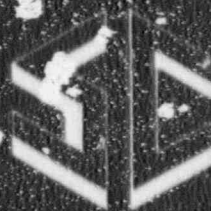


PROPOSAL TO PROVIDE TECHNICAL ASSISTANCE
FOR RULEMAKING AND REGULATORY ANALYSIS
FOR REQUIREMENTS PRIMARILY INVOLVING
ADMINISTRATIVE & PROCEDURAL MODIFICATIONS
TO NRC LICENSED FACILITIES

Solicitation No. RS-RES-89-083

Technical and Management Proposal

9102080258 901211
PDR FOIA
KNUDSON90-337 PDR



Inc.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1. INTRODUCTION	1-1
2. PERSONNEL	2-1
2.1 Project Team	2-1
3. UNDERSTANDING AND APPROACH	3-1
3.1 Understanding of the NRC and the Regulatory System	3-1
3.2 Understanding of the Value-Impact Analysis	3-4
3.3 Approach to the Development of Rulemaking Packages	3-9
3.3.1 Drafting Technical Support Documents for Developing Regulations	3-10
3.3.2 Public Comment Analysis	3-11
3.3.3 Reviewing Current Technical Literature on Specific Issues	3-14
3.3.4 Review of RES Contractor Reports and Recommending Staff Utilization of Research Results	3-16
3.3.5 Assisting in the Preparation of Draft Rulemaking Packages	3-17
3.4 Approach to the Development of Regulatory Value-Impact Analyses	3-18
3.4.1 Evaluation of Costs to Licensees	3-19
3.4.2 Evaluation of Occupational Radiation Exposure	3-24
3.4.3 Costs to Government Entities	3-31
3.4.4 Evaluation of Health and Safety Benefits	3-34
4. INFORMATION AVAILABILITY	4-1
4.1 Economic Costs	4-1
4.2 Cost-Benefit	4-12
4.3 Risk Consequence Assessment	4-14

5.	CORPORATE TECHNICAL QUALIFICATIONS	5-1
5.1	S. Cohen & Associates	5-1
5.2	SCIENTECH	5-39
5.3	Jack Faucett Associates	5-41
6.	MANAGEMENT CONTROLS	6-1
6.1	Response to Task Order Requests for Proposal	6-3
6.2	Project Control	6-6
6.2.1	Project Cost and Schedule Control	6-6
6.2.2	Technical Review and Quality Control	6-9
6.2.3	Task Plan Management	6-9
6.3	Reporting Requirements	6-10
6.4	Potential Problem Areas	6-10
6.4.1	Specialized Technical Expertise Required	6-11
6.4.2	Widely Fluctuating Work Loads	6-11
6.4.3	Supporting Activity Failures	6-11
6.4.4	Changes in Project Direction	6-11
6.4.5	Misinterpretation of Task Objective	6-13
6.4.6	Lack of Satisfaction with Deliverables	6-13
	APPENDIX A. FORMER AGENCY EMPLOYEE INVOLVEMENT	A-1
	APPENDIX B. LETTERS OF COMMENDATION FROM SC&A's CLIENTS	B-1

I. INTRODUCTION

The Nuclear Regulatory Commission (NRC) is an independent regulatory agency created by the Energy Reorganization Act of 1974 to administer, among other things, programs of safety regulation and safety research for activities authorized pursuant to the Atomic Energy Act, as amended. In the NRC, licensing and inspection of nuclear power plants are controlled by the Office of Nuclear Reactor Regulation (NRR); licensing and inspection functions for nuclear materials, including radioactive waste management and nuclear facility safeguards, are assigned to the Office of Nuclear Material Safety and Safeguards (NMSS); and research and standards setting responsibilities are assigned to the Office of Nuclear Regulatory Research (RES).

Rulemaking is one of the services the Office of Nuclear Regulatory Research performs for the program offices of NRC. Support of the RES rulemaking function is the subject of this proposal. The term rulemaking actually covers the establishment of two kinds of regulatory requirements - the Regulations of the NRC contained in Title 10 of the Code of Federal Regulations (10 CFR) and Regulatory Guides. Both types of requirements, rules and guides, are developed in a two-step process. In the first step a draft rule or guide is developed for public comment. The draft is developed at a technical staff level, coordinated up through parallel management chains of the affected offices of the NRC, reviewed by an appropriate advisory committee and the internal management Committee for the Review of Generic Requirements, and then presented to the appropriate decision maker(s) for action. Proposed Regulatory Guides are issued by the Director of RES for public comment; proposed rules are issued by the Commission. The entire process is repeated again for the final rule or guide developed in light of the comments received from the public.

Support of the Regulation Development Branch (RDB), which has broad responsibility for the development of rulemaking packages and guidance, will entail the review of contractor reports, development of appropriate methodologies and databases, performance of supporting analyses, and preparation of background reports. For the types of procedural rule changes anticipated to be the focus of the tasks under this contract, the analyses

will generally include assessments of the risk reductions anticipated to be achieved, evaluation of costs, and the performance a regulatory impact analysis identifying the cost-benefit or value-impact of the actions. These assessments will have to be made in accordance with NRC's established methodologies for evaluating costs and benefits.

To provide the range of capabilities and experience required for this solicitation, SC&A is proposing a team approach, providing the NRC with the combined corporate resources of SC&A, SCIENTECH, and Jack Faucett Associates. This team approach enables us to provide the NRC with both the breadth of expertise required to accomplish any assigned tasks under the Statement of Work, and a reserve of qualified personnel drawn from the combined resources of all three companies.

Since it was founded in 1981, SC&A has specialized in providing consulting services to the NRC and other Federal agencies in the areas of radiation policy and regulatory analysis. In fact, many of the databases and methodologies used by the NRC to estimate costs were developed by SC&A under previous contracts, and many of the personnel who contributed to those projects are an integral part of our proposed personnel. SCIENTECH, founded in 1983, is a Small Business Administration 8(a) firm. With a unique understanding of the NRC's regulatory process, it has specialized in accident risk reduction evaluations. Jack Faucett Associates provides the team more than 25 years of experience in performing economic and value-impact assessments for government agencies.

This technical and management proposal consists of five sections. Section 2 presents the proposed personnel, giving their experience keyed to the areas of expertise called for in the solicitation, and providing for each a resume in the required format. Section 3 presents our understanding of and approach to accomplishing tasks ordered under the Statement of Work. After a brief description of our understanding of the NRC organization and regulatory system, we summarily describe our approach to value-impact analysis. We also describe our approach to the development of rulemaking packages. Finally, we describe our approach to regulatory analysis, including the evaluation of costs, occupational exposure, and health and safety benefits.

Section 4 describes the availability of information needed to perform the analyses described in Section 3. The corporate technical competence of each member of the proposed team is described in Section 5, by the presentation of brief synopses of relevant experience. Section 6 describes the administrative and management methods to be used in controlling work performed under the contract.

In closing, we would like to emphasize that radiation policy and regulatory analysis is at the heart of SC&A's consulting practice. We are currently completing a project for the EPA Office of Radiation Programs in which we are supporting the development of standards under Section 112 of the Clean Air Act by evaluating risk levels and control technology costs for alternative versions of standards for 12 classes of facilities, and we assisted the Agency in preparing briefing materials for the Administrator.

We supported the Nuclear Regulatory Commission in the development of its severe accident guidance for nuclear power plant licensees. This work involved an assessment of the uncertainty in severe accident probabilities and consequences, and the contribution to risk of Class 9 reactor accidents from human error, external events, and outliers in the risk assessment. We also supported the NRC in the development of its revisions to the Standards for Protection Against Radiation (10 CFR Part 20). By visiting and discussing the revisions with several categories of licensees likely to be affected by the new regulations (i.e., operators of nuclear power reactors, research reactors, uranium fuel cycle facilities, and nuclear medical facilities), we were able to provide important feed-back to the NRC.

SC&A assisted the Congressional Office of Technology Assessment in advising Congress on several proposals for the regulatory reform of nuclear power. Case studies of existing reactors were conducted to determine the principal contributory factors to the delays in the licensing and construction schedules. In followup work conducted for the Atomic Industrial Forum (now the Nuclear Utility Management and Resources Council), we evaluated the contribution of NRC regulations to the exposure of workers to radiation. In another related project for the DOE Energy Information Administration, SC&A

evaluated the contribution of NRC regulations to the escalation in costs of nuclear power plants.

We also performed an assessment for the Department of Energy of the NRC Safety Goals, by comparing the risk criteria to existing radiation risk guides and criteria. For the State of New Mexico, we evaluated the shipping container (the "TRUPACT") planned for the shipment of DOE wastes to the Waste Isolation Pilot Plant against NRC regulations. The original design of the TRUPACT did not satisfy the NRC double-containment or venting provisions. This work was responsible, in part, for the DOE's decision to redesign the TRUPACT and to apply for NRC certification of the container.

Approximately six years ago, under a subcontract with Argonne National Laboratory, SC&A developed for the NRC Office of Nuclear Reactor Regulation a methodology for evaluating the costs of NRC regulatory actions ("A Handbook of Cost Estimating," NUREG/CR- 3971). As a result of that work, SC&A was selected by Science & Engineering Associates (SEA) as a subcontractor on its cost estimation work for the NRC. For approximately six years, SC&A has assisted SEA on many of the tasks on that project, including the provision of QA on software for the generic estimation of costs; the development of a generic dose rate data base; the validation of the generic cost estimating methodology; the derivation of radiation productivity factors and health physics costs used in the generic cost estimating methodology; the estimation of costs for plant startup/shutdown; the estimation of costs for low-level radioactive waste management; and the estimation of costs for revisions to 10 CFR Part 50, Appendix J.

In evaluating our proposal, we urge the source evaluation panel to consider the following factors:

SC&A has been continuously involved in cost impact analysis for the NRC since 1982. SC&A performed the pioneering work in NRC regulatory cost estimation by preparing, under a subcontract with Argonne National Laboratory, most sections of NUREG/CR-3971. SC&A's evaluation of the impact of the revisions of 10 CFR Part 20 (resulting entirely in procedural and administrative changes to

licensees) was used in its entirety by the NRC in the Agency's value impact analysis.

SC&A has assembled an outstanding team for this work. Several of the members of our team have nuclear power plant experience. We are supplementing our capable in-house staff with two outstanding subcontractors - Jack Faucett Associates and SCIENTECH - for expertise in economics and hands-on experience in NRC rulemaking practices.

SC&A's existing level-of-effort contract with the EPA Office of Radiation Programs (\$11 million) is evidence of our experience and success in managing headquarters' support contracts.

The entire project team is local to the Washington, D.C. metropolitan area, providing ready access to the NRC.

The best measure of our capabilities is the esteem in which we are held by our clients. We urge the evaluation panel to consider the letters of commendation we have included in Appendix B.

2. PROPOSED PERSONNEL

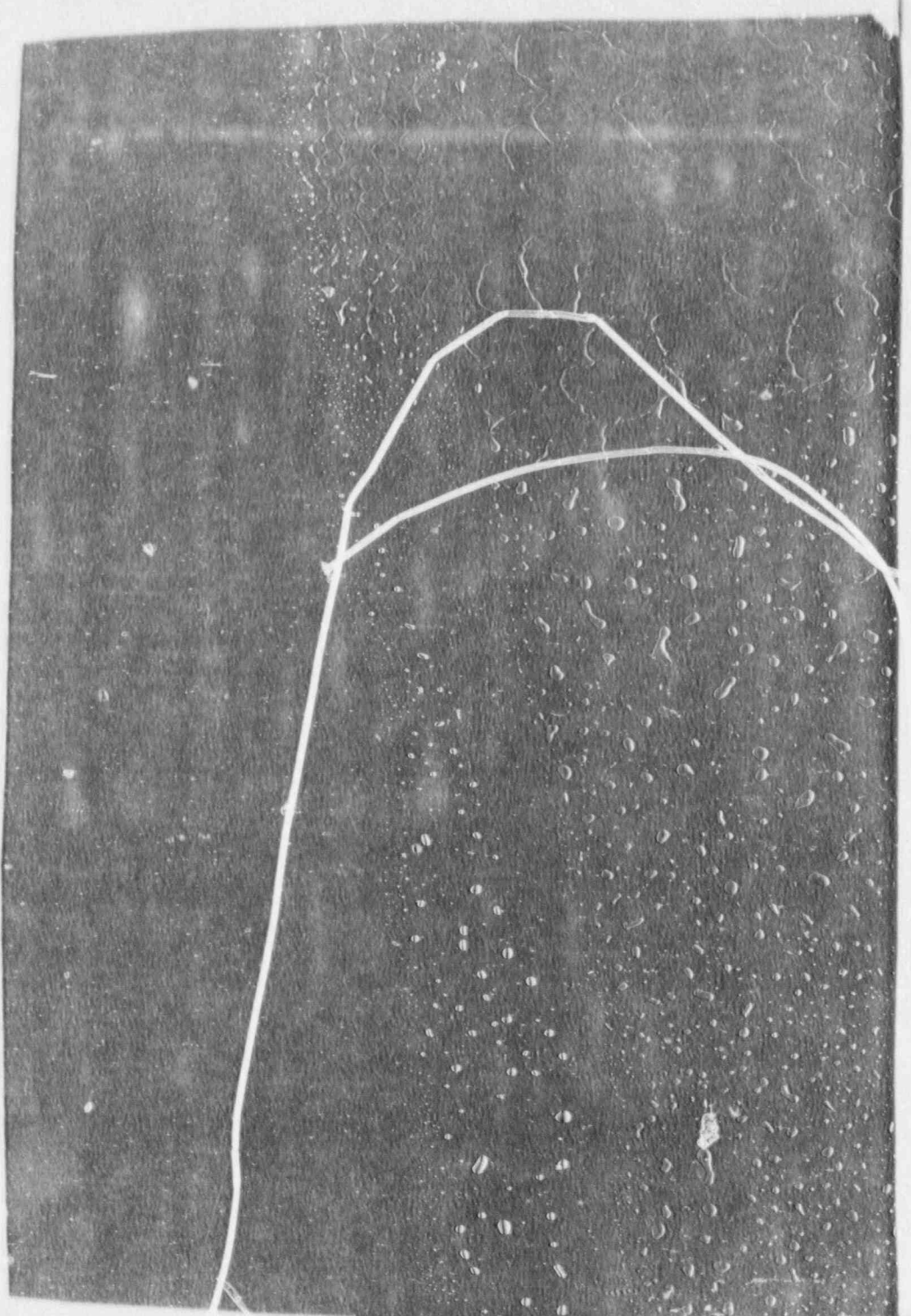
2.1 Project Team

The proposed Project Team assembled to support this procurement consists of personnel from SC&A, SCIENTECH, and Jack Faucett Associates. Together, the project team possesses all of the capabilities and qualifications requested in the RFP. Moreover, given the wealth of their experience both in supporting the RDB in its development of rulemaking packages and in implementing NRC rules and regulations at licensed facilities, the team is uniquely qualified to provide the full range of support services required for this procurement.

The qualifications of the proposed personnel, keyed to the requirements set forth in the solicitation are summarized in Table 2-1. The resumes of the proposed project team which follow the summary chart provide details of the extensive experience and capabilities of the personnel proposed to support this procurement.

Table 2-1: Qualifications of the Proposed Project Personnel

Team Member and Parent Company	Experience and Understanding of NRC and License Operating and Implementation Procedures	Expertise and Experience in Project Management and Regional Economic Analysis	Expertise and Experience in Health Physics	Expertise and Experience in Nuclear, Mechanical, Structural, Electrical Engineering	Academic Training Experience, and Expertise in the Physical Sciences
C. Cohen, SC&A					
D. Goldin, SC&A					
R. Mattson, SCIENTECH					
M. Lawrence, JFA					



C. Cohen, SC&A
D. Goldin, SC&A

R. Mattson, SCIENTECH

M. Lawrence, JFA

3. UNDERSTANDING AND APPROACH

3.1 Understanding of the NRC and the Regulatory System

The Nuclear Regulatory Commission (NRC) is an independent regulatory agency created by the Energy Reorganization Act of 1974 to administer, among other things, a program of safety regulation for activities authorized pursuant to the Atomic Energy Act, as amended. These activities pertain principally to the production of electricity by nuclear power plants. NRC's regulatory program includes the nuclear power plants and their associated fuel cycle, plus a variety of other activities involving radioactive materials.

Since its creation by the Congress in 1975, the NRC has undergone several changes that affect the manner in which it performs the regulatory analyses that are the subject of this procurement. In order to efficiently perform the work associated with this procurement, it is essential for the contractor to have an understanding of the NRC's regulatory mission and how that mission has evolved over the years, as described below.

The organization of NRC is generally prescribed by the Energy Reorganization Act. However, since its initial operations in 1975, the NRC organization has changed several times. As a result, the roles of various offices in setting requirements and performing associated regulatory analyses have also changed. Today, licensing and inspection of nuclear power plants are controlled by the Office of Nuclear Reactor Regulation (NRR); licensing and inspection functions for nuclear materials, including radioactive waste management and nuclear facility safeguards, are assigned to the Office of Nuclear Material Safety and Safeguards (NMSS); and research and standards setting responsibilities are assigned to the Office of Nuclear Regulatory Research (RES). A simple way to understand the interrelationships of these offices is to realize that RES develops regulatory requirements, in consultation with NRR and NMSS, and then NRR and NMSS implement the requirements through the licensing and inspection functions.

The Office of Nuclear Regulatory Research (Office of RES) performs a variety of services for the program offices of NRC. The RES service that is of interest to this procurement is rulemaking.

The term rulemaking actually covers the establishment of a number of different kinds of regulatory requirements. The most formal of the regulatory requirements are the Regulations of the NRC contained in Title 10 of the Code of Federal Regulations (10 CFR). The Regulations are mandatory requirements which are established through a formal rulemaking process involving Commission action. The NRC also issues Regulatory Guides. These Reg Guides are issued by the staff of the NRC and describe methods of meeting the Commission's Regulations that have been found acceptable by the staff and are encouraged for use by license applicants. In theory, the Reg Guides allow alternative approaches to meeting the Regulations. However, because of the time and regulatory precedent involved in the generation of Reg Guides, they become important regulatory requirements in actual licensing practice. Regulatory Guides often endorse, and sometimes modify, the criteria established by consensus industry standards developed under the aegis of the American National Standards Institute.

There are other forms of regulatory requirements, such as the Standard Review Plan, Branch Technical Positions, Generic Letters, Bulletins, and Orders of the NRC. These other forms of requirements are administered by NRR and NMSS, not RES. Thus, the other forms of regulatory requirements are outside the scope of this procurement.

This procurement concerns the establishment of regulatory requirements by RES through the development of Regulations and Regulatory Guides. Both types of requirements are developed using a two-step process. In the first step, a draft rule or guide is developed for public comment. Such drafts are usually developed by RES in consultation with and behalf of NRR, NMSS or both. The drafts are developed at a technical staff level, coordinated up through parallel management chains of the affected offices, reviewed by the appropriate advisory committee (usually the ACRS except for waste management matters which now have their own advisory committee), reviewed by a senior management review group called the Committee for the Review of Generic Requirements (CRGR), and then presented to the appropriate decision maker(s) for action.

When the development of a rule or a guide reaches the point that it is presented to the decision makers the process diverges. Substantive rules can

only be issued for public comment by a majority vote of the five NRC Commissioners. Therefore, proposed rulemakings are recommended by the Office of RES, with the concurrence of the affected program office, through NRC's Executive Director for Operations, to the Commission for action. The Commission will have input from the appropriate advisory committee and the CRGR to assist in its decision. The proposed rulemaking actions are transmitted to the Commission by a Policy Paper (called a SECY paper), and a Commission briefing by technical staff from RES and the affected program office may be required before the Commission acts.

Once the Commission has decided to issue a proposed rule for public comment, a notice is issued in the Federal Register of the proposed action; the Federal Register Notice also identifies the time allowed for comments and may specify particular questions on which the Commission desires input. Many times these particular questions involve the matters treated in the Regulatory Analysis performed for the proposed rule; e.g., the anticipated cost and other impacts of imposing the new rule.

Public comments received on a proposed rule are evaluated by the RES staff in consultation with the affected program office. The Commission has sometimes used rulemaking hearings, which are formal adjudicatory proceedings, or public meetings, which are less formal, to further discussion and input concerning a proposed rule. Once the inputs are all received and evaluated, the staff makes any necessary modifications to the rule, repeats essentially the entire review process followed for the proposed rule, and returns the rulemaking package to the Commission for final action. When the Commission makes its final decision on the rule, it is issued in effective form with a notice in the Federal Register. The rule then becomes a part of 10 CFR.

The process followed by the Office of RES in developing a draft and then a final Regulatory Guide is essentially the same as that for a rule, except that the Executive Director for Operations and the Commission are not involved. Rather, the final decision authority for issuing Regulatory Guides, either in draft form for public comment or in final form, is the Director of the Office of RES. Nevertheless, the Regulatory Guide development process has most of the same steps as the rulemaking process.

3.2 Understanding of Value-Impact Analysis

In order to ensure that NRC regulatory decisions are cost-effective and based on adequate information concerning the need for and potential consequences of a proposed regulatory action, the charter for the NRC's Committee to Review Generic Requirements (CRGR) requires that written justification accompany all proposed new regulatory requirements. Included in the justification package must be an assessment of the risk reduction expected from implementing the proposed requirement and an estimate of the costs to the NRC and the licensees. The foundation of all regulatory analyses is the evaluation of benefits and costs in what are typically called Value-Impact Assessments¹ in the NRC.

Generally, a value-impact assessment is a decision-making tool designed to provide a coherent, understandable, well-documented account of the basis for NRC regulatory actions. Because, the value-impact assessment, in providing approximate quantitative estimates of the costs and benefits of a proposed regulatory action, does not serve as the only basis for regulatory decision-making, it is essential that the assessment make explicit both the uncertainty in the analysis and its implications. An effective and useful value-impact analysis offers not only informative, consistent, and systematic analysis but also a clear display of the important assumptions and analysis, thus enabling the reviewer to understand the assessment and to criticize it.

Schematically, the value-impact assessment follows a four-step procedure. Based on the proposed NRC action, the attributes² affected by the action are

¹Values measure the potential public benefits of a regulatory action, i.e., safety improvements and improvements in safety-related knowledge, while impact measure the other consequences of the proposed action, such as potential increases in NRC and industry implementation and operating costs.

