path, Baldwinsville, NY 13027
1172. A.E. Wasserbach, New York State Federation for Safe Energy, Box 2308, West Saugerties Road, Saugerties, NY 12477
1173. E.C. Watson, Pacific Northwest Laboratory, Radiological Sciences Department, P.O. Box 999, RTL Building, Richland, WA 99352
1174. Kenneth S. Watts, American Nuclear Corporation, Gas Hills Route, Riverton, WY 82501

1175. J. Weber, Ministry of Public Health and Environmental Hygiene, Sector Straling, Koopmansstrat Ryswy (2H), The Netherlands
1176. Harriet A. Webster, Duke Power Company, David Nabow Library, P.O. Box 33189, Charlotte, NC 28242
1177. T.C. Weeks, Chem-Nuclear Systems, Inc., Field Services, 240 Stoneridge Drive, One Greystone West Building, Columbia, SC 29210
1178. L. Weil, Bundesministerium des Innern, Husarenstrasse 30, Postfach 1 02 90, D-5300 Bonn 7 1, Federal Republic of Germany
1179. Walter C. Weimer, Pacific Northwest Laboratory, Biology and Chemistry Department, P.O. Box 999, 329 Building/300 Area, Richland, WA 99352
1180. Albert A. Weinstein, S.M. Stoller Corporation, Systems Division, 1250 Broadway, New York, NY 10001
1181. C.G. Weir, British Nuclear Fuels Limited, Decommissioning Department, Sellafield, Seascale, Cumbria, United Kingdom CA20 1PG
1182. C.T. Wentzel, Union Carbide Corporation, Rifle Vanadium Plant, 24230 Highways 6 and 24, Rifle, CO 81650
1183. George J. Werkema, U.S. Department of Energy, Albuquerque Operations Office, Health and Environmental Programs, P.O. Box 5400, Albuquerque, NM 87115
1184. Jack B. Wert, Airco Industrial Gases, Rare and Specialty Gases, Union Landing and River Roads, Riverton, NJ 08077
1185. Robert A. Wessman, EAL Corporation, Nuclear Science Department, 2030 Wright Avenue, Richmond, CA 94804
1186. E.R. White, EG&G Idaho, Inc., LOFT Technical Support, P.O. Box 1625, Building TAN 602, Idaho Falls, ID 83415
1187. I.F. White, National Radiological Protection Board, Chilton, Didcot, Oxon, United Kingdom OX11 ORO
1188. Jerry D. White, U.S. Department of Energy, Richland Operations Office, Surplus Facilities Management Program Office, P.O. Box 550, Federal Building, Room 667, Richland, WA 99352
1189. Mary G. White, U.S. Department of Energy, NE-24, Division of Remedial Action Projects, Washington, DC 20545
1190. Mark Whittaker, Chem-Nuclear Systems, Inc., Technical Services Division, 240 Stoneridge Drive, #100, Columbia, SC 29210
1191. Charles E. Wickland, Rockwell International, Energy Systems Group, Waste Operations Division, P.O. Box 464, Golden, CO 80401
1192. Maggie A. Widmayer, U.S. Department of Energy, Idaho Operations Office, 550 Second Avenue, Idaho Falls, ID 83401
1193. L.C. Wilbur, Worcester Polytechnic Institute, Department of Mechanical Engineering, Institute Road, Worcester, MA 01609
1194. G.E. Wilkinson, Gardinier, Inc., P.O. Box 3269, Tampa, FL 33601
1195. Daniel H. Williams, Arkansas Power and Light Company, Nuclear Operations, P.O. Box 551, Little Rock, AR 72203
1196. Roy E. Williams, University of Idaho, College of Mines, Moscow, ID 83843
1197. John M. Williford, Chemrad Corporation, Radiological Operations, 2007 Louisiana Street, League City, TX 77573
1198. F.F. Wilson, Arkansas Department of Health, Division of Radiation Control, 4815 West Markham Street, Little Rock, AR 72201
1199. Vern Winkler, Ford, Bacon & Davis Utah, Inc., P.O. Box 8009, 375 Chipeta Way, Salt Lake City, UT 84108
1200. Dayton D. Wittke, Omaha Public Power District, Engineering Division, 1623 Harney Street, Omaha, NE 68102
1201. Eric C. Wolff, Concord Oil Company, Minerals Department, 1500 Alamo National Building, San Antonio, TX 78205
1202. W.C. Wolkenhaver, Washington Public Power Supply System, Technology Division, 3000 George Washington Way, P.O. Box 968, Richland, WA 99325
1203. Tom Wong, Union Carbide Corporation, Metals Division, P.O. Box 5100, Gas Hills Station, Riverton, WY 82501
1204. Eugene M. Woodruff, Pacific Northwest Laboratory, Materials Department, P.O. Box 999, Richland, WA 99352
1205. R.J. Woods, University of Saskatchewan, Department of Chemistry, Saskatoon, Saskatchewan, Canada S7N 0W0
1206. P.B. Woollam, Central Electricity Generating Board, Berkeley Nuclear Laboratories, Berkeley, Gloucestershire, United Kingdom GL13 9PB

1207. Robert A. Wynveen, Argonne National Laboratory, Occupational Health and Safety Division, 9700 South Cass Avenue, Building 201, Argonne, IL 60439
1208. John A. Yellich, Rocky Mountain Energy Company, Uranium Development, 10 Longs Peak Drive, Broomfield, CO 80020
1209. Fred Yost, Utility Data Institute, Research Services, 2011 I Street, NW, Suite 700, Washington, DC 20006
1210. Yuchien Yuan, Argonne National Laboratory, 9700 South Cass Avenue, EIS, Building 214, Argonne, IL 60439
1211. James G. Yusko, Pennsylvania Bureau of Radiation Protection, Division of Radiation Control, Kossman Building, 100 Forbes Avenue, Pittsburgh, PA 15222
1212. Wolfgang Zimmermann, Kernforschungszentrum Karlsruhe GmbH, Postfach 3640, D-7500 Karlsruhe, Federal Republic of Germany
1213. M.J.F. Zuber, Commission for the Safety of Atomic Installations, CH-5303 Wuerealingen, Switzerland
1214. Milton Zukor, Illinois Department of Nuclear Safety, 1035 Outer Park Drive, Springfield, IL 62704