²The term "attributes" denotes the category of consequences that are relevant in assessing a particular decision. For example, industry implementation consequences, off-site property consequences, and effects on public health.

identified. Next, the potential effect of the proposed action on each attribute is evaluated. Thirdly, the individual evaluations are summarized, and the value-impact results displayed. Finally, sensitivity analyses are performed, if appropriate, to document the importance of certain major assumptions.

The major potential effects of NRC regulatory action can be measured in terms of the impact on the following attributes¹.

- Public Health
- Occupational Exposure (Accidental and/or Routine)
- Off-site property
- On-site Property
- Regulatory Efficiency
- Improvements in Knowledge
- Industry Implementation
- Industry Operation
- NRC Development
- NRC Implementation
- NRC Operation

The value-impact assessment measures the change in each attribute relative to the existing condition. Measures of risk, therefore, reflect risks averted or incurred, and costs reflect either costs added or costs saved. The attributes affected by any given regulatory proposal vary, and the analyst must determine the appropriateness of each attribute in terms of the issue at hand.

The NRC is interested in the quantification of the costs and benefits associated with each attribute. These are summarized using one or both of two major methods: the ratio method and the net-benefit method. The ratio method expresses the total net public health value of a proposed regulation in terms of the expected reduction in public exposure. These benefits, measured in

¹Definitions and explanations for the evaluation of each of the following NRC-designated attributes are available in NUREG/CR-3568, A Handbook for Value-Impact Assessment, December 1983.

person-remS averted, are divided by the total costs of the proposal, measured in millions of dollars.

The net-benefit method is the sum of all attributes quantified in monetary terms. For this, it is essential that all factors used to quantify non-monetary attributes be explicitly stated. A major difficulty with the net-benefit method is the quantification of health effects. There are several common methods for such quantification, all of which must be clearly defined, thus demonstrating that the attributes have been evaluated in a consistent manner. NUREG/CR-3568 suggests the valuation of environmental person-remS at \$1,000 (1983). (Occupational person-remS are valued at \$5,000) Because this estimate is debatable, it is common to perform sensitivity studies using \$500 or \$2000 per person-rem. Table 3-1 summarizes the kind of information necessary for a complete value/impact assessment.

The proposed project team has completed a variety of projects requiring value-impact assessments for the NRC and for other Federal agencies. Many of these projects have involved the calculation of probabilistically-weighted accident related exposures. The project team has extensive experience in the quantification of non-monetary costs and benefits.

- For NRC's Office of Nuclear Regulatory Research, SC&A and one of the proposed subcontractors (Jack Faucett Associates) evaluated the cost impacts of proposed revisions to occupational exposure regulations contained in 10 CFR Part 20. The objective of this study, which covered all NRC licensees and NRD Agreement State licensees, was to estimate the cost of detailed components of the guidance for different classes of licensees. The components included:
 - Annual exposure limits
 - Weighted internal exposures
 - Training
 - Recordkeeping
 - Protection for the unborn
 - Planned special exposures

Table 3-1: Summary of Industry-Wide Value/Impact Analysis for Alternative ____

Attribute	Dose Reduction (person-Rem)		Cost (\$1,000 -1989)	
	Best Est.	High Est.	Best Est.	High Est.
Public Health ¹				
Occupational Exposure (Accidental)				
On-site Property Damage (10% discount)				
Off-site Property Damage (10% discount)				
Industry Implementation and Operation				
NRC Development/Implementation and Operation				
Net Benefit				

Benefit(\$)/Cost(\$)²

Dose-Reduction (person-rem/\$ Million)³

Value/Impact Ratio⁴

Benefit/Cost Ratio Sensitivity Analysis for Alternate ____

Parameter	New Value	Net Benefit	Benefit/Cost Ratio
Baseline Best Estimate			
Discount Rate	5% 8%		
Health Effects	\$ 500/person-rem \$2,000/person-rem		

¹ health consequences set at \$1,000 per person-rem.

² Averted health cost divided by NRC and industry development, implementation, and operational costs.

³ Public dose reduction divided by NRC and industry development, implementation, and operational costs.

⁴ Cost of NRC and industry development, implementation, and operational costs divided by public dose reduction.

These components were evaluated for the changes from the existing regulation as they would affect individual industries. In this study, a series of industry case studies was conducted. The data acquired through these were combined with secondary data to develop estimates of potential aggregate costs of compliance impacts. On-site visits were made to nuclear power plants, hospitals and private medical and dental practices, nuclear pharmacies, DOE facilities, and uranium mills and UF₆ conversion facilities.

- For EPA's Office of Radiation Programs, our proposed subcontractor, Jack Faucett Associates, completed a series of 12 Regulatory Impact Analyses, including cost-benefit analysis, of proposed National Emissions Standards for Hazardous Air Pollutants (NESHAPS) for radionuclides. On November 8, 1979, EPA listed radionuclides as a hazardous air pollutant under the provisions of Section 112 of the Clean Air Act. In 1988 and 1989, EPA reviewed and updated its studies of all radionuclide source categories. SC&A was responsible for the Background Information Document on each of the twelve chapters, and Jack Faucett Associates prepared the Regulatory Impact Analyses.

The twelve source categories studied were:

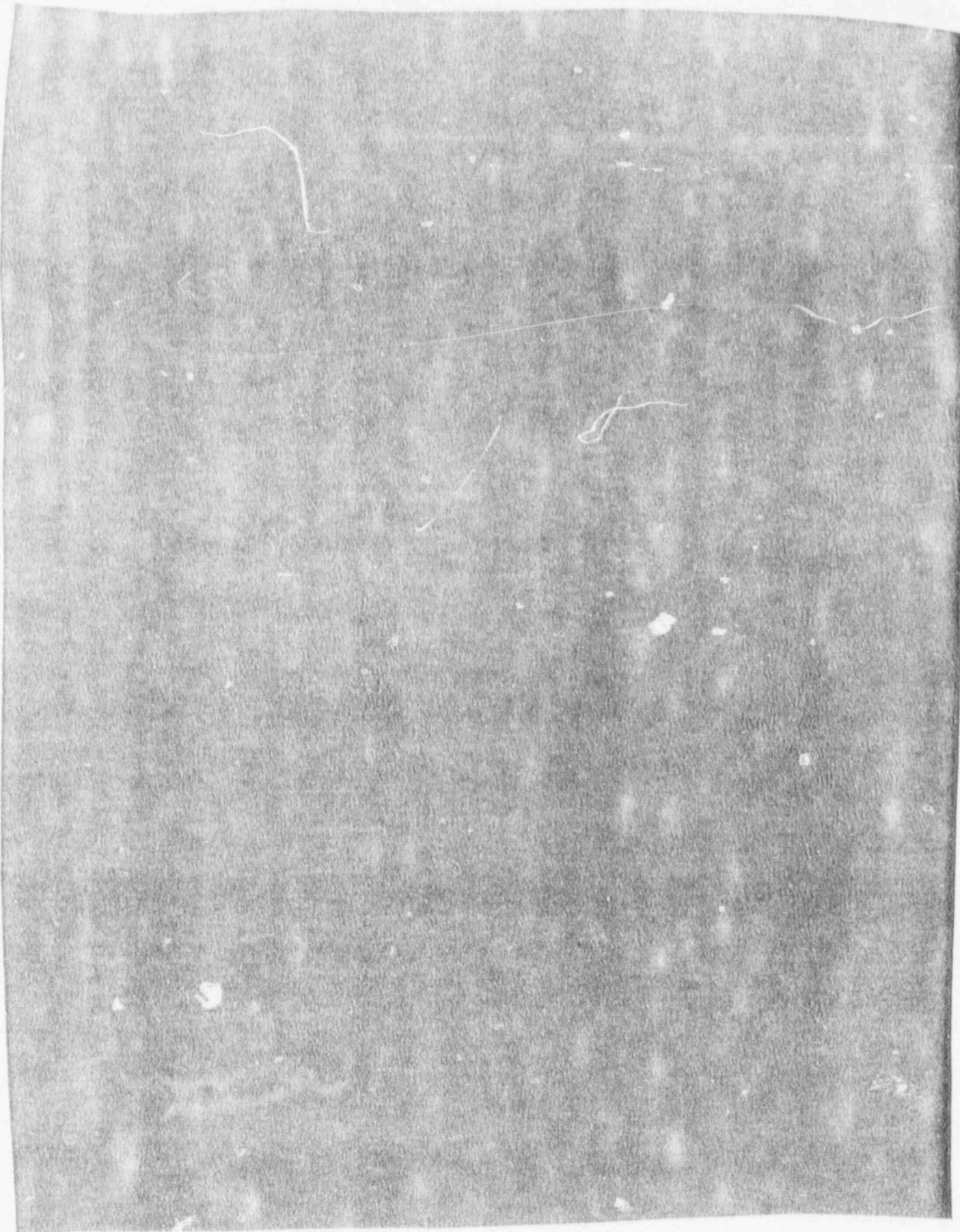
- Uranium Fuel Cycle Facilities
- Underground Uranium Mines
- Inactive Uranium Mill Tailings Sites
- Licensed Uranium Mill Tailings Sites
- High-Level Waste Disposal
- Department of Energy Facilities
- Department of Energy Radon Sites
- Elemental Phosphorus Plants
- Phosphogypsum Stacks
- Coal-Fired Boilers
- NRC-Licensed and Non-DOE Federal Facilities
- Surface Uranium Mines

Each chapter was organized into five sections. Section 1 summarized the results. Section 2 contained background information of the various industries or facilities, including characteristics of demand, supply, competitive products and processes, other economic characteristics, and forecasts. Section 3 presented the current emissions for each source category, by site, the risk levels associated with the emissions, and the cost and efficiency of various potential technologies useful for controlling emissions. Section 4 was an analysis of the costs and benefits of the proposed standards. Generally, the fourth section identified a least-cost technology and any available alternatives, described the health effects of using these technologies and compared their costs and benefits. Section 5 concluded each chapter with an evaluation of the economic impacts, primarily on industry, of the proposed regulation. An analysis of the potential effects of the standard on small business was also undertaken for each source category.

- Jack Faucett Associates has also recently (1989) completed two value-impact assessments for the Department of Labor's Occupational Safety and Health Administration (OSHA): an analysis of the costs and benefits of regulations to prevent the occupational exposure of health workers to bloodborne diseases; and the cost-benefit analysis of a proposed safety standard for the structural steel erection industry.

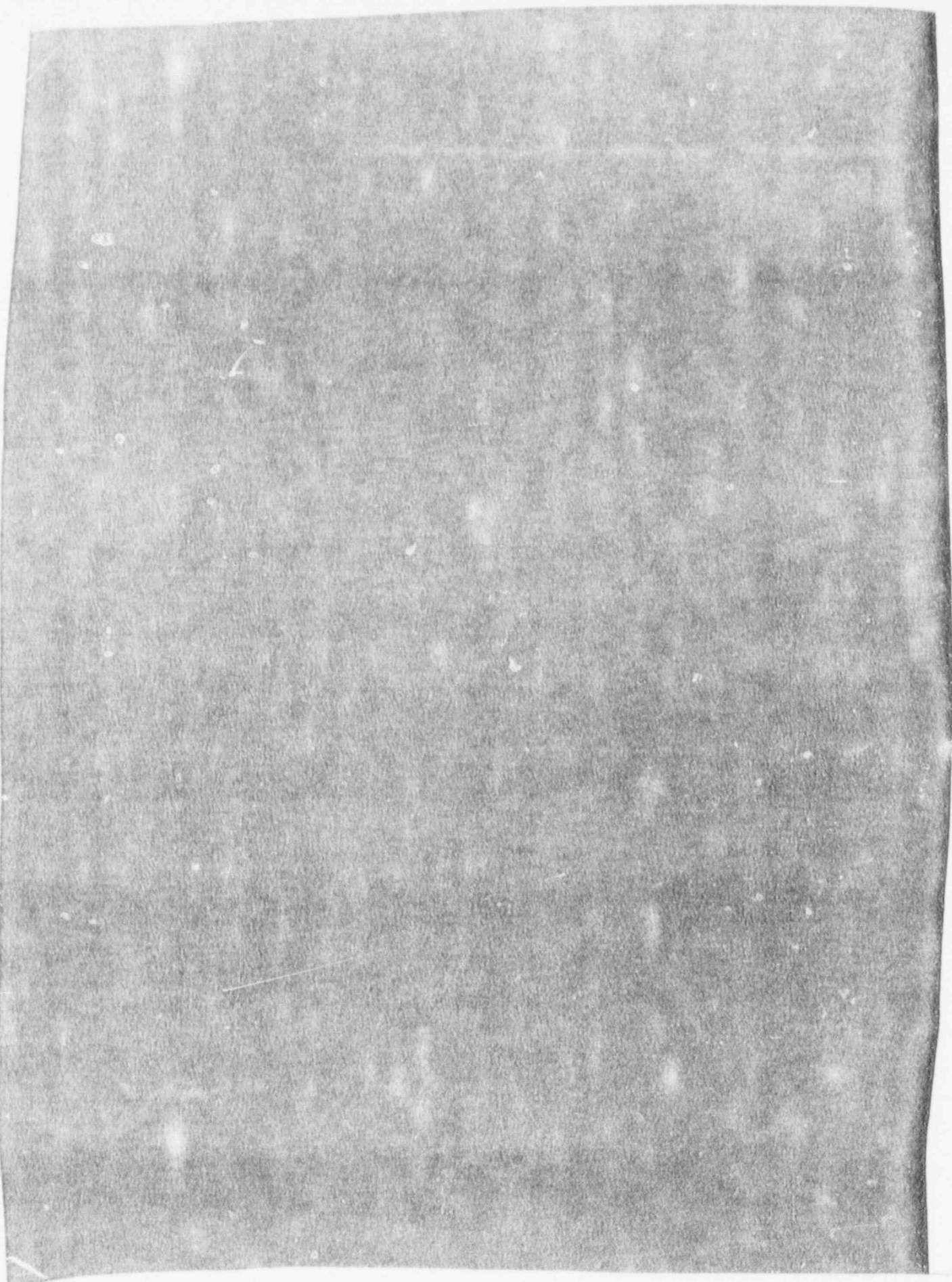
3.3 Approach to the Development of Rulemaking Packages

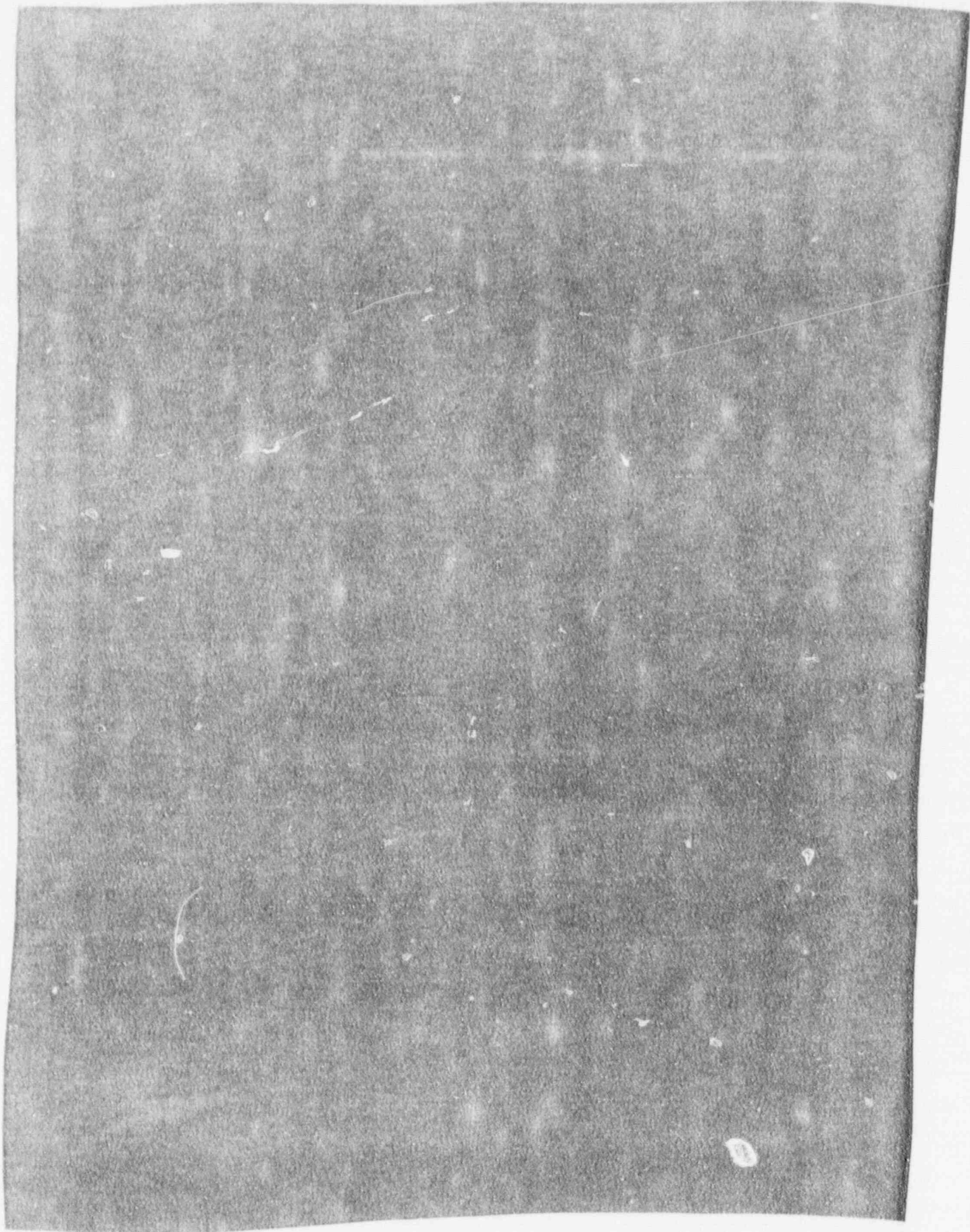
The development of Regulations and Regulatory Guides depend on the underlying technical assessments and evaluations of the specific problem. These include the identification of the risks associated with the problem (frequently statistical or probabilistic risks), the alternative methods available or feasible for resolving the problem; the effectiveness of each alternative in ameliorating the risk, and the costs associated with each alternative. The sections below detail the approaches that are proposed for supporting the development of rulemaking packages.



3-10

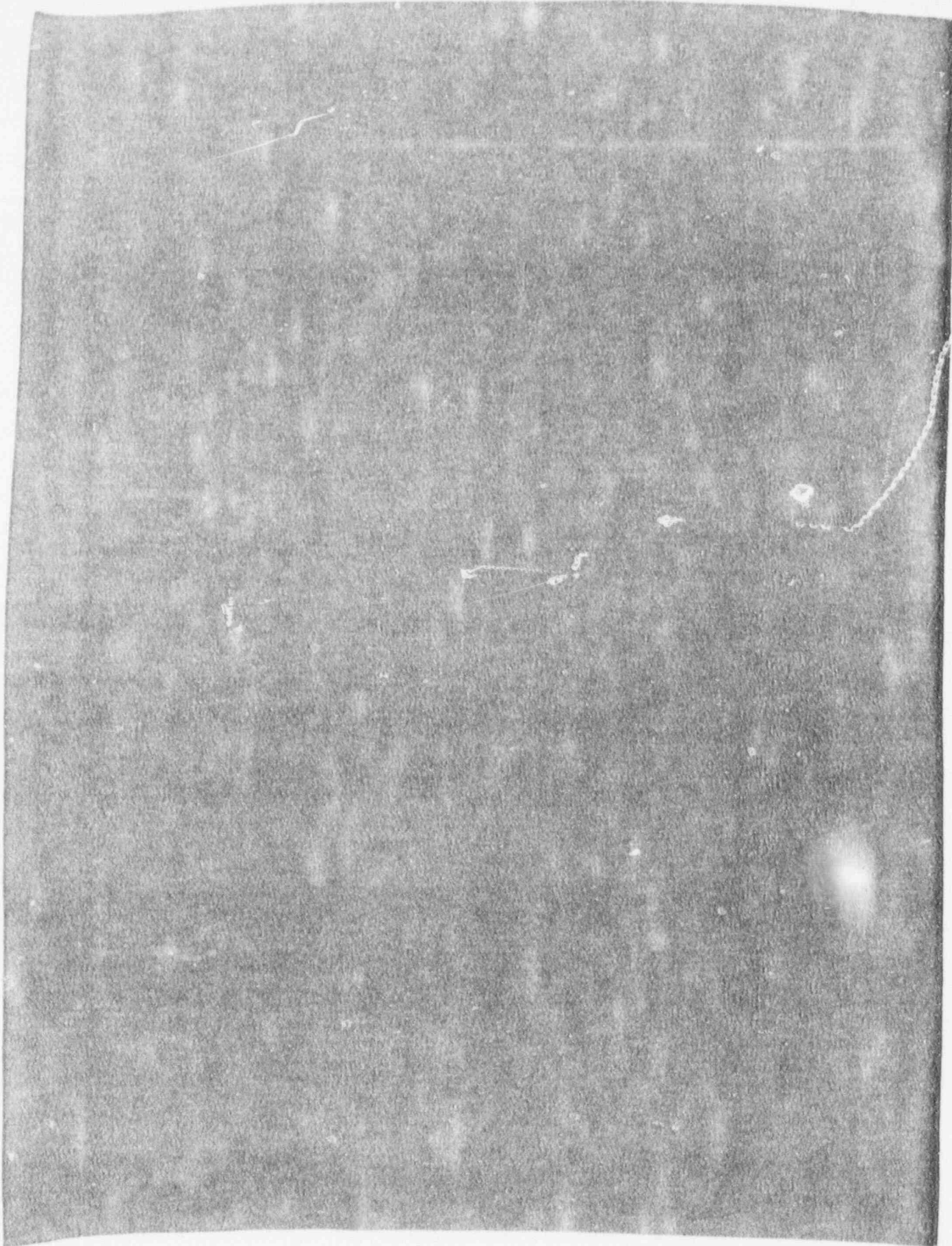
SC&A

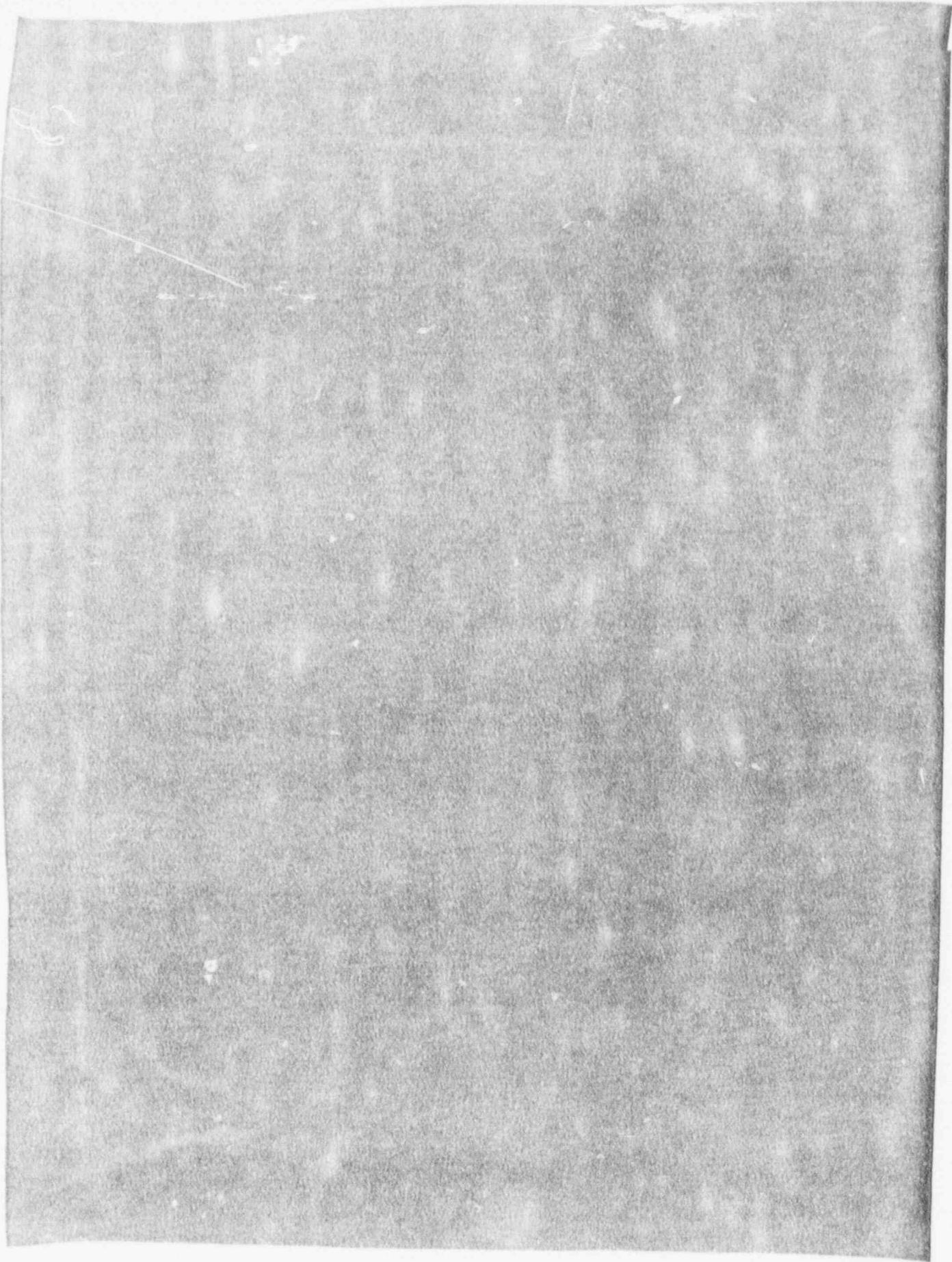


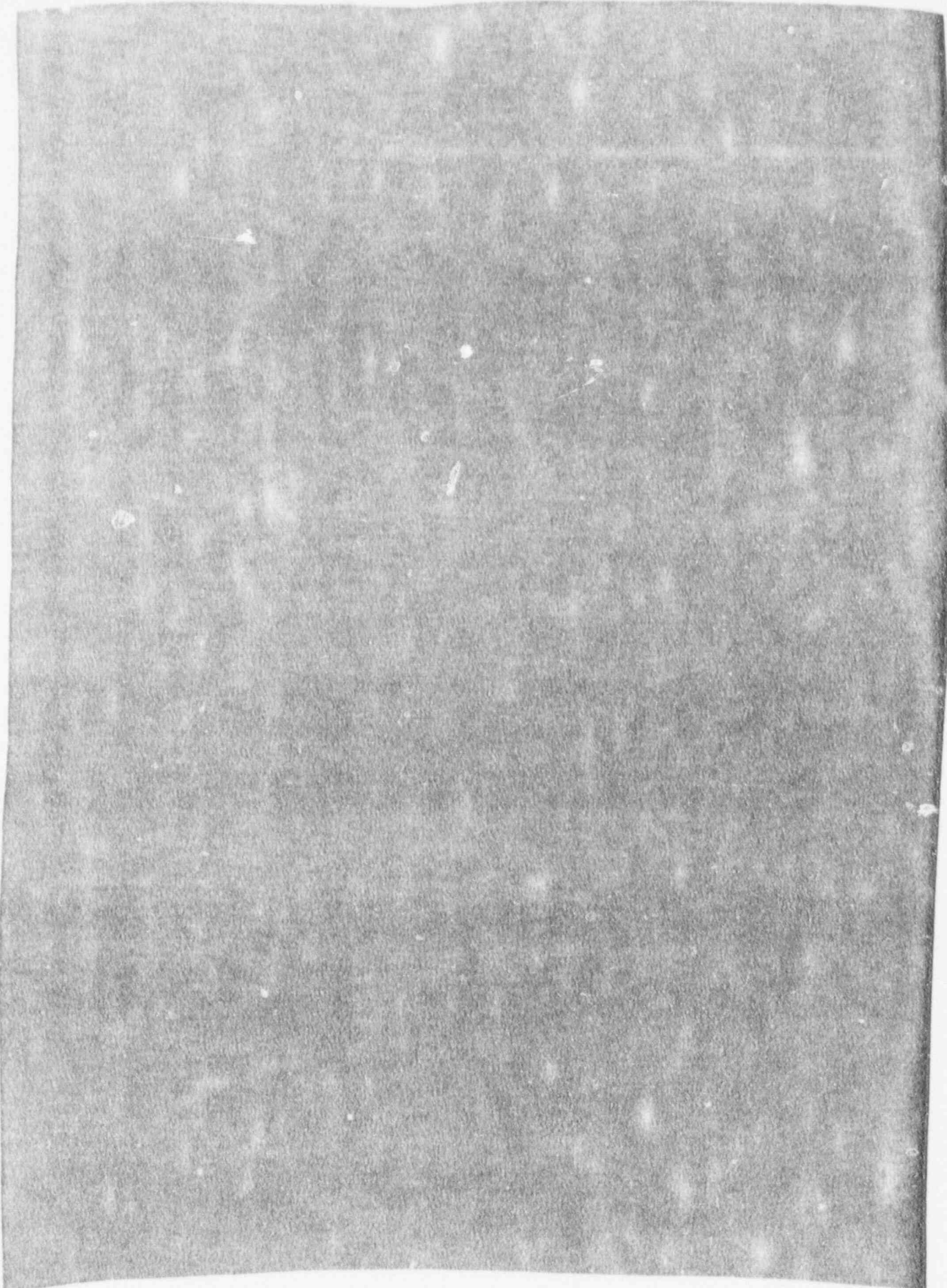


3-12

SC&A

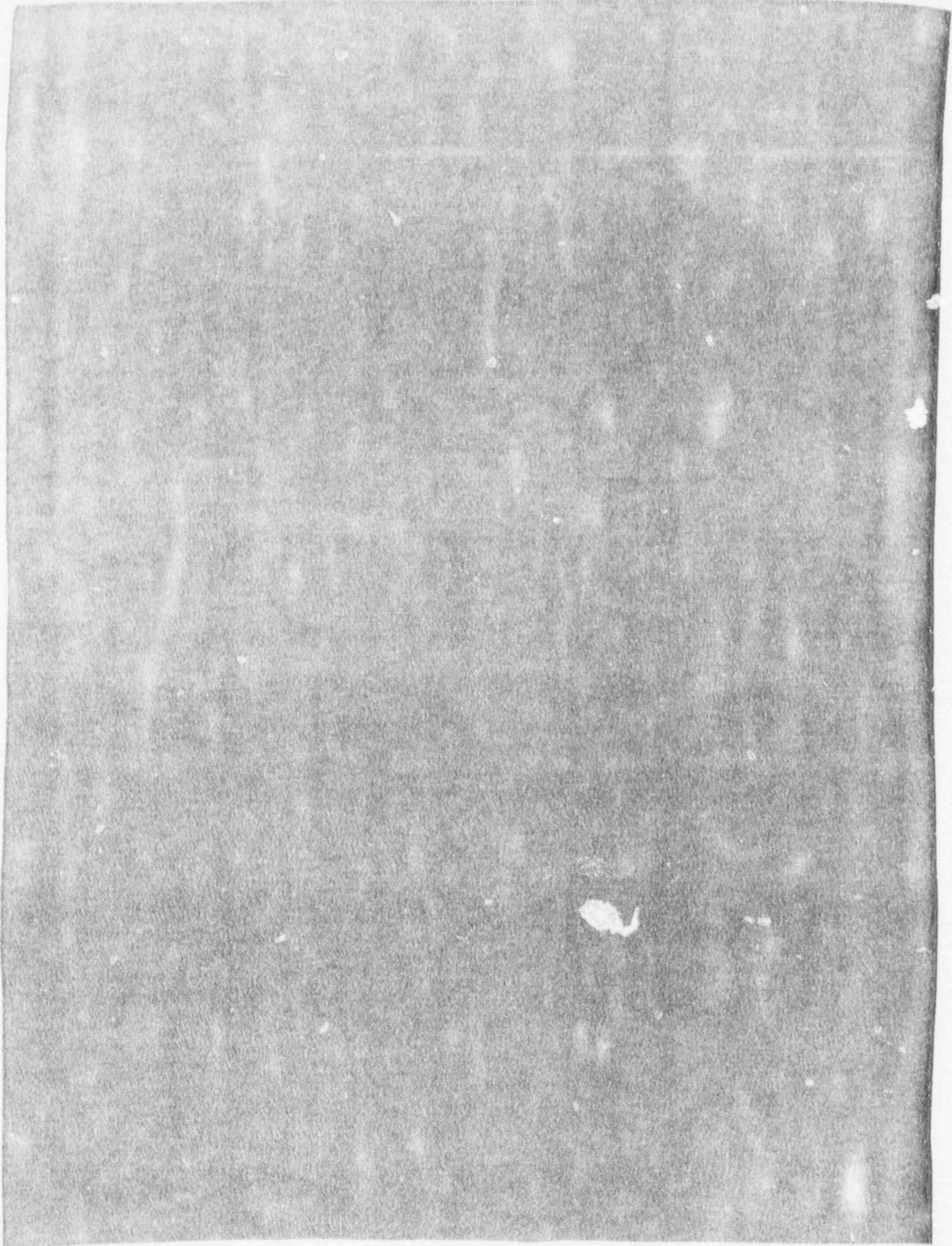


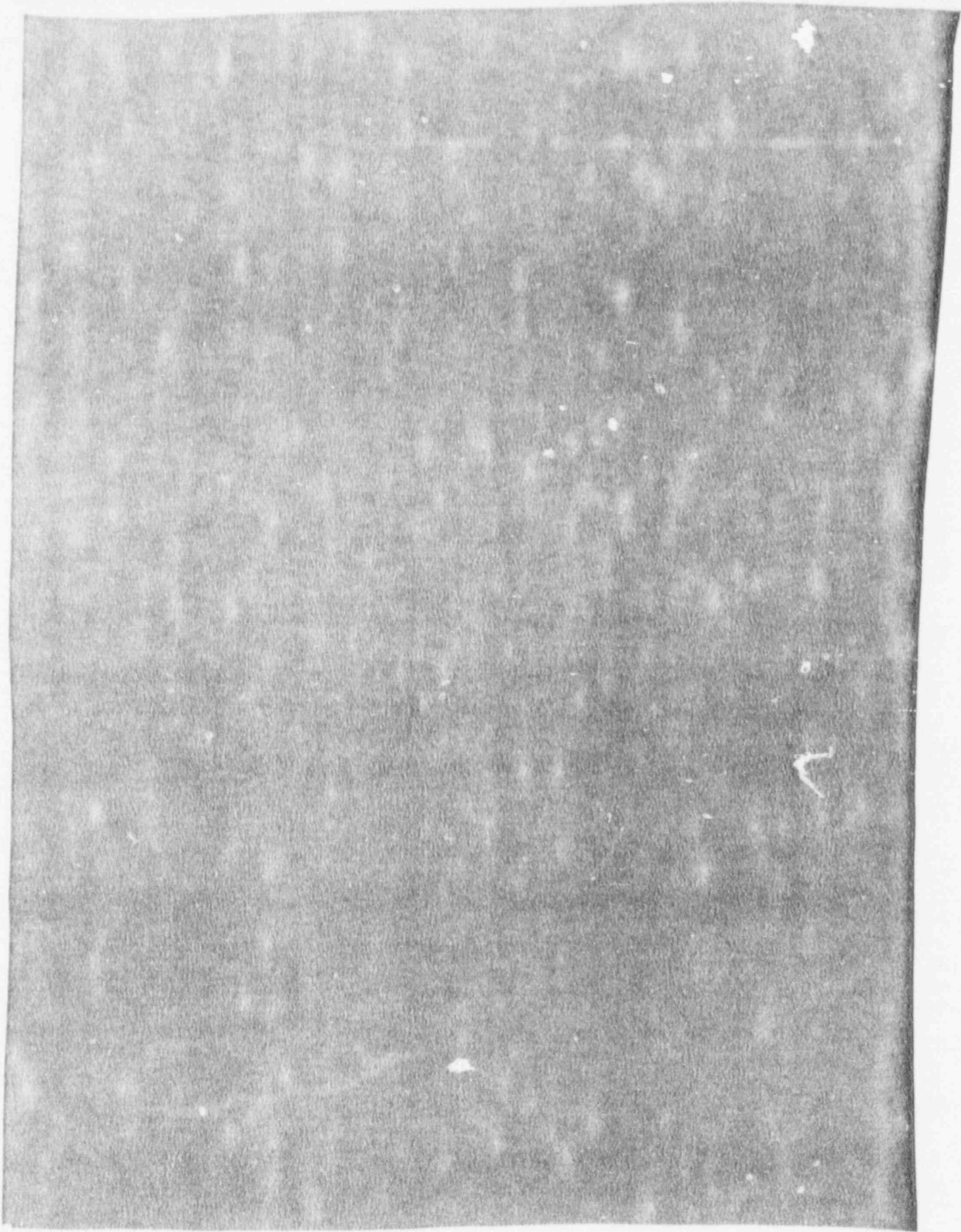


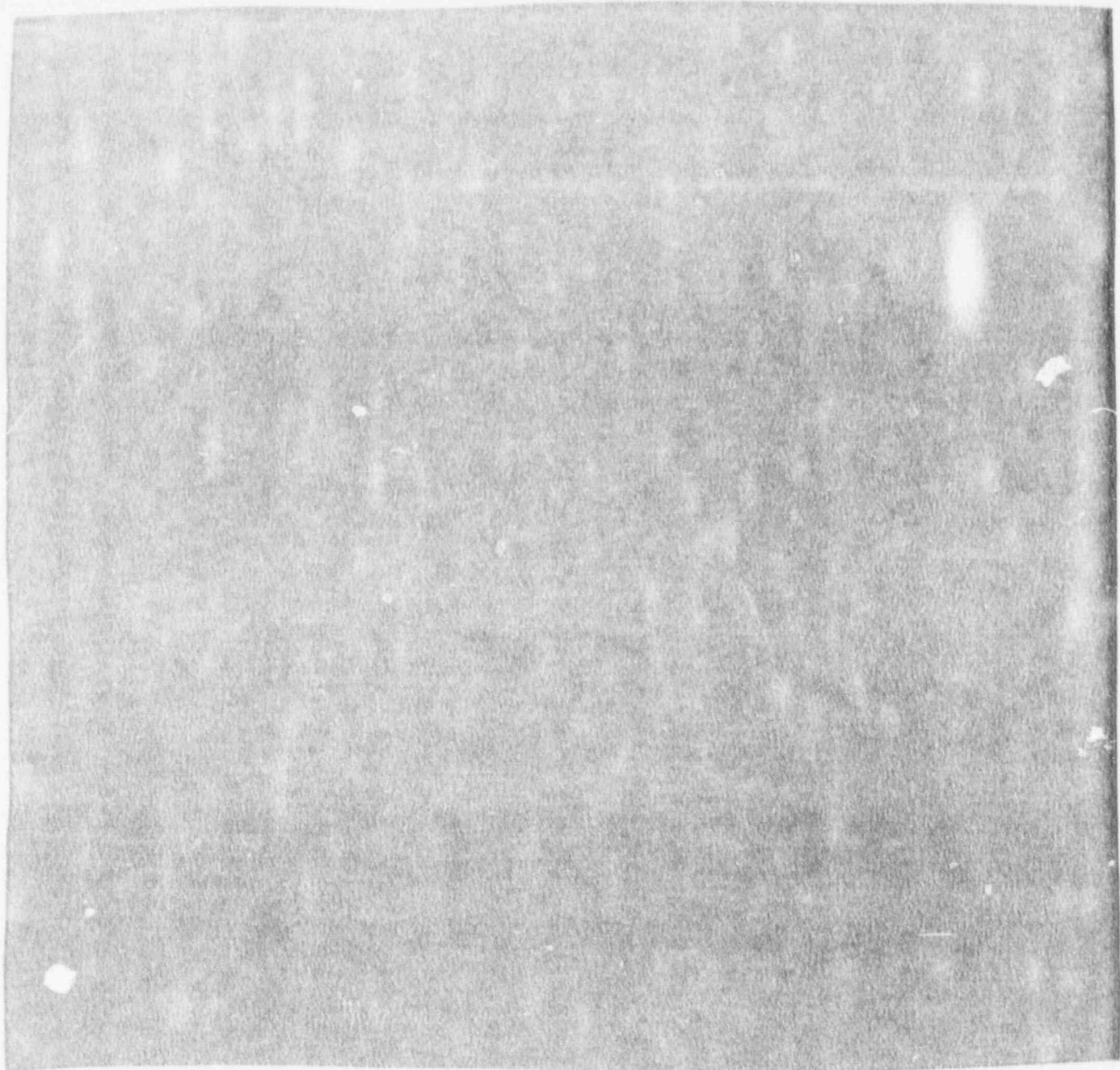


3-15

SC&A

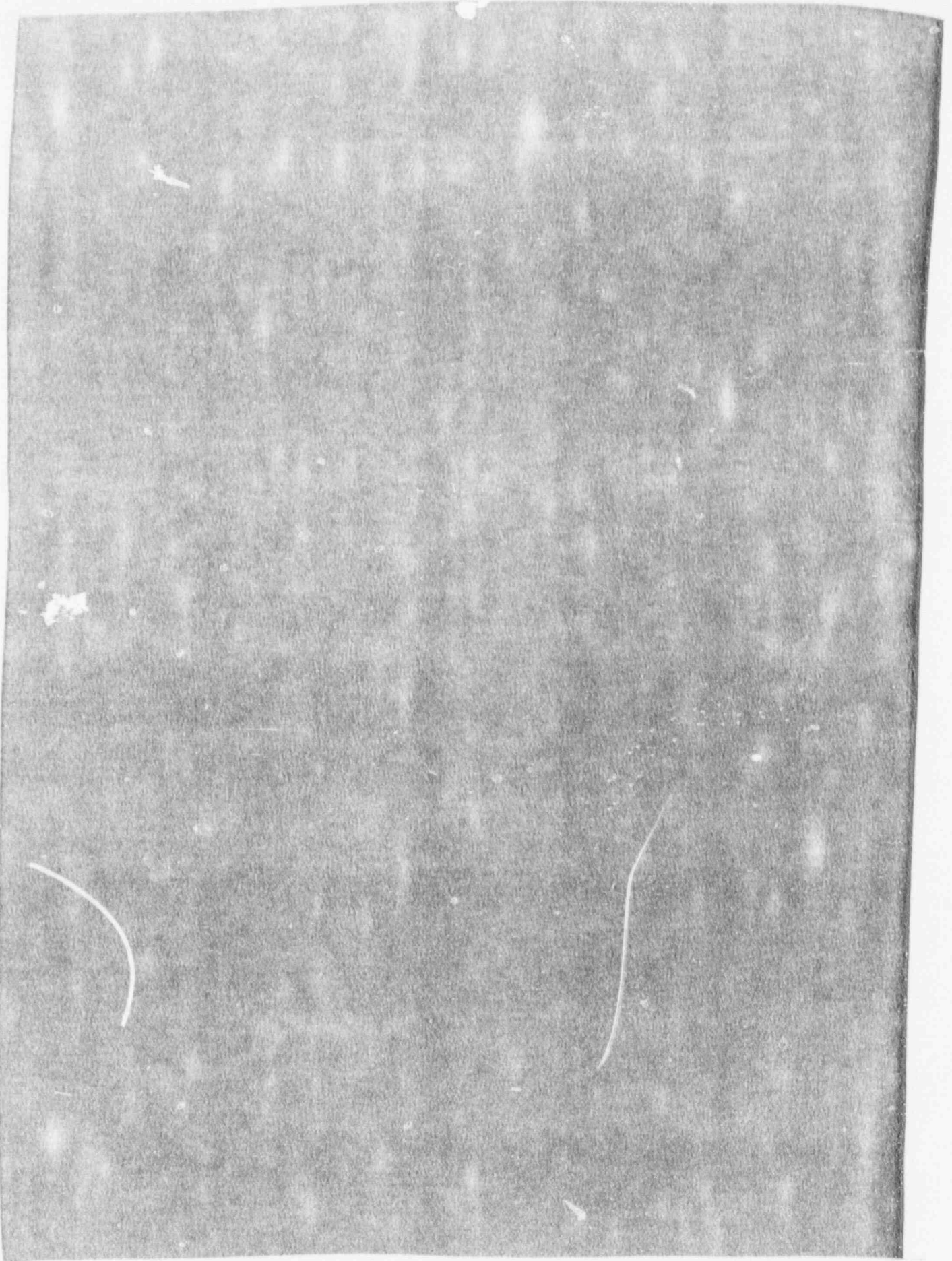


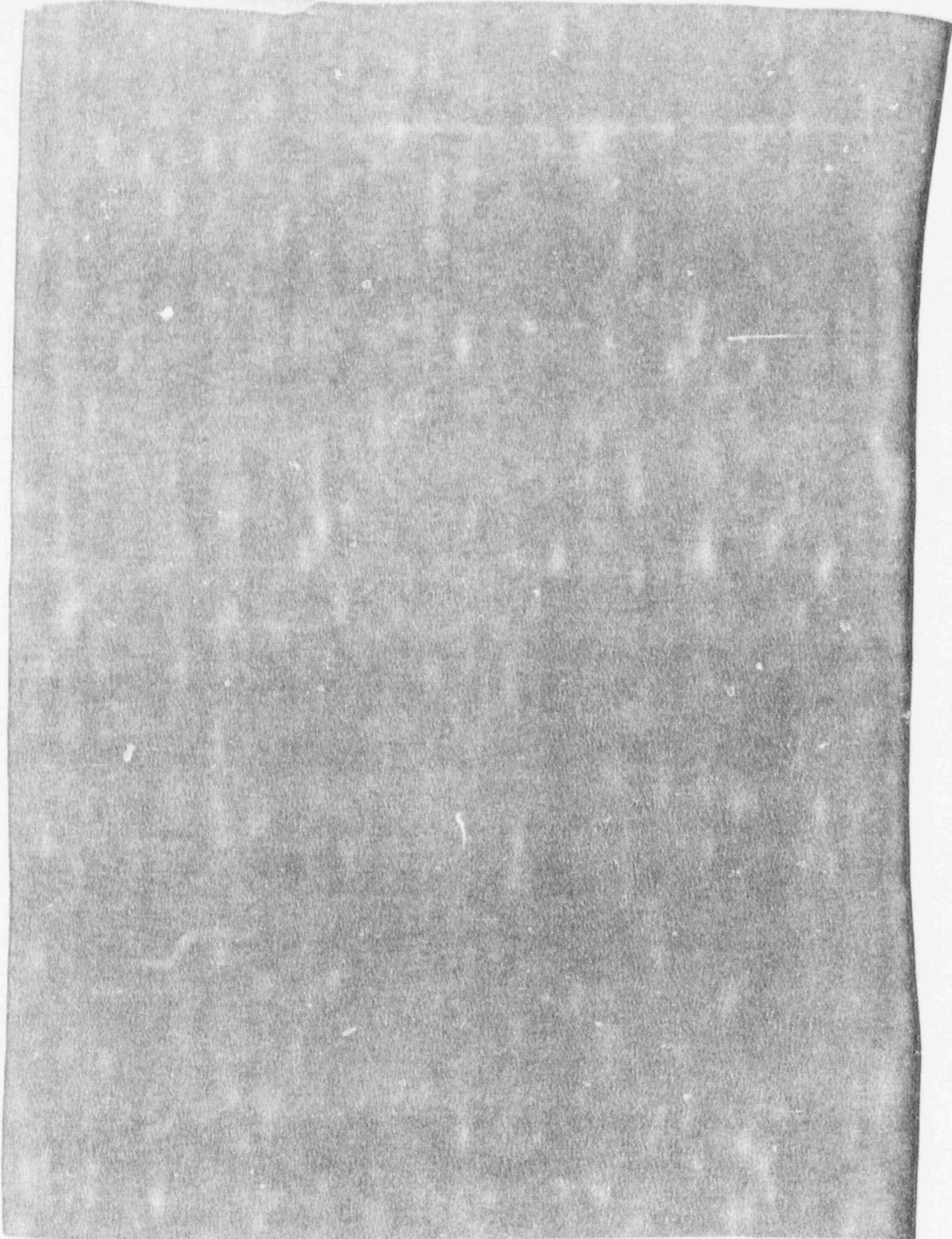


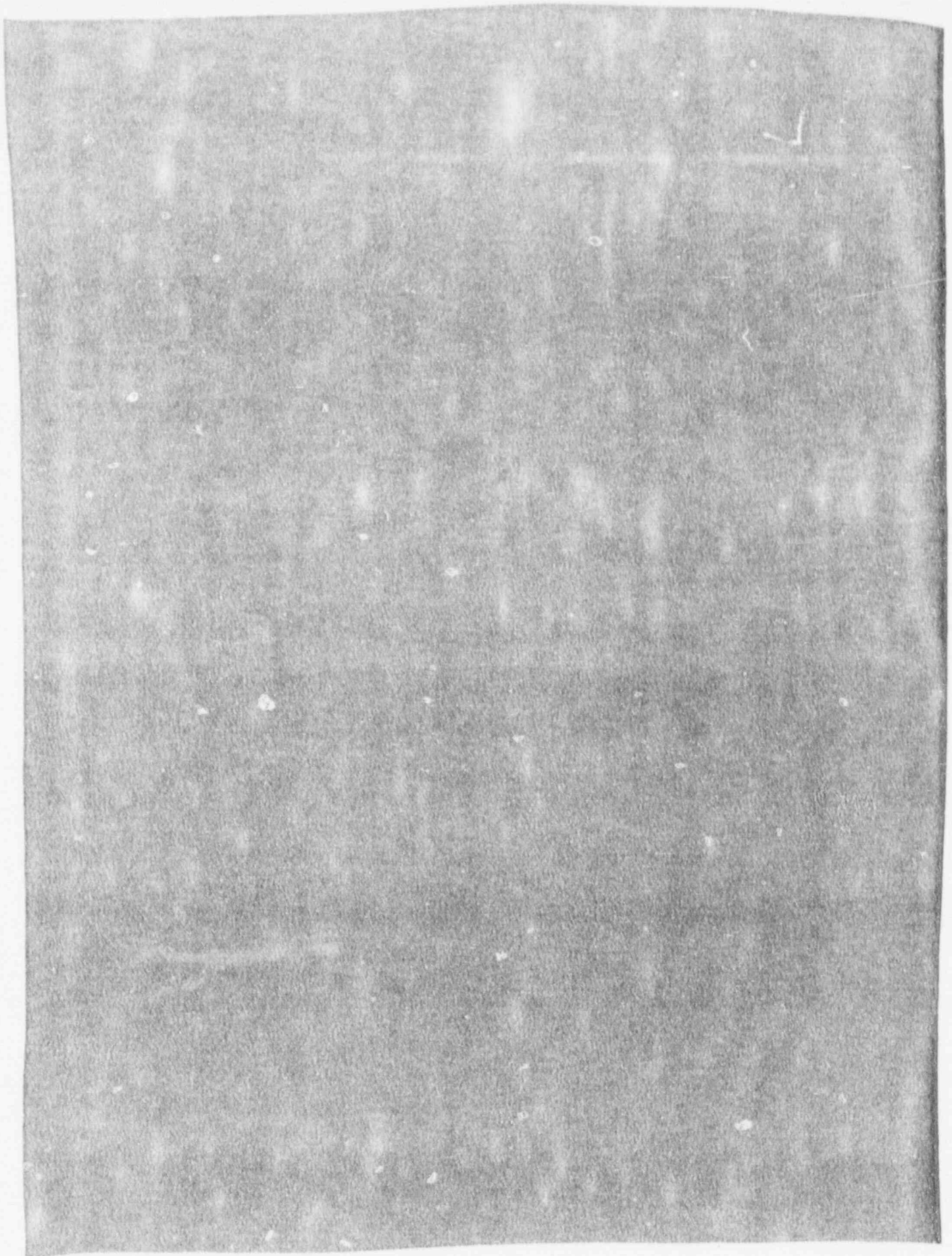


3.4. Approach to the Development of Regulatory Value-Impact Analyses

Regulatory value-impact analyses for rules requiring procedural and administrative changes at licensees require careful and thorough evaluations of costs to licensees, effects on occupational radiation exposures, costs to government entities, and effects on public health and safety. The following subsections discuss our approach for evaluating each of these critical components.

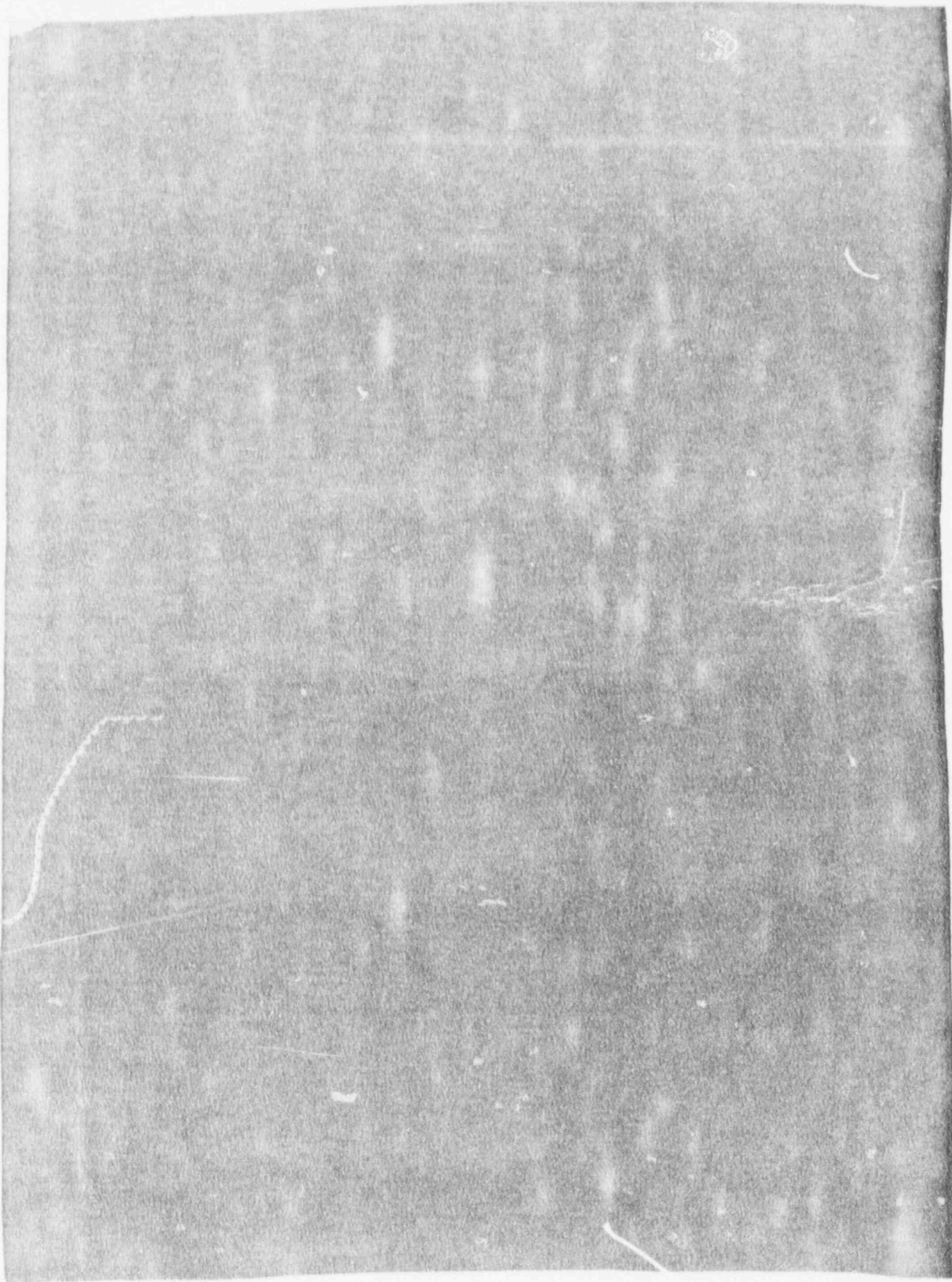






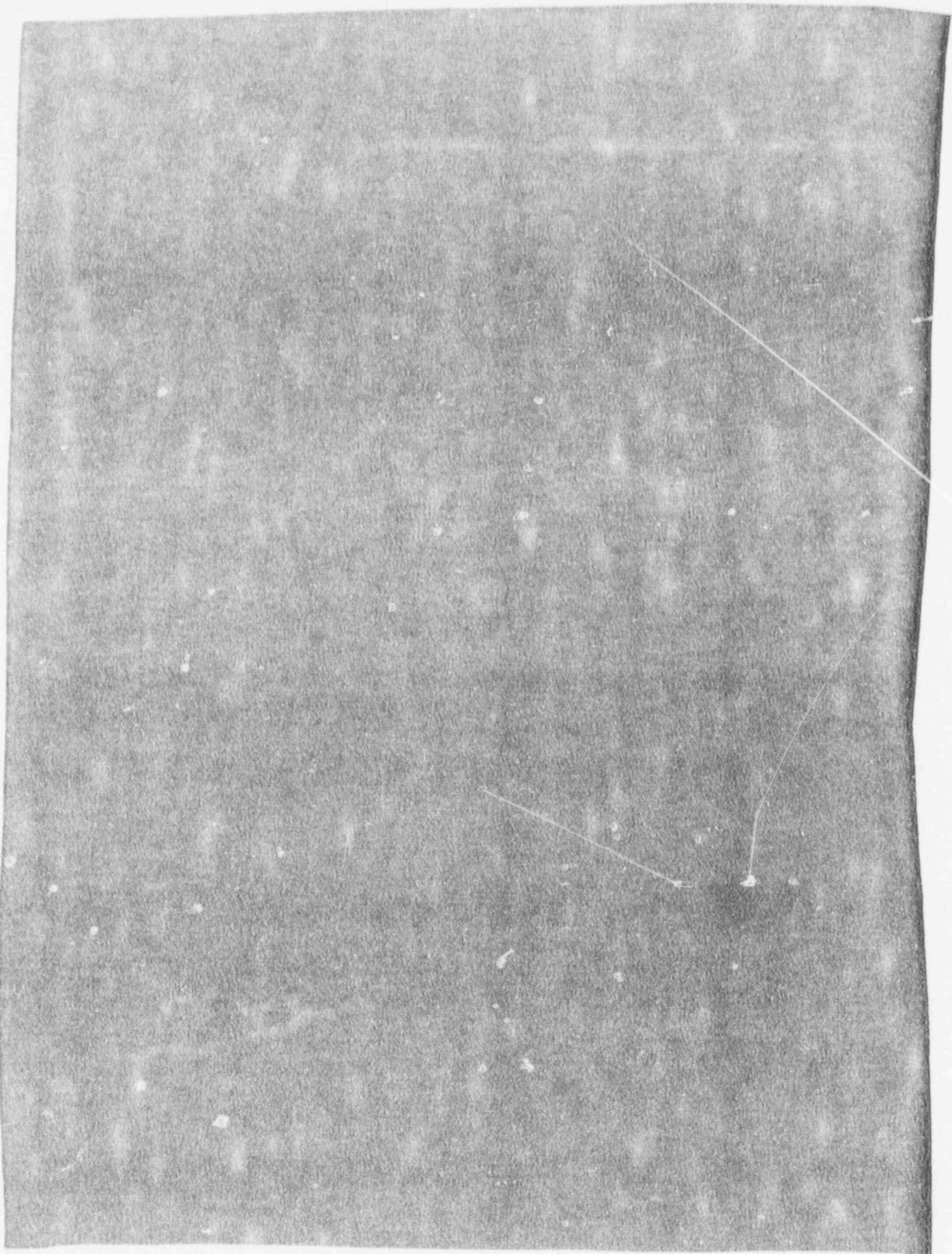
3-21

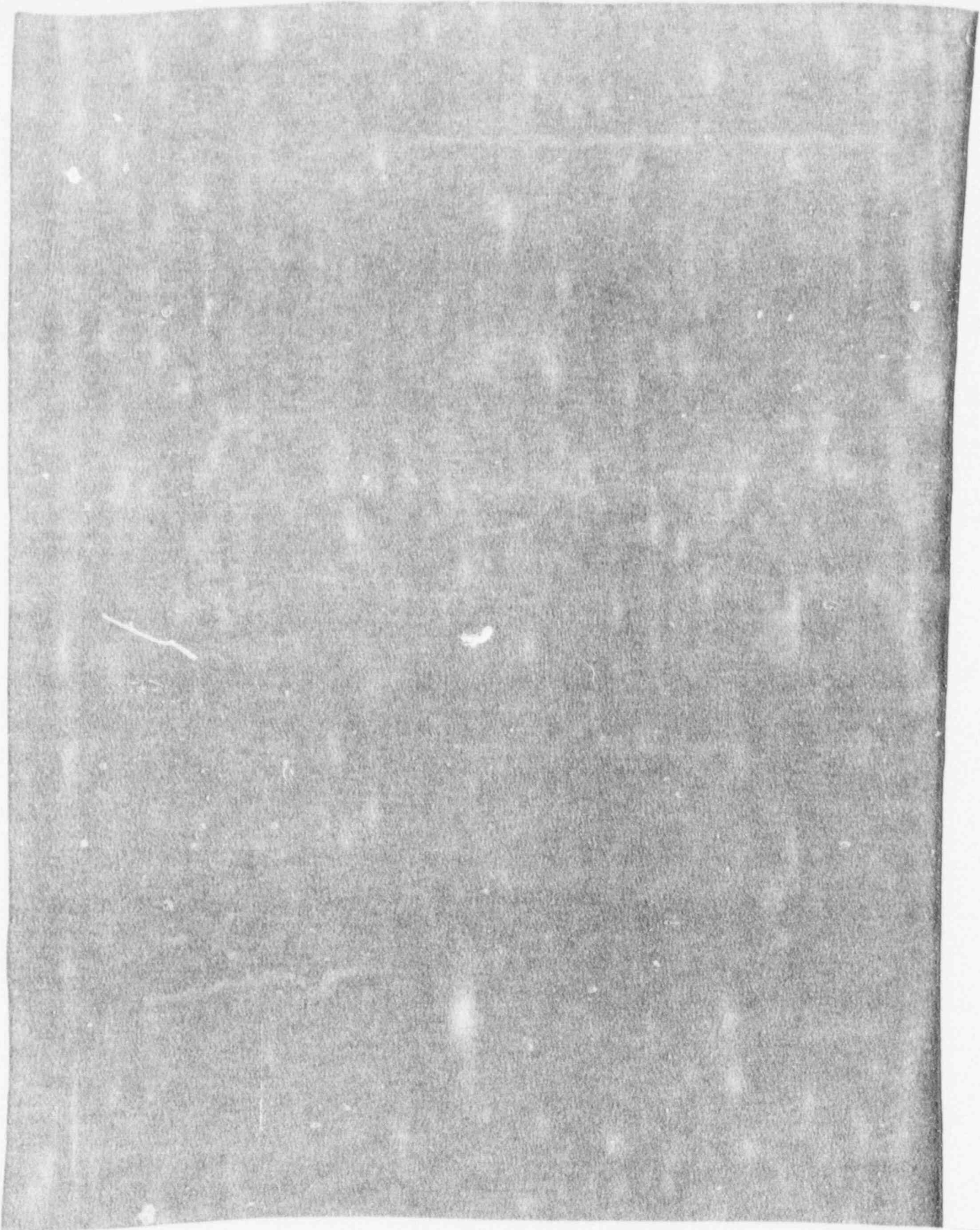
SC&A

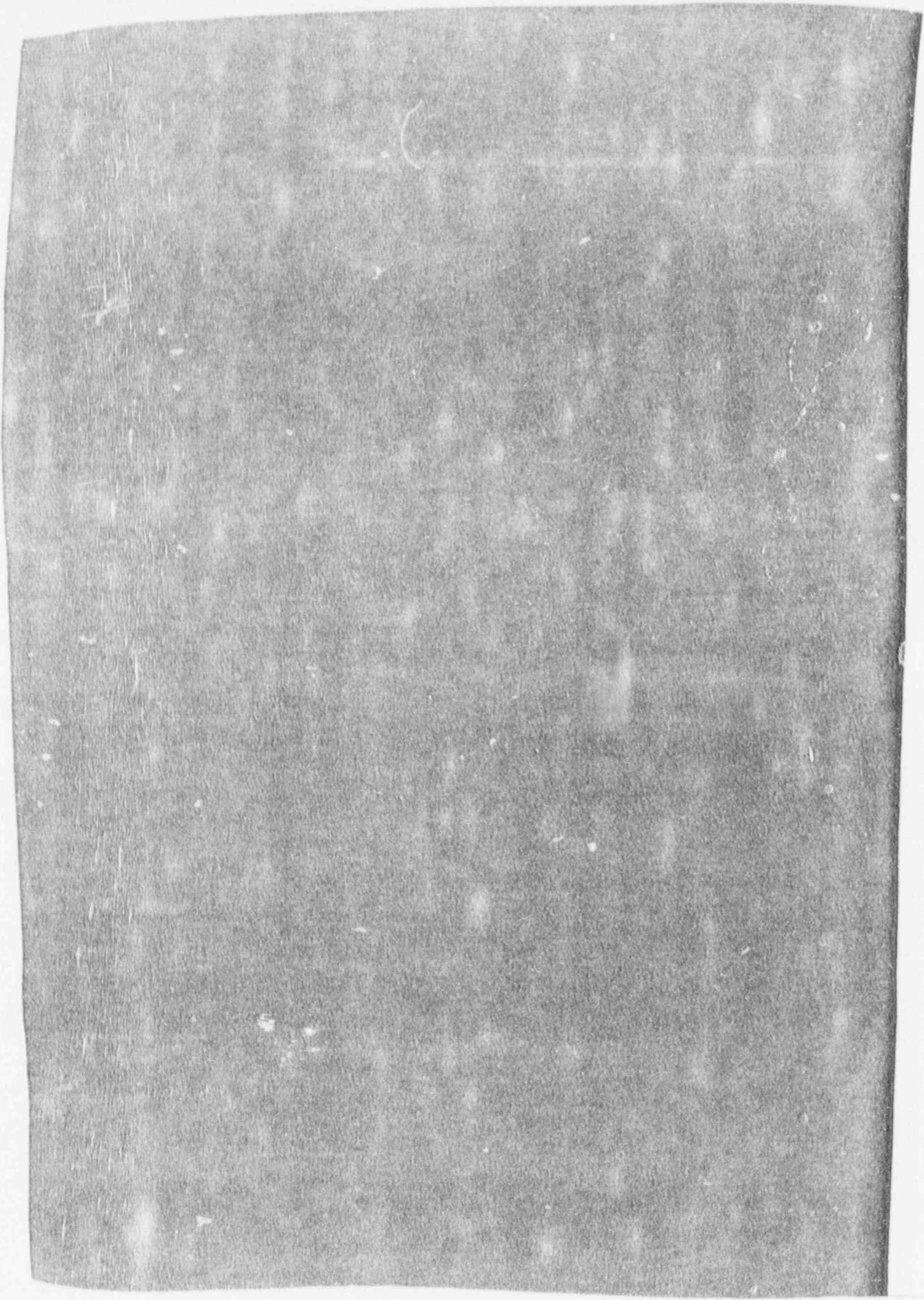


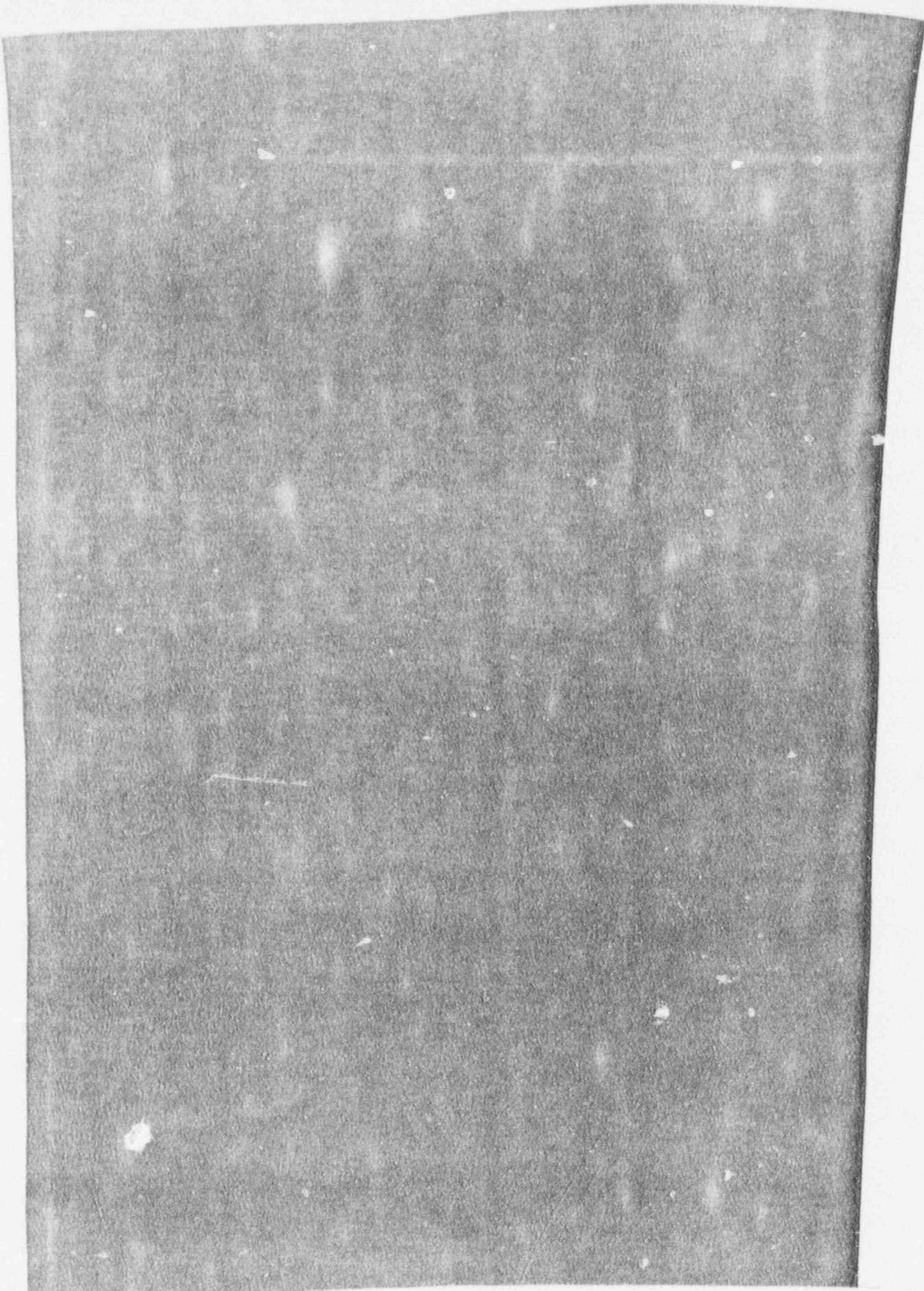
3-22

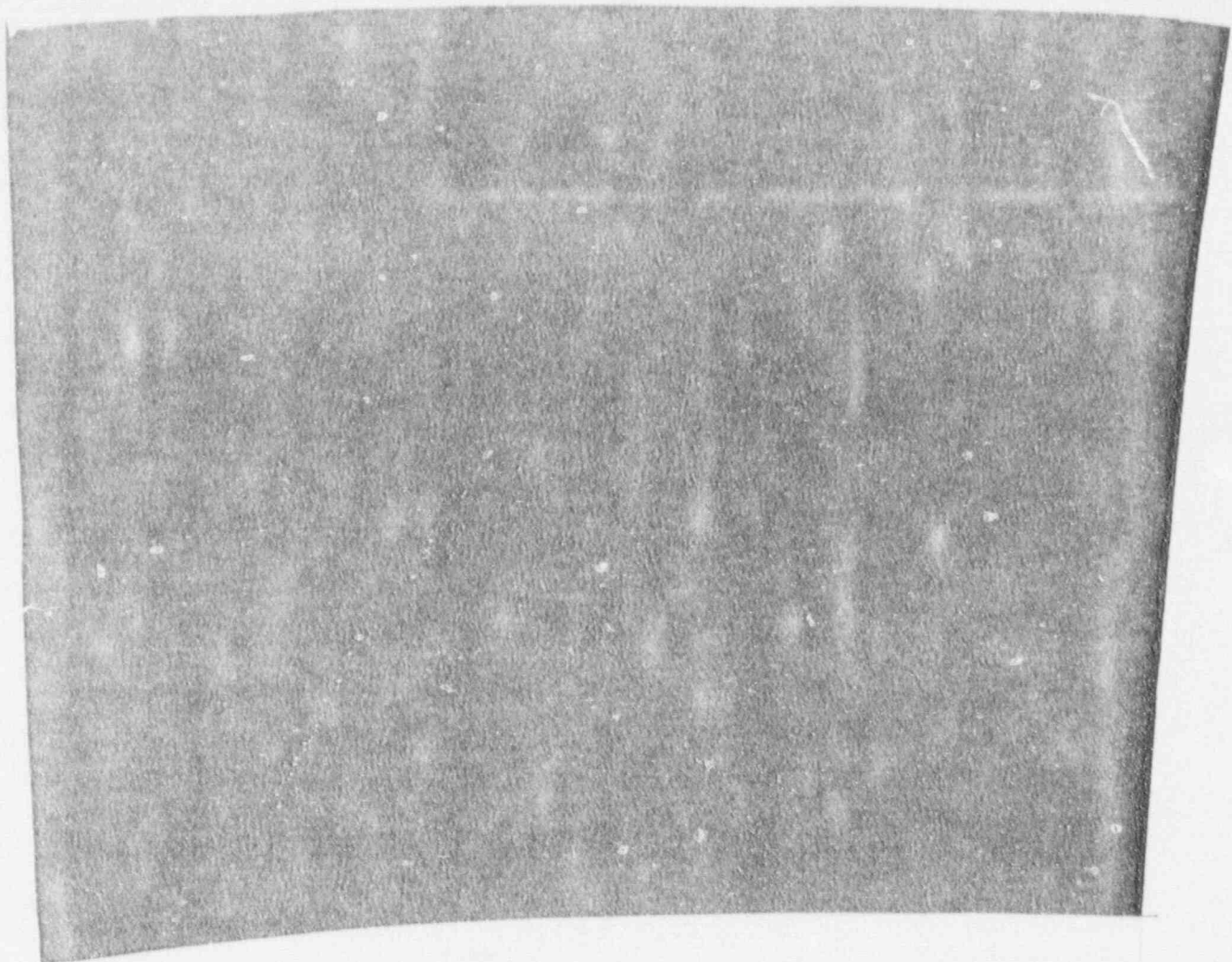
SC&A

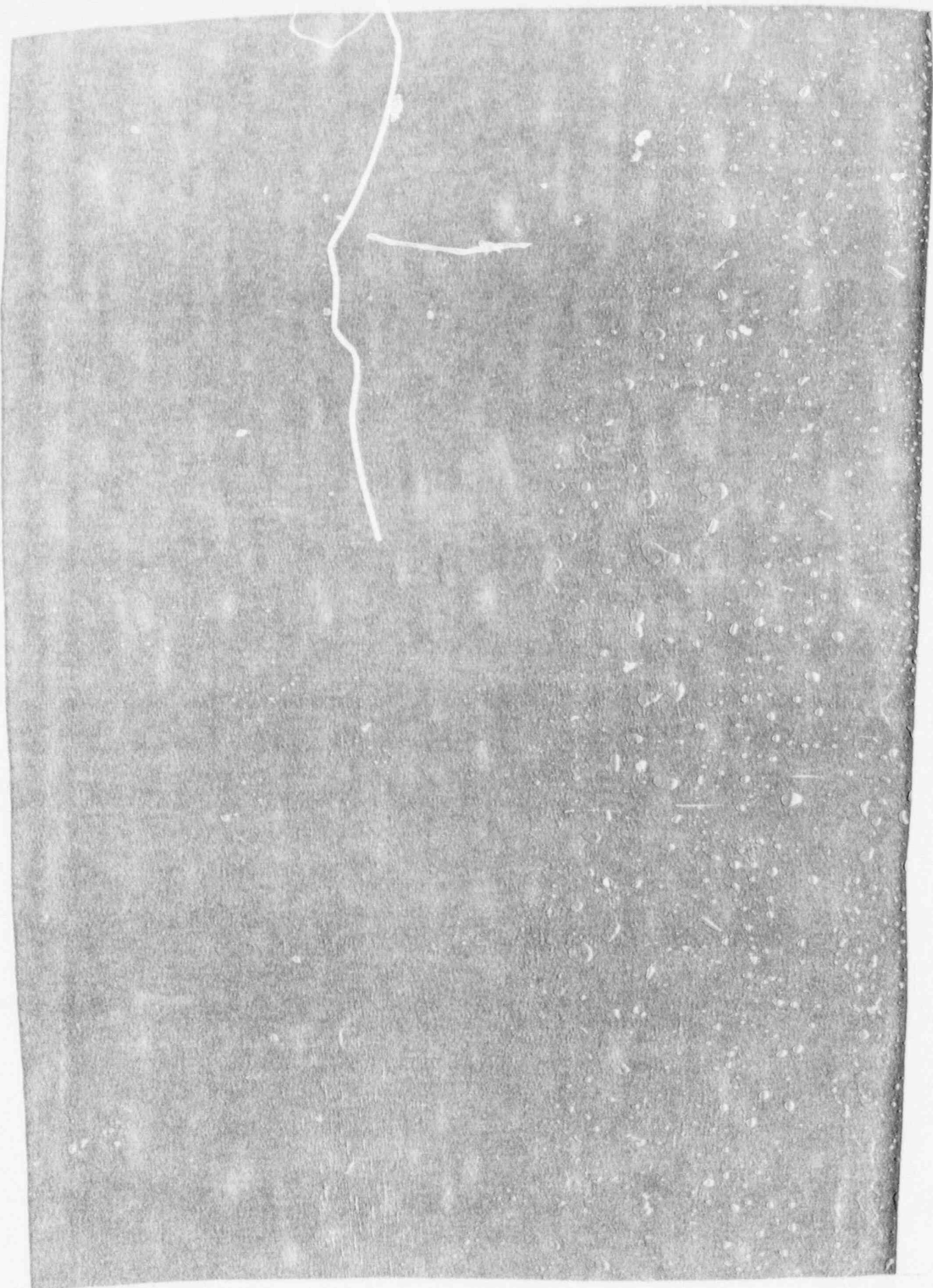


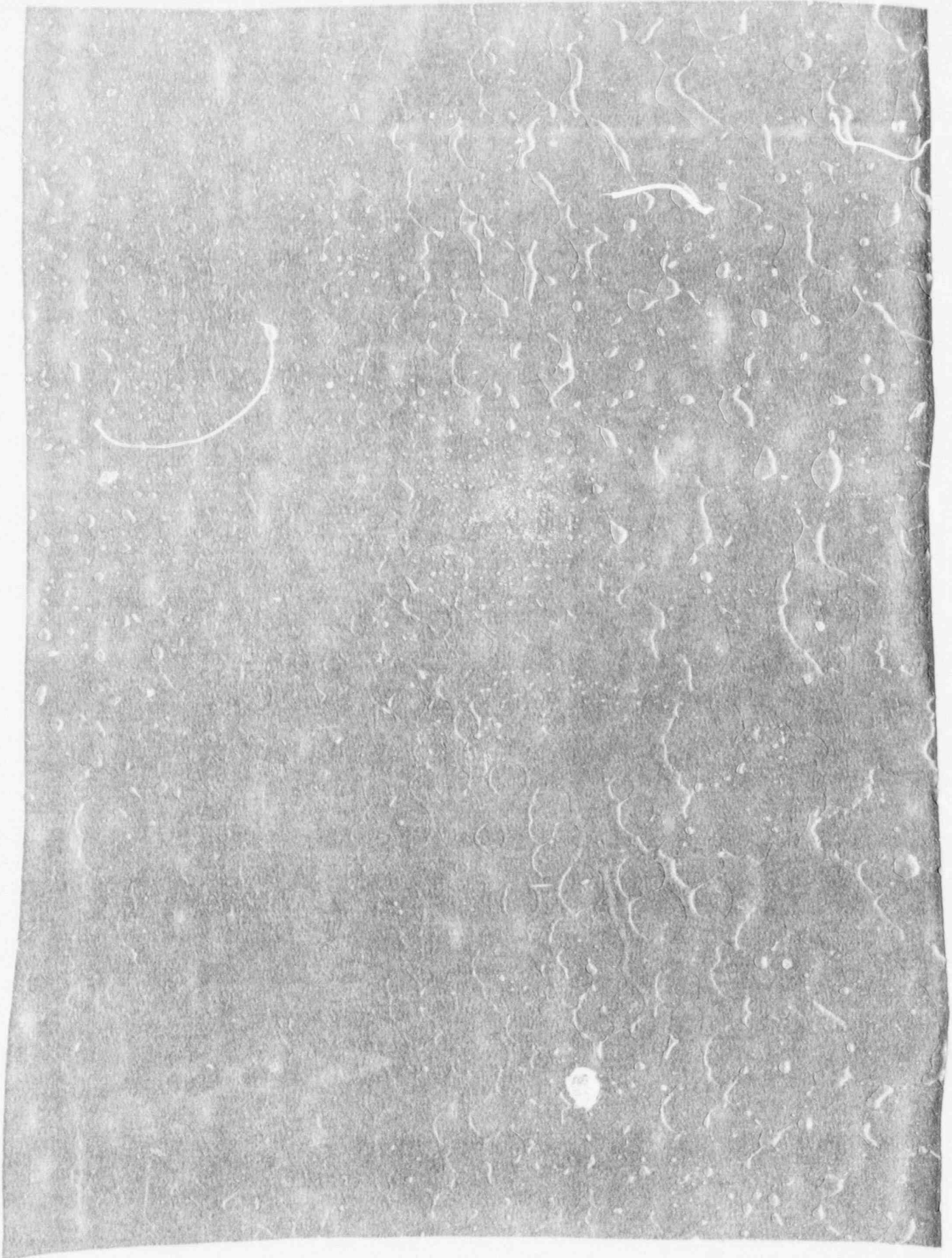








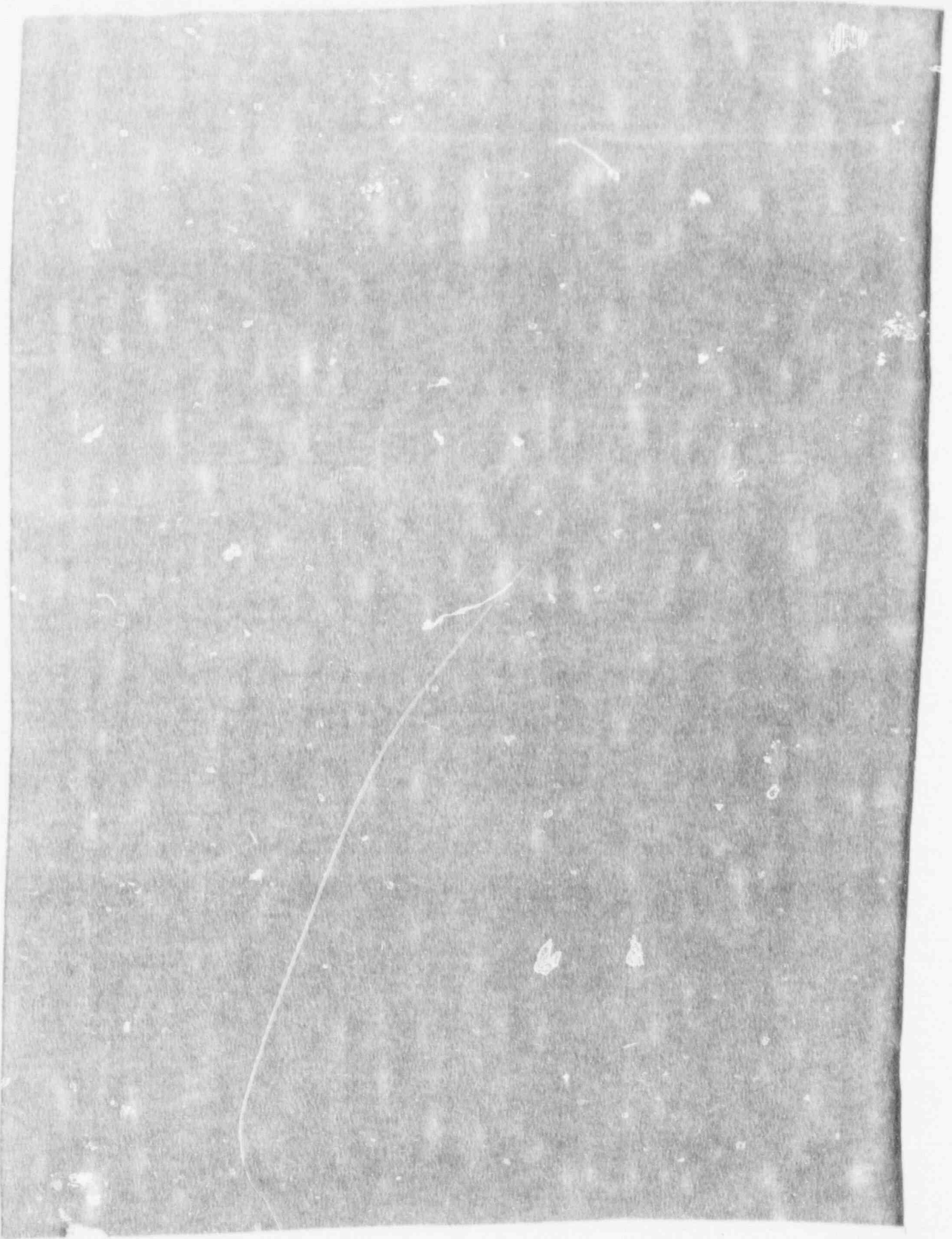


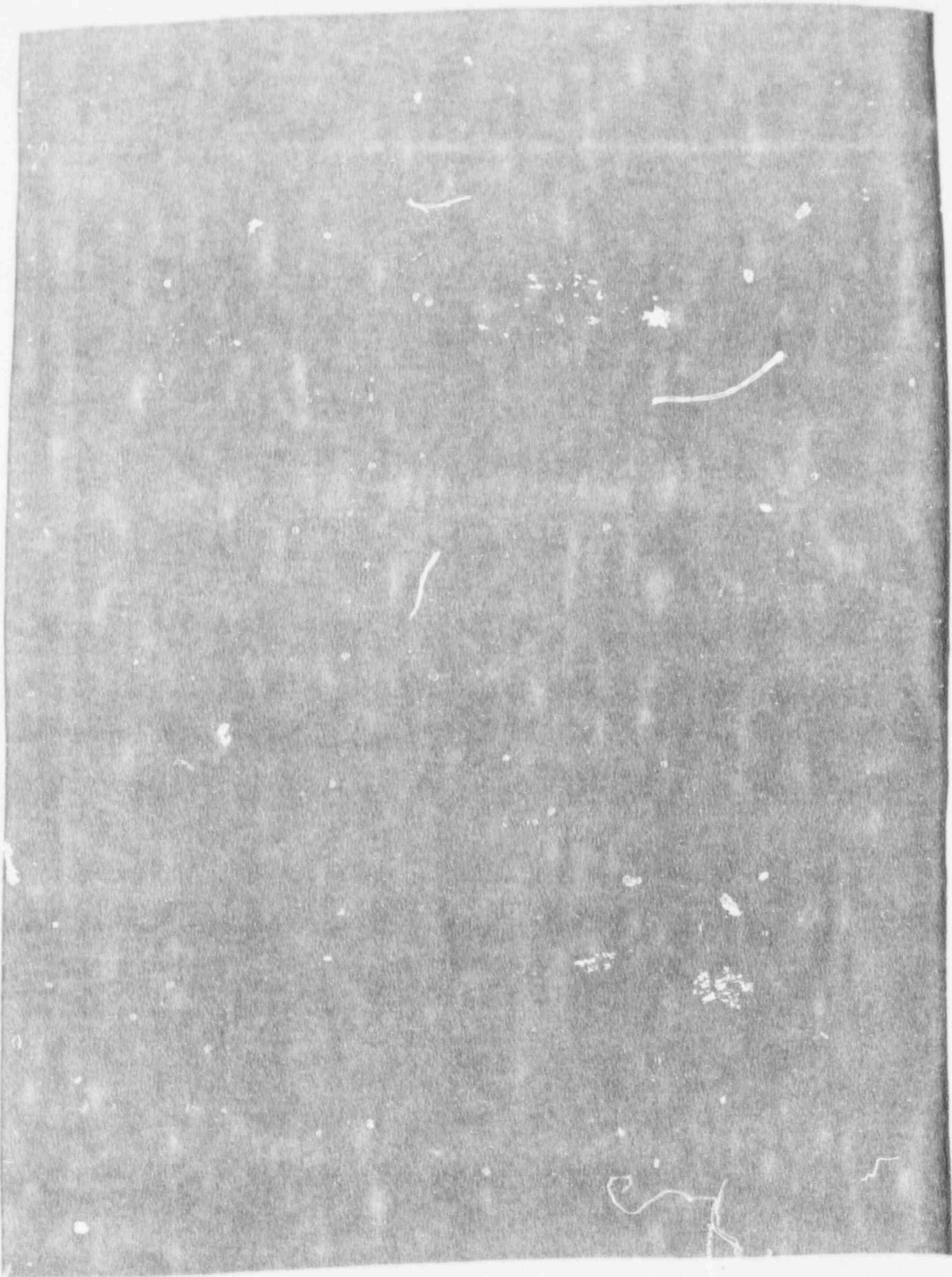


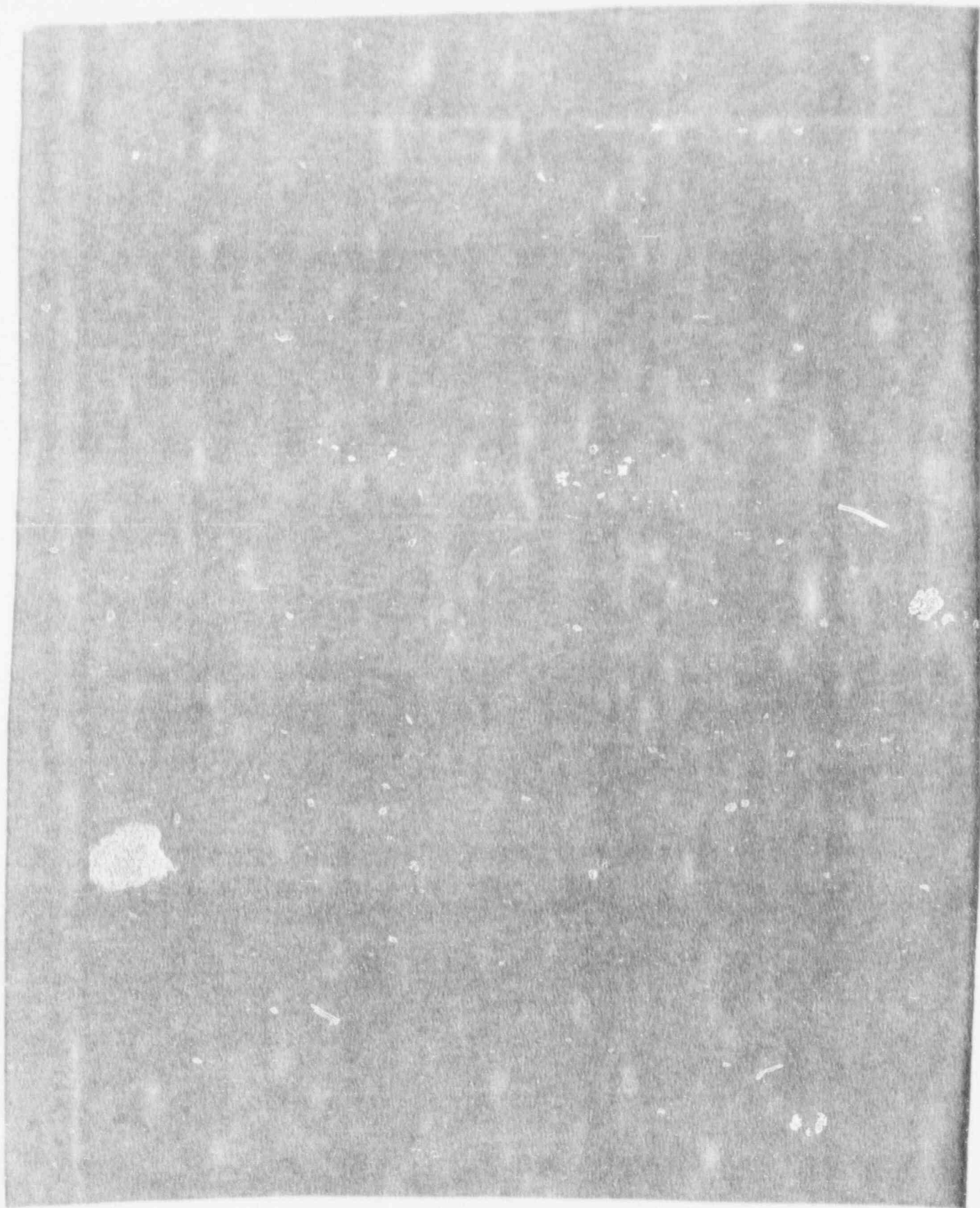


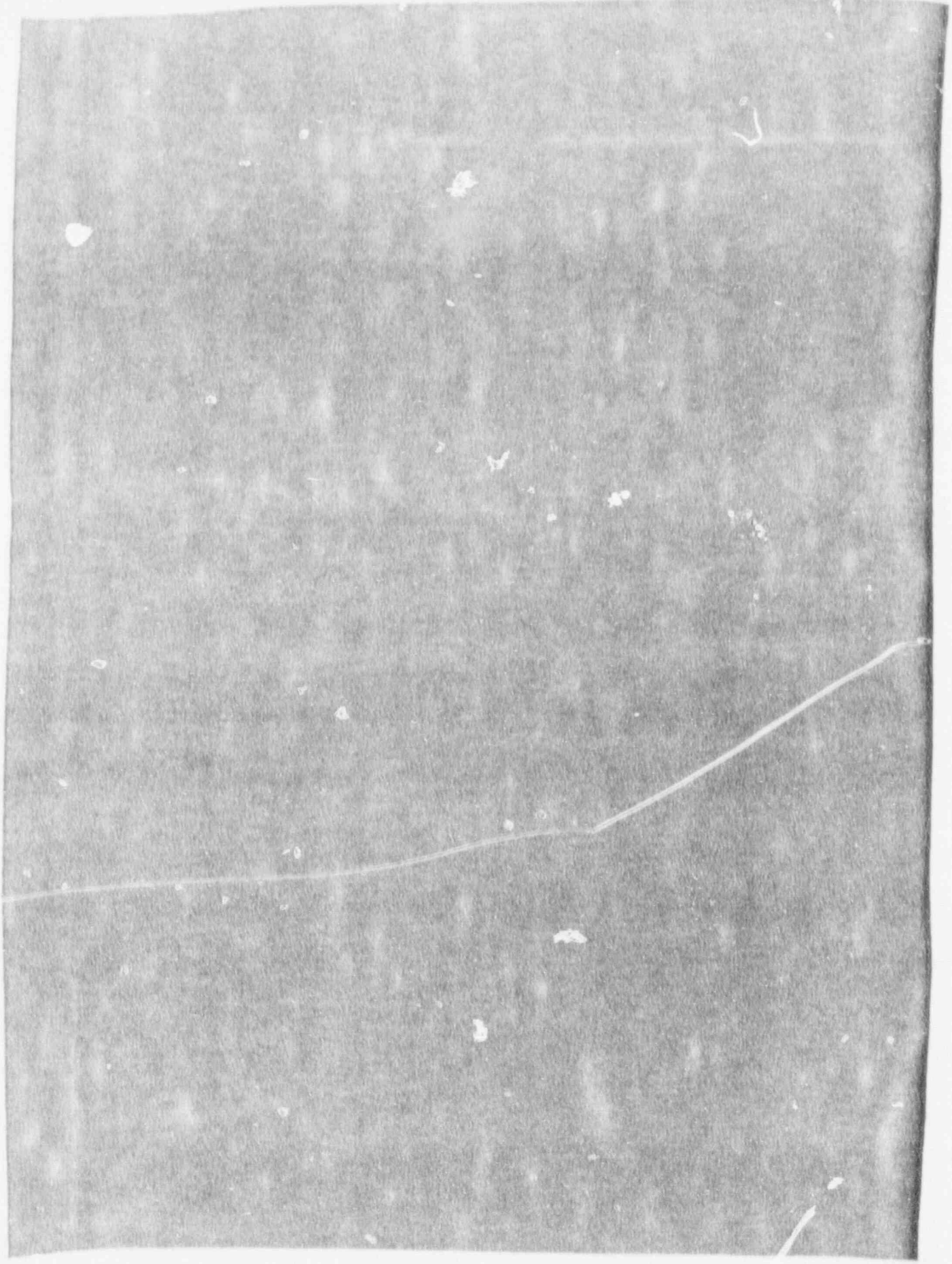
3-30

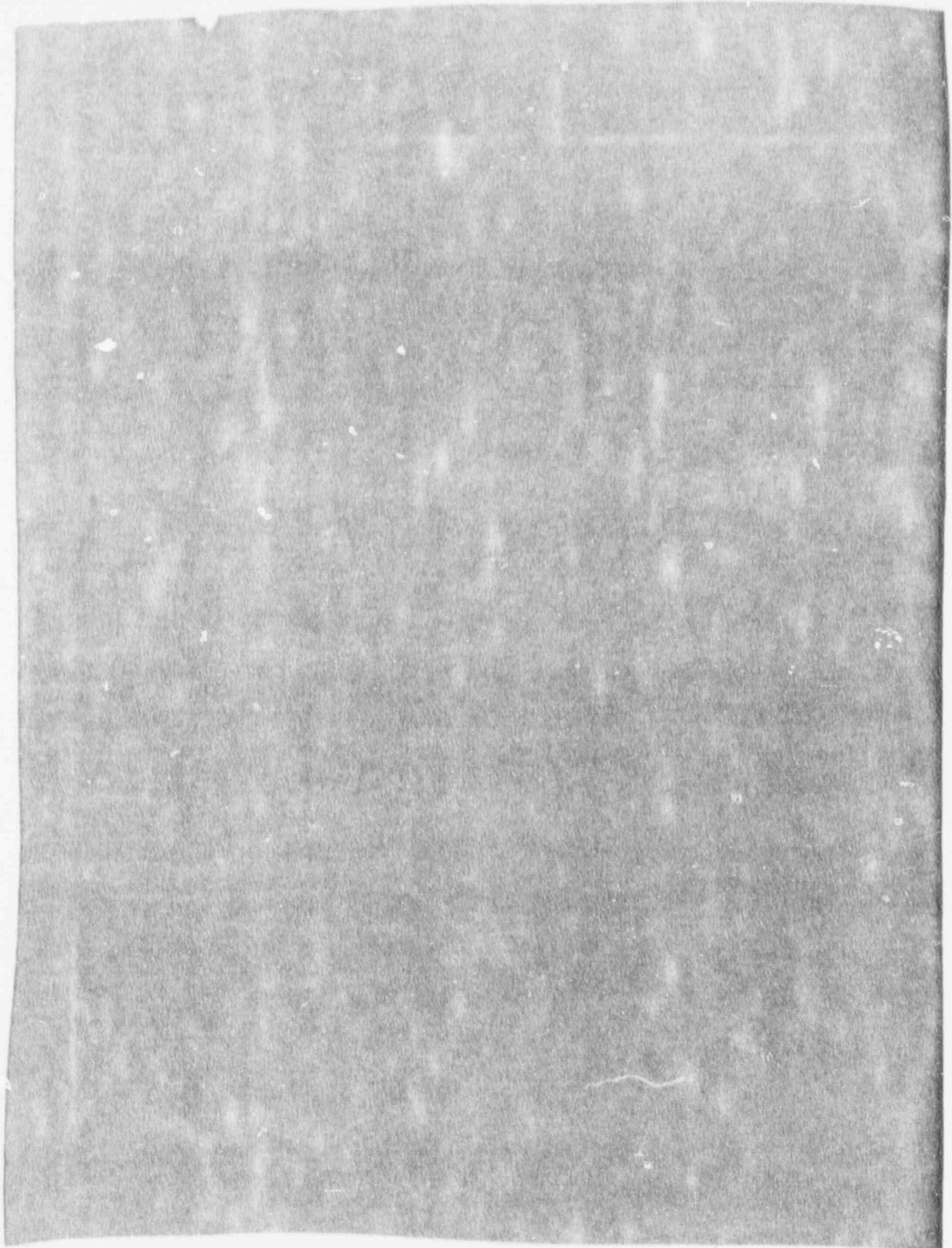
SC&A

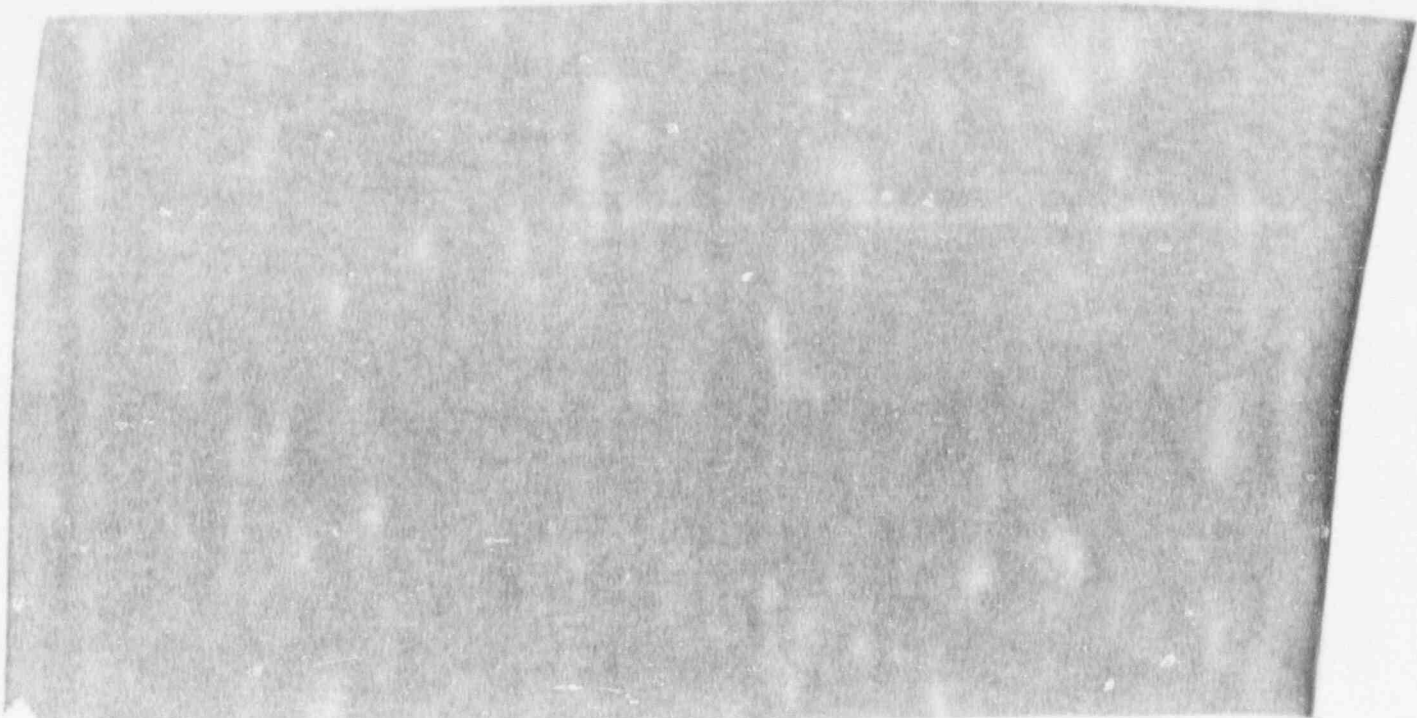












4. INFORMATION AVAILABILITY

The scope of this solicitation will require that the contractor have access to information on economic costs, value-impact methodologies, and risk/consequence assessments to perform the required analyses. The following sections detail our approach for obtaining these types of information.

1.1 Economic Costs

Many of the references for estimating economic costs are given on page 13 of the solicitation. The PNL report, "Handbook of Value-Impact Assessment" (NUREG/CR-3568), is used to scope the value-impact analysis, presenting the elements of the analysis and providing helpful hints for the evaluation of each of the elements. The Argonne reports (NUREG/CR-3971, "A Handbook for Cost Estimating" [written largely by SC&A]) and (NUREG/CR-4568, "Quick Cost Handbook") are useful for identifying potential types of costs (i.e., "functional responses" and cost elements) and for coming up with "rules-of-thumb" for developing cost estimates.

As discussed in the previous section, it is unlikely that the generic methodology for evaluating costs developed by SEA with the assistance of SC&A will be of much utility in evaluating the costs of procedural and administrative changes at nuclear power plants. The first step in applying this methodology is to determine the "greenfield" costs using the EEDB data base. Although the data base is described in NUREG/CR-4764, the data base itself is extensive and comes in two parts - the CONCICE printout and the PEGASUS printout. There is also a commodity list and craft summary. The data base is updated periodically, as long as the funding continues from the DOE (through Oak Ridge National Laboratory). We are in possession of the Phase VIII printout, dated January 1, 1986, for the Model 148 PWR and the Model 205 BWR Mark II. Another volume describes the components and systems given in the data base ("The Technical Reference Book," DOE/NE-0059). In general, the EEDB component framework is at a relatively high degree of aggregation, causing a problem for most realistic applications. For example, the PWR steam generator is a single entry in the data base. However, an SEA document cited in the solicitation, NUREG/CR-5160, gives a procedure for using the EEDB at the sub-component and subsystem level.

The purpose of the labor productivity adjustment factors (NUREG/CR-4546) is to correct these greenfield costs for actual conditions in an operating nuclear power plant - namely, congestion, radiation fields, outage conditions, etc. In practice, the factor which usually has the most significant effect is the radiation field adjustment factor, the formulation of which has recently been modified by SC&A (the results will be presented in an SEA report which is currently being prepared). There is also an engineering and quality assurance cost factor derived by United Engineers & Constructors which should be factored in (NUREG/CR-4921), although this is also not as significant as the radiation field adjustment factor.

In order to derive the radiation field adjustment factor, an estimate of the dose rate is necessary, and a first approximation to this may be obtained from NUREG/CR-5035 ("Data Base of System-Average Dose Rates at Nuclear Power Plants"), which was developed by SC&A. The dose rate obtained from this report (if it is available) must be corrected by an ALARA adjustment factor, which is obtained once the man-rem are derived from the greenfield labor hours and the system-average dose rates. The evaluation is iterative, since the man-hours are dependent on the labor productivity factors, which are dependent on the radiation fields, which are dependent on the ALARA correction, etc. In general, the ALARA correction is small.

If the regulatory action results in a plant shutdown, the cost of replacement power dominates. Estimates of this may be obtained from the Argonne National Laboratory work, summarized in NUREG/CR-4012 ("Replacement Energy Costs for Nuclear Electricity-Generating Units in the United States: 1987-1991").

The cost of waste disposal has been summarized in NUREG/CR-4555 ("Generic Cost Estimates for the Disposal of Radioactive Wastes"), developed by SEA with the assistance of SC&A.

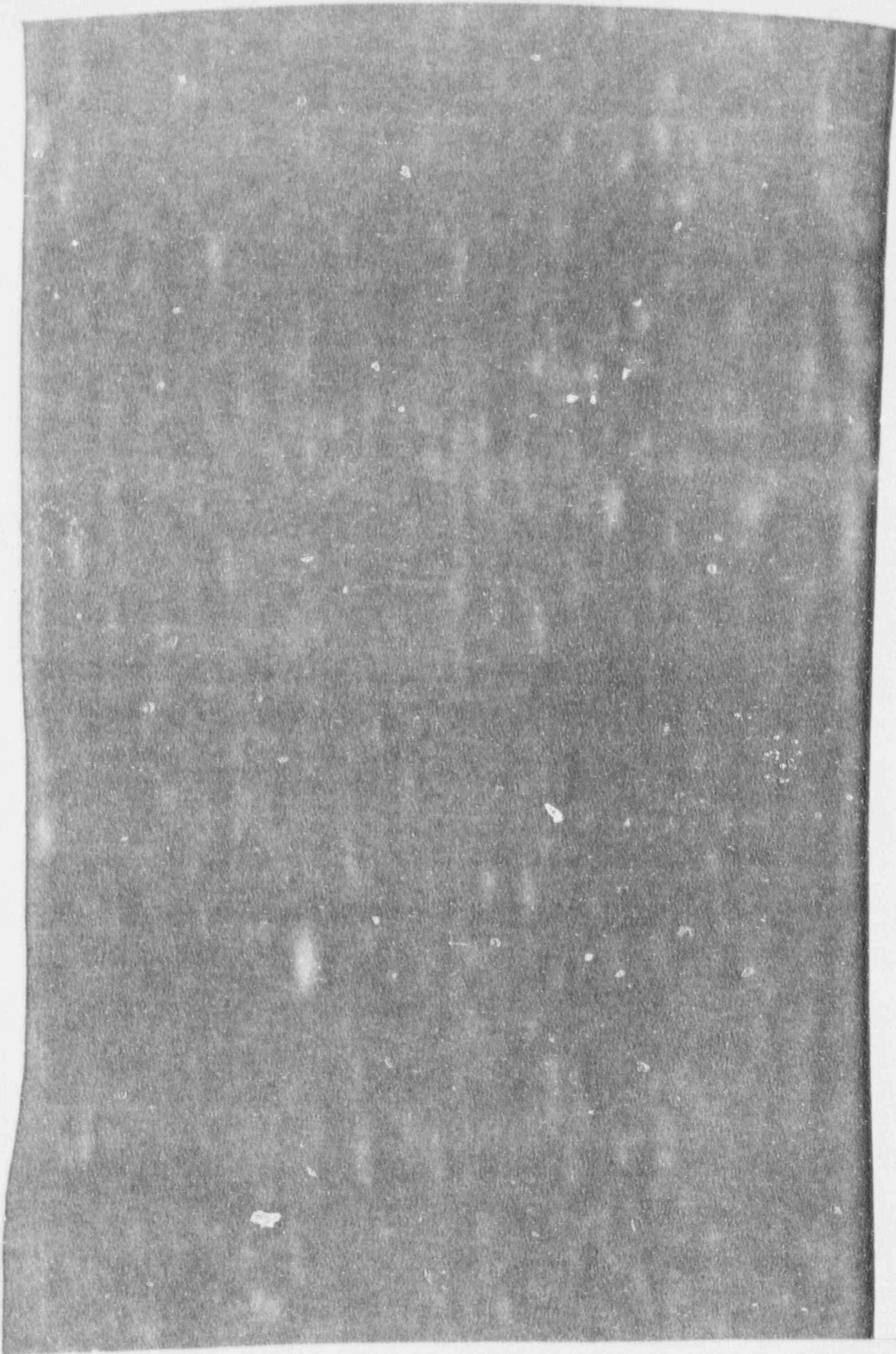
The above methodology has been, in part, validated using actual cost data provided by the utilities. The validation is described in NUREG/CR-5138 ("Validation of Generic Cost Estimates for Construction-Related Activities at Nuclear Power Plants"). However, relevant data for such validations are very difficult to obtain, and the validation process itself contains a number of

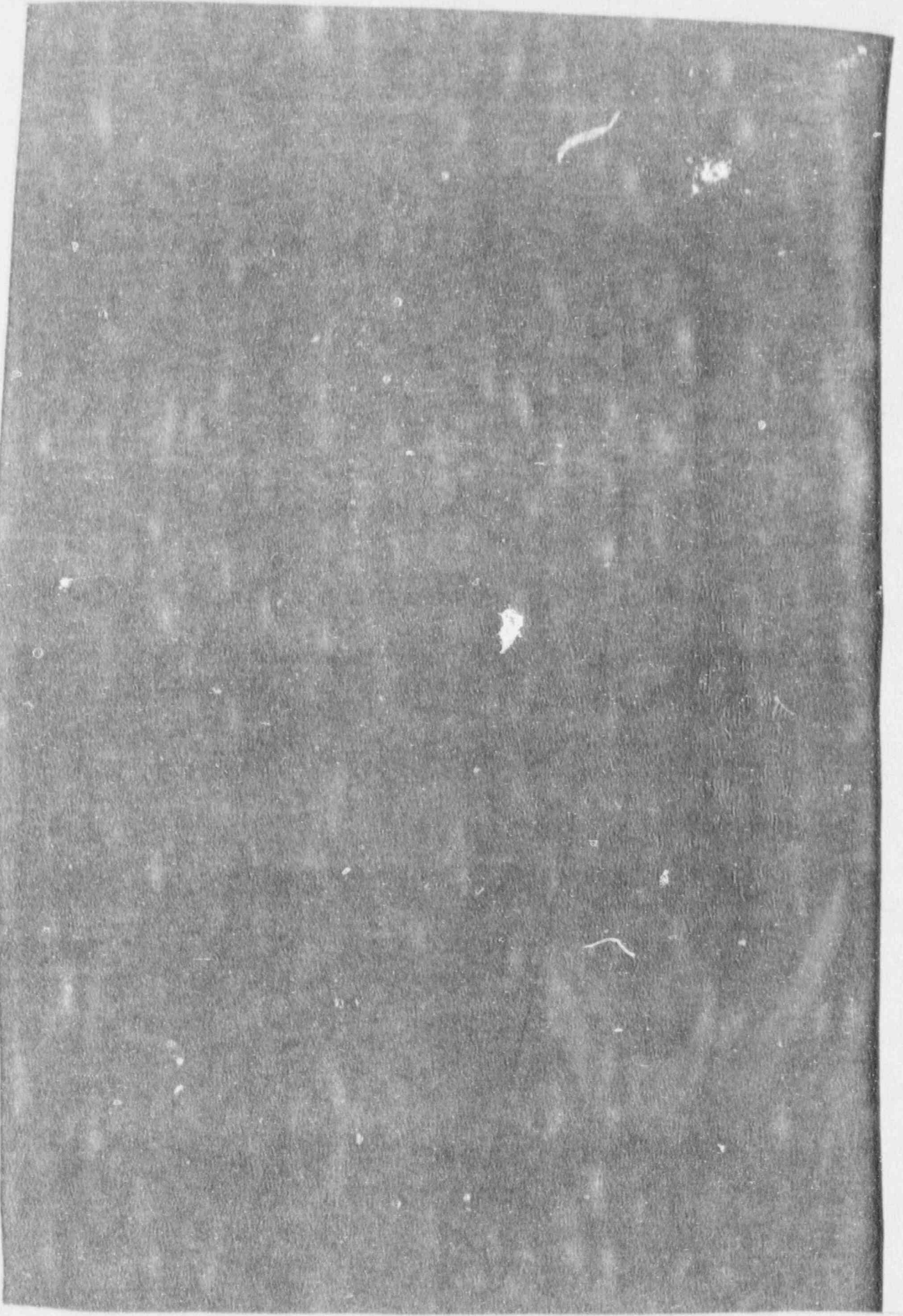
uncertainties. Therefore, additional work must be performed in order to unambiguously validate the methodology.

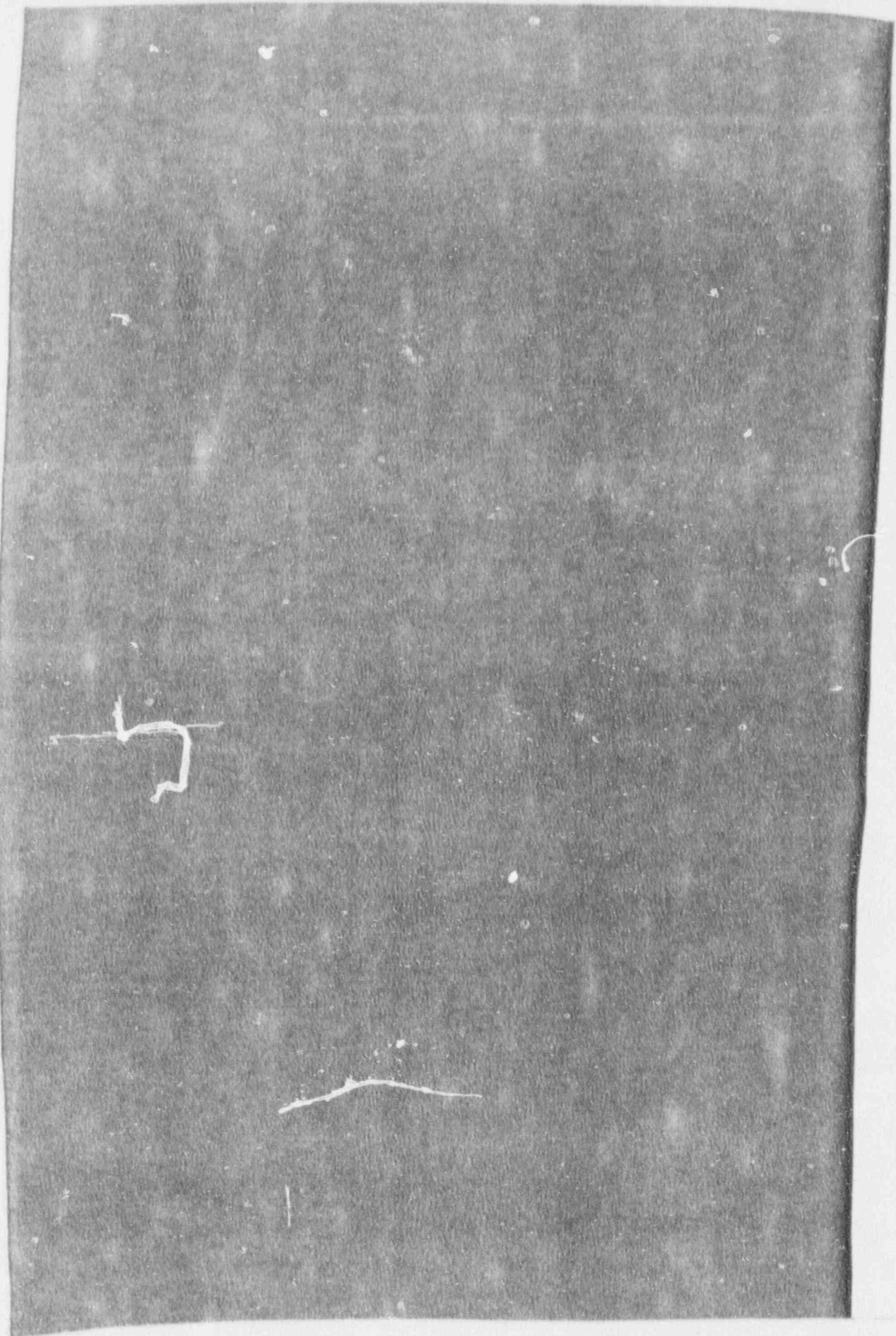
A useful compilation of generic cost estimates is contained in NUREG/CR-4627 ("Abstracts from Generic Studies for Use in Preparing Regulatory Impact Analyses"). Some of the abstracts contained in this document are summaries of task-specific cost estimates (i.e., steam generator repairs, centrifugal pump shaft seal replacement costs); others are summaries of costs associated with physical modifications (i.e., reactor shutdown and startup costs, radioactive waste disposal costs, etc.), and others are summaries of costs associated with procedural and administrative changes (i.e., writing or rewriting procedures, training or retraining staff, etc.). As described in the previous section, these cost estimates for procedural and administrative changes must be used with caution when the procedural and administrative changes are the dominant costs in the overall value-impact assessment (precisely the case addressed by this solicitation). Accordingly, the generic cost estimates contained in NUREG/CR-4627 are not likely to be adopted without reservation in any cost evaluations performed under the contract awarded as a result of this solicitation.

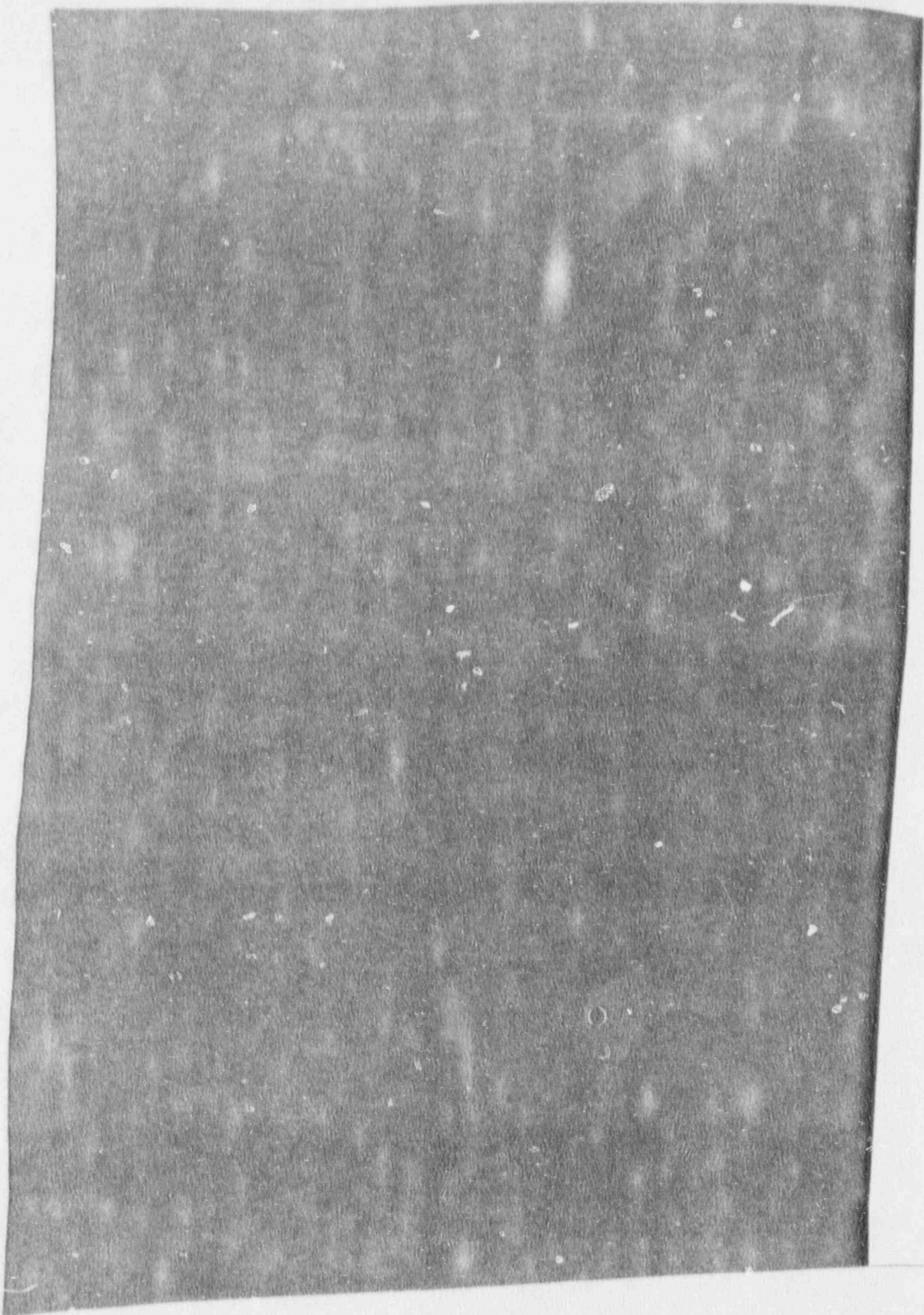
Therefore, as discussed in the previous section, our experience suggests that accurate estimates of the costs of procedural and administrative changes to plants can only be obtained through carefully-considered discussions with utility personnel. A list of our utility contacts is given in Table 4-1. However, before these contacts are made, there are important data in the open literature that can be used to channel our efforts more efficiently.

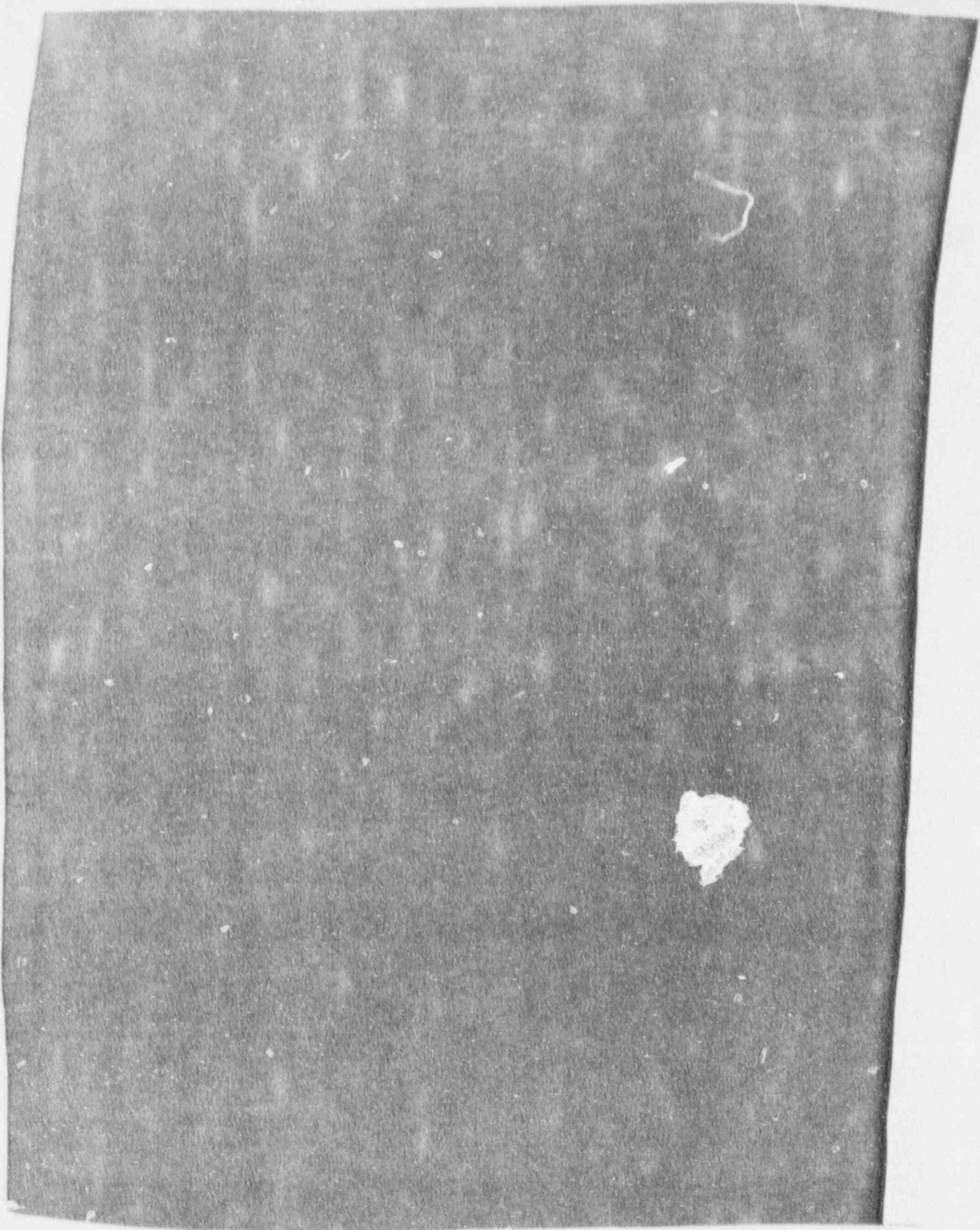
For example, Utility Data Institute publishes annually a report giving U.S. nuclear power plant statistics. This document gives the current status of U.S. nuclear plants, the ownership, the current cost data for plants under construction, the performance data for the previous year, the operating expenses for the previous year, the current capitalization of the operating nuclear plants, and the total megawatt-hours generated for the previous year. The 1988 report, published in July, has the number UDI-014-88.











Nuclear News also publishes periodically vital statistics of nuclear plants. In addition to the World List published annually, Study No. 6 gives "\$ Facts About The On-Line U.S. Nuclear Power Plant Market." This contains the actual O&M expenditures for each unit for the previous year, and the dollars spent in 33 equipment and service categories.

We subscribe to *Nucleonics Week*, which publishes weekly the kilowatt-hour generating statistics for each unit in the world. We also subscribe to the so-called NRC "gray book" (NUREG-0020, "Licensed Operating Reactors"), which gives a monthly status report of each operating reactor, including the facility description (A-E, constructor, NSSS supplier, etc.), the inspection summary, and complete operating statistics for the previous month (i.e., gross electrical generation, hours critical, availability factor, capacity factor, etc.). In addition, we subscribe to the quarterly "Report to Congress on Abnormal Occurrences" (NUREG-0090).

Another useful subscription service is the NRC Rules and Regulations, which gives monthly updates of amendments to the actual rules, proposed rulemakings, petitions for rulemaking, statements of consideration. We also subscribe to the update of the Regulatory Guides.

We have found a volume developed by the Tennessee Valley Authority Division of Engineering Design, "Cost Estimating Guide," to be very helpful in much of our cost estimating work. This document provides man-hour estimates for various design activities (civil design, electrical design, and mechanical design), and estimates for the design overhead used by this large utility. Estimates are also given for contingencies, design-construction ratios, contract administration, and escalation.

Another useful reference is the "Cost Engineers' Notebook," provided free-of-charge to members of the American Association of Cost Engineers. This extensive compendium contains sections on capital cost estimating, capital cost control, computer applications, operating/manufacturing costs, profitability, and cost of major equipment. However, the most useful section is the one that contains cost indices (i.e., buildings, general construction, plant construction and equipment, construction materials, wages & employment,

construction equipment, commodity prices, labor output, plant maintenance, transportation, and a comparison of building cost indexes).

The engineering cost books published by the R.S. Means Company are essential references for cost estimators. We have used two of these in our work, Assemblies Cost Data, 12th Ed., 1987, and Facilities Cost Data, 12th Ed., 1987. The Handy-Whitman Index of Electric Utility Construction Cost, published by Whitman, Reguardt and Associates, is also an important source of information for estimating costs associated with nuclear power plant construction. This document is published semi-annually, and contains cost information for specific items of equipment. Other handbooks with useful cost information include the Dodge Data Series and the General Construction Estimating Standards published by Richardson Services.

The periodical, Electrical World, also publishes from time to time cost information which may be useful in this work for the NRC. For example, engineering salaries are periodically reviewed by experience level, engineering discipline, and job function. Utility executive salaries are also periodically reviewed. All components of generating costs are also periodically evaluated and analyzed. The Bureau of Labor Statistics Indices also provide salary statistics and escalation factors. Construction cost indices are contained in the Engineering News Record Construction Index.

Another periodical that contains useful cost information is Power Engineering. This publication puts out "A Data Base for U.S. Power Plants," that contains the costs of estimated bulk commodities, the average craft man-hours to build nuclear units by geographical area of the country, and the annual percent increase in the craft man-hours. It also gives the man-hours for the installation of structural materials and piping, and electrical materials, for BWRs and PWRs. Power Engineering also publishes from time-to-time useful algorithms for cost estimating; for example, in the article "Nomogram Simplifies Use of Cost Scaling Factors," scaling factors for the installation of pumps, motors, transformers, tanks, and heaters are given for various sizes. Other periodicals with potentially applicable information include Nuclear Energy, Nuclear Engineering International, and Nuclear Safety.

The DOE Energy Information Administration also publishes useful cost data relating to nuclear power plants. Two of the most recent of these are DOE/EIA-0485 ("An Analysis of Nuclear Power Plant Construction Costs") and DOE/EIA-0511 ("An Analysis of Nuclear Power Plant Operating Costs").

In the private sector, United Engineers & Constructors has performed some of the most useful work in support of nuclear power plant construction costs. In addition to the EEDB data base, described above, a number of unpublished studies have been performed by UE&C in support of the DOE Assistant Secretary for Nuclear Energy. For example, "Nuclear Power Plant Cost Drivers" contains breakdowns for material costs for light water reactors, piping and electrical commodity costs, structural costs, cable costs, and conduit costs.

For many of our tasks for the NRC under subcontract with SEA, we have performed searches of the materials contained in the Public Document Room (PDR) now located at 2120 L Street, N.W. in Washington, D.C. Although we are capable of searching the index of documents from our PCs, we have found the staff in the PDR to be available and extremely skillful in locating information through the computerized index system. Therefore, we have always relied on their assistance and will continue to do so until we find that they are overloaded.

We have found our Washington metropolitan area location to be beneficial to searches in the PDR for information relevant to NRC cost evaluations. Although much useful regulatory information has been identified for tasks under the SEA subcontract, cost information itself appears to be very limited in the PDR.

The Safety Analysis Reports, Environmental Reports, and Environmental Statements related to each specific nuclear power plant may have useful information for specific cost evaluations potentially required under the proposed contract. These are located in the relevant dockets maintained in the PDR.

The Electric Power Research Institute has also sponsored a number of studies resulting in published reports containing cost data pertinent to the proposed

effort. We found this source of information to be particularly helpful in the evaluation of costs relating to low-level waste disposal (NUREG/CR-4555).

SC&A has performed a number of studies relating to occupational radiation exposure which may be helpful in estimating occupational exposures under tasks that may be issued under the proposed work. These include AIF/NESP-033 ("Occupational Radiation Exposure Implications of NRC-Initiated Multi-Plant Actions"), AIF/NESP-028 ("Characterization of the Temporary Radiation Work Force at U.S. Nuclear Power Plants"), and AIF/NESP-039 ("Estimating Collective Dose in Nuclear Facilities, With Emphasis on the Design Process"). Other useful studies are NUREG/CR-4160 ("Historical Summary of Occupational Radiation Exposure Experience at U.S. Commercial Nuclear Power Plants") and NUREG/CR-4524 ("Occupational Dose Reduction and ALARA at Nuclear Power Plants: Study on High-Dose Jobs, Radwaste Handling, and ALARA Incentives"). Of course, we will use NUREG/CR-5035 ("Data Base of System-Average Dose Rates at Nuclear Power Plants"), which SC&A prepared for the NRC under subcontract with SEA, to the extent practicable. For other sources of exposure information, we will refer to the ongoing Brookhaven bibliographic effort for the NRC, NUREG/CR-4409 ("Data Base on Dose Reduction Research Projects for Nuclear Power Plants").

4.2 Cost-Benefit

As noted above, the PNL report, "Handbook of Value-Impact Assessment" (NUREG/CR-3568) used to scope the value impact analysis, presents the elements of the cost-benefits analysis and provides helpful hints for the evaluation of each of the elements. The following sections list references and sources of information available in-house to our economics subcontractor, Jack Faucett Associates.

4.2.1 Economic Theory

Wilson, Richard and Edmund Crouch, Risk/Benefit Analysis, Ballinger Publishing Company, Cambridge, MA, 1982.

Thompson, Mark S., Benefit-Cost Analysis for Program Evaluation, Sage Publications, Beverly Hills, 1980.

Musgrave, Richard A. and Peggy B. Musgrave, Public Finance in Theory and Practice, 2nd Edition, McGraw-Hill Book Company, New York, 1976.

Henderson, James M. and Richard E. Quandt, Microeconomic Theory: A Mathematical Approach, 2nd Edition, McGraw-Hill Book Company, New York, 1971.

Journal of Environmental Economics and Management, Academic Press, San Diego, various issues.

Journal of Economic Literature, American Economic Association, Nashville, various issues.

Theil, Henri, Principles of Econometrics, John Wiley & Sons, Inc., New York, 1971.

4.2.2 Regulatory Analysis Handbooks and Guidelines

Executive Order 12 291 for the Resolution of Generic Issue 82, "Beyond Design Basis Accidents in Spent Fuel Pools", U.S. NRC, Office of Nuclear Regulatory Research, April 1989.

Resolution of Generic Issue 99: "Loss of RHR Capability in PWRs", Office of Nuclear Regulatory Research, February 1989.

NRC Regulations Handbook, November 1987.

Value/Impact Assessment for Seismic Design Criteria, U.S. NRC, August 1984.

Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission, May 1984.

A Handbook for Value-Impact Assessment, U.S. NRC, December 1983.

4.2.3 Examples of Data Sources

World Nuclear Fuel Cycle Requirements 1988, U.S. Department of Energy, Energy Information Administration.

1982 Census of Manufactures, U.S. Department of Commerce, Bureau of the Census, various issues.

1980 Census of Population, U.S. Department of Commerce, Bureau of the Census, various issues.

Producer Prices and Price Indexes, U.S. Department of Labor, Bureau of Labor Statistics, various years.

CPI Detailed Report, U.S. Department of Labor, Bureau of Labor Statistics, various years.

County Business Patterns, U.S. Department of Commerce, Bureau of the Census, various issues.

4.3 Risk Consequence Assessment

The published literature relevant to probabilistic risk analysis (PRA) and risk reduction methods constitutes an enormous body of information. PRAs can provide general information that is applicable to all plants or to all plants of a certain reactor vendor. However, much of the information contained in PRAs is plant-specific. It is important to ensure that reference PRA studies are carefully evaluated as to their applicability to specific plants and specific risk reduction activities. It is therefore important to survey the PRA literature to identify any important features that may not be addressable by "generic" approaches. To date, more than 50 PRAs have been performed. The majority of these PRAs determine only core damage frequency (Level 1). Also, a number of these PRAs have not been published and are considered proprietary.

The most important "generic" source of information will be NUREG-1150, the Reactor Risk Reference Document. NUREG-1150 is a multi-year effort by the NRC to estimate the risk from five "representative" nuclear power plants using the latest PRA state-of-the-art. NUREG-1150 estimates the core damage frequency, the frequency and magnitude of releases of radioisotopes to the environment given core damage or core melt, and the health consequences to the public. The most recent draft of this report was received by SC&A approximately two weeks ago.

Generic Letter 88-20, Individual Plant examination for Severe Accident Vulnerabilities - 10 CFR 50.54(f), requires all utilities to perform a systematic examination of their plant(s) to identify plant-specific vulnerabilities. The documents accompanying the Generic Letter can be important sources for lessons learned from previous PRAs and associated research. In particular, NUREG/CR-4920, Volumes 1 - 5, and NUREG/CR-5132 relate state-of-the-art data on lessons learned from past PRAs. The Individual Plant Examinations (IPE) determine core damage frequency and the frequency and magnitude of radioisotopic releases (source term) from a severe core damage or core melt using an "abbreviated" method. These submittals to the NRC, together with plant-specific PRAs (e.g., Zion and Indian Point) that include an estimate of the consequences, will be valuable sources of

information for identifying plant-specific features important to risk. We will have access to the IPE reports and previously submitted plant-specific PRAs (e.g., Zion, Indian Point, Limerick) through the NRC and has also several plant-specific PRAs in its library.

The National Laboratories that were involved in NUREG-1150 work are important sources for detailed information. Such information may be required in some cases where the information in NUREG-1150 is insufficient to determine whether an issue can be treated in a general manner or is dependent on the specific design and operation of a plant. Available documentation, as well as personal communication, will be used to obtain this information. For numerical evaluations of risk-reduction options, NUREG-1150 data such as the cut sets (failure combinations that lead to core melt) are available on diskettes for use with NRC's personal computer code IRRAS. We will obtain these cut sets from the NRC when necessary. SMART (consequence code), another PC code, is also available for analysis of risk reduction options. SCIENTECH has IRRAS and SMART installed. The computer code EVNTRE, used in NUREG-1150 for containment event tree analysis, is available on VAX and mainframe computers.

Specific issues are also treated in institutional publications and in papers presented at conferences. A specific example of institutional publications would be the work in human reliability analysis at EPRI. Examples of potentially useful articles in risk reduction include:

- "The Benefits of Planning for Maintenance and Repairs"
(Nuclear Engineering International)
- "Estimating the Risks From Occupational Exposure"
(Nuclear Engineering International).

In certain cases, data may be required that are not available in published sources. Such information is often plant- or site-specific, and may be obtained through direct contacts with specialists or experts who have substantial knowledge of the issues related to the estimation of risk.

The senior personnel assigned to the estimation of risk have many years of experience in the areas relevant to potential risk-evaluation task assignments. In addition to their expertise, valuable contacts have been established with utility technical and management personnel; at the

National laboratories; at government agencies, including NRC and DOE; and at nationally recognized academic institutions, such as UCLA. This combination of experience and industry-wide contacts makes an exceptional resource that can be applied to tasks assigned under this contract.

National laboratories; at government agencies, including NRC and DOE; and at nationally recognized academic institutions, such as UCLA. This combination of experience and industry-wide contacts makes an exceptional resource that can be applied to tasks assigned under this contract.

5. CORPORATE TECHNICAL QUALIFICATIONS

The following sections describe the technical expertise and experience of SC&A and its proposed subcontractors relevant to the Statement of Work contained in the solicitation.

5.1 S. Cohen & Associates

S. Cohen & Associates (SC&A), a Virginia corporation, was founded in 1981 by Sanford Cohen. The firm specializes in the technical and policy analysis of environmental and safety issues, particularly those related to radiation and nuclear power. The firm also provides health physics and nuclear fuel cycle consulting services, mathematical modeling and computer code development, and estimates the costs of regulatory requirements. SC&A is dedicated to providing the very highest quality technical support to its clients. Moreover, the firm is committed to client responsiveness and fiscal responsibility.

SC&A is able to assemble, frequently on short notice, multidisciplinary working teams of technical specialists specifically designed to solve clients' problems. This is accomplished by maintaining close collaboration with scientists and engineers from the university and industry. By providing attractive forms of professional association, SC&A is able to secure many of the nation's leading experts in engineering and science.

The firm's clients include:

- Electric Power Research Institute
- Atomic Industrial Forum/Nuclear Utilities Management
and Resources Council (NUMARC)
- Nuclear Safety Oversight Committee
- Congressional Office of Technology Assessment
- Executive Office of the President (CEQ)
- U.S. Department of Energy
- Oak Ridge National Laboratory
- Brookhaven National Laboratory
- Argonne National Laboratory
- Battelle Pacific Northwest Laboratory
- U.S. Nuclear Regulatory Commission
- U.S. Environmental Protection Agency
- General Atomics
- State of New Mexico (Environmental Evaluation Group)

Most of the firm's work has been for agencies of the Federal government, primarily those concerned with health and safety issues related to radiation and nuclear power. These agencies include the Nuclear Regulatory Commission, the Department of Energy (much of the work through its prime contractors), and the Environmental Protection Agency. In its seven years of existence, SC&A has performed work on approximately 50 contracts, and has worked on an estimated 150 tasks for its clients.

One of these contracts accounts for approximately one-half of these tasks. This contract, which is in its third year, is a planning and support effort for the Office of Radiation Programs at EPA Headquarters in Washington.

Since SC&A maintains a very simple organizational structure, the corporate lines of authority for the proposed work are straightforward. Dr. Cohen is the President of SC&A and the proposed Project Manager. In this role, he will work with the Project Director in scoping out each task order, assigning technical personnel, reviewing deliverables, and meeting with the NRC Project Officer. The Project Director is Mr. David Goldin. As Project Director, he will direct the technical personnel assigned to the project on a day-to-day basis in carrying out the work necessary to complete each task. If only one task is underway at any particular time, Mr. Goldin will also serve as the task leader. If multiple tasks are underway, and depending on the magnitude and complexity of the tasks, Mr. Goldin (consulting with the Project Manager) may assign individual task leaders to each task.

This mode of operation has been very effective in accomplishing multiple tasks (there have been nearly 100 over a two and one-half year period) for the EPA Office of Radiation Programs on our level-of-effort contract with that agency.

SC&A has approximately [redacted] employees and Associates to draw from to accomplish tasks assigned under any contract awarded as a result of this NRC solicitation. Their disciplines are nuclear engineering, health physics, mechanical engineering, economics, and physical sciences. Several of the staff also are experienced in project management. Several of these personnel have nuclear power plant experience. There are also technical support personnel such as computer programmers and technical editors. SC&A is proposing [redacted] individuals for this work. Most of the remaining personnel

will be available on October 1st to assist in performing tasks under this contract.

SC&A is proposing two subcontractors to supplement the SC&A staff for this work - SCIENTECH, Inc. and Jack Faucett Associates, Inc. SCIENTECH has been selected for its knowledge of the NRC regulatory process and its accident evaluation capability. The disciplines of its staff include nuclear engineering, electrical engineering, cost engineering, thermal-hydraulic analysis, and reliability and maintainability. It also has a number of personnel with project management experience. SCIENTECH has a staff of approximately [REDACTED] persons. [REDACTED] individuals are being proposed for this work. A significant number of the remaining staff would be available if called upon to assist with tasks during peak loads.

Jack Faucett Associates has been selected for its economic capabilities and its experience in cost-benefit and value-impact analysis. Most of its [REDACTED] professional staff are economists, experienced in performing value-impact analyses for government agencies. [REDACTED] professionals have been proposed for this effort. A majority of the remaining staff would be available if called upon to assist with tasks during peak loads.

The following pages contain synopses of projects performed by SC&A which are directly relevant to this procurement. SC&A's project summaries are followed by brief descriptions of our proposed subcontractors and summaries of previous projects they have performed.

U.S. Environmental Protection Agency
Office of Radiation Programs

DEVELOPMENT OF PROCEDURES FOR COMPLIANCE WITH
THE CLEAN AIR ACT STANDARDS FOR RADIONUCLIDES

In February 1985, the Environmental Protection Agency (EPA) promulgated, under Section 112 of the Clean Air Act, standards for radionuclides emitted into the air. The standards for NRC-licensed and non-DOE Federal facilities (40 CFR 61 Subpart I) required facilities to demonstrate compliance using the EPA computer codes, AIRDOS-EPA and RADRISK. However, these codes will be difficult to run for the majority of the estimated 6000 NRC licensees subject to the standards.

SC&A assisted the NRC in developing less cumbersome compliance procedures. These consist of:

- 1) A table of annual quantities of radionuclides that can be handled without causing any member of the public to receive a dose that is more than 20 percent of the standards. These annual quantities were derived using empirically-derived release fractions.
- 2) A table of stack concentrations that limit the dose to any member of the public to less than 20 percent of the standards.
- 3) A computer code which automates the methodology given in NCRP Commentary No. 3.
- 4) A computer code which extends the methodology given in NCRP Commentary No. 3 by providing a more complete treatment of air dispersion and a more sophisticated calculation of organ dose.

Demonstration of compliance using methods 1) through 3) also exempts licensees from reporting to the EPA.

The procedures are explained in a "user-friendly" guidance manual which sets down the alternative steps for demonstrating compliance.

EPA Contract No. 68-02-4375

Project Officer:

Al Colli

(202)475-9610

Cost: \$150,000

U.S. Environmental Protection Agency

Office of Radiation Programs

DERIVATION OF RADIONUCLIDE RELEASE FRACTIONS FOR NRC-LICENSED FACILITIES

To assist the EPA in developing alternative procedures for demonstrating compliance with the standards for radionuclides under Section 112 of the Clean Air Act, SC&A derived generic radionuclide release fractions appropriate to non-fuel cycle facilities licensed by the Nuclear Regulatory Commission.

The generic release fractions were derived from the following sources:

- 1) Measured release fractions reported in the open literature.
- 2) Emissions data reported in the open literature.
- 3) Concentration data reported in the open literature.
- 4) Data on Worker Intakes.

The recommended release fraction for all radionuclides in gaseous form was 1.0. For radionuclides in powder or liquid forms, a release fraction of 1×10^{-3} was recommended, except for materials at elevated temperatures. For solids and capsules, the recommended release fraction was 1×10^{-6} .

EPA Contract No. 68-02-4375

Project Officer:

Al Colli

(202)475-9610

Cost: \$50,000

U.S. Environmental Protection Agency
Office of Radiation Programs

SUPPORT FOR THE REISSUANCE OF HIGH-LEVEL WASTE STANDARDS
(40 CFR PART 191)

The EPA has initiated a program to re-promulgate its environmental standards for disposal of spent nuclear fuel and high-level and transuranic radioactive wastes (Subpart B of 40 CFR Part 191). SC&A is providing technical support to the EPA in this effort by updating and expanding the Background Information Document. In particular, the following four chapters are being updated:

- Chapter 1: Introduction
- Chapter 2: Current Regulatory Programs and Strategies
- Chapter 3: Quantities, Sources, and Characteristics of Spent Nuclear Fuel and High-level and Transuranic Radioactive Wastes
- Chapter 4: Planned Disposal Programs

Additionally, SC&A is assisting in the performance assessment of the DOE Waste Isolation Pilot Plant by reviewing and recommending failure scenarios. This work is being coordinated with the New Mexico Environmental Evaluation Group.

EPA Contract No. 68-02-4375

Project Officer:

Dan Egan

(202)475-9633

Cost: \$200,000

U.S. Environmental Protection Agency
Office of Radiation Programs

EVALUATION OF THE COSTS OF IMPLEMENTING INGESTION
PROTECTIVE ACTION GUIDES (PAGs)

The EPA is working with the Food and Drug Administration in developing Protective Action Guides (PAGs) for the accidental release of radionuclides to the environment. In developing these guides, the cost of implementing a protective action must be balanced against the detriment avoided.

SC&A and its subcontractors are assisting the EPA in this cost evaluation by determining the unit value of food products for various potential points of intervention to implement protective action. The significance of these costs is also being evaluated, by determining the difference between the normal cost of the food, including the protective action, and the cost to get the same or similar uncontaminated food from more distant locations. A review of the literature is also being made to determine the economic value of food discarded in actual radiological emergencies.

EPA Contract No. 68-02-4375

Project Officer:

Joe Logsdon

(202)475-9620

Cost: \$34,000

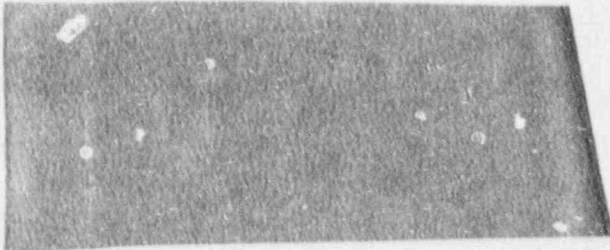
Nuclear Utilities Management and Resources Council (NUMARC)
PLEX Committee

ENVIRONMENTAL REPORT ON PLANT LIFE EXTENSION

For the Plant Life Extension Committee (PLEX) of NUMARC, SC&A wrote an Environmental Report on commercial nuclear power plant life extension. The report adopted the format of NRC Regulatory Guide 4.2 for the assessment of impacts.

The report analyzed on a generic basis the environmental impacts of the initial 40 years of plant operations, and compared those with the anticipated impacts of license renewal for an additional 40-year period. Additionally, impacts were compared with those from the coal fuel cycle and other potential sources of electrical generating capacity.

NUMARC letter contract

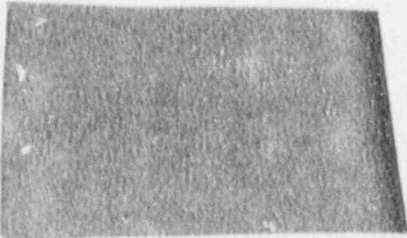


Union Carbide Corporation
Oak Ridge National Laboratory

REVIEW OF AEROSOL BEHAVIOR IN CONNECTION
WITH LWR ACCIDENT SOURCE TERMS

Deposition and re-entrainment of aerosols in the primary system and in the containment are mechanisms which affect the LWR source term during a severe accident. Oak Ridge National Laboratory (ORNL) is conducting a series of experiments in order to understand aerosol deposition and re-entrainment. SC&A supported ORNL in the theoretical aspects of the problem. Various aerosol deposition mechanisms were reviewed to evaluate their relative importance with respect to the deposition of aerosols in the primary system during the course of severe accidents. Natural convection, both by itself and superimposed upon forced convection, was examined to determine what effect it has upon aerosol behavior. SC&A examined re-entrainment data and developed models which allow comparison of data from a wide variety of experiments. SC&A also examined a specific accident situation to determine the magnitude of the effect re-entrainment might have upon the retention of aerosols in the primary system.

Union Carbide Corporation Subcontract 41X-40125V



Atomic Industrial Forum
NESP Project

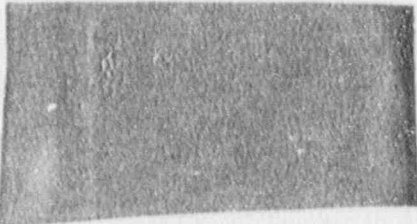
OCCUPATIONAL EXPOSURE AND ALARA IMPLICATIONS OF
NRC MULTI-PLANT ACTIONS

SC&A evaluated the impact of NRC-initiated multi-plant actions on worker radiation exposures. A list of multi-plant actions potentially resulting in occupational radiation exposures was compiled from the NRC "orange book" for the period 1979 through 1983, and this list was supplemented by the relevant I&E Bulletins over the same time period. The next step was to divide the operating reactors into classes, based on distinguishing parameters, and to select representative plants from each of the classes.

Occupation radiation exposure data were obtained from the Radiation Work Permits at ten representative plants for tasks corresponding to the NRC multi-plant actions. The exposures from these representative plants were used to estimate the total exposures at light water-cooled reactors. The results were presented in a form which illustrates the contribution of dose from NRC-initiated multi-plant actions to total worker dose.

The report was published as AIF/NESP-033, Occupational Radiation Exposure Implications of NRC-Initiated Multi-Plant Actions, March 1986.

Letter Contract



Atomic Industrial Forum
NESP Project

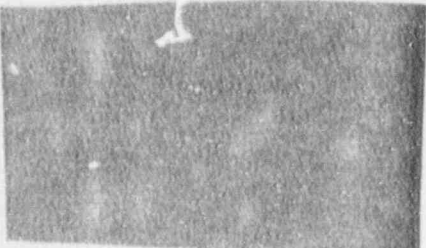
METHODS FOR IMPROVING ACCURACY IN ESTIMATING
WORKER DOSES AT NUCLEAR POWER PLANTS

SC&A developed for the nuclear power industry methods for predicting worker doses. The objective was to determine how accurate are current state-of-the-art estimates, and to develop a method which improves the accuracy of these estimates. Initially, using data collected from representative nuclear power plants, estimated doses were compared with actual doses in an attempt to explain the reasons for discrepancies. The results of these comparisons were used to guide the development of a method to improve the accuracy of these estimates.

The method comprises three building blocks -- an overall logic, checklists, and worksheets. A logic diagram guides the estimator through a series of steps, each of which involves the completion of a checklist or worksheet. The checklists systematically solicit the information needed to prepare the estimate, including appropriate adjustment factors. The worksheets are used to organize information and perform calculations needed to construct the dose estimate. The final report describes the application of the method to the engineering design process, and presents a sample problem which illustrates its application.

The report was published as AIF/NESP-039, Estimating Doses in Nuclear Facilities with Emphasis on the Design Process, January 1987. The method is currently being programmed for implementation on a desk-top computer.

Letter Contract



Congress of the United States
Office of Technology Assessment

EXAMINATION OF REACTOR REGULATION

The Office of Technology Assessment (OTA) conducted an assessment on the future of conventional nuclear power. The objective of the study was to determine the impediments to the future growth of the industry, and to advise the Congress on ways to remove these impediments. SC&A was responsible for examining the regulatory impediments.

The principal proposals for reform of the regulatory process were reviewed, and the relative strengths and weaknesses of each of the major proposals were assessed from the perspective of the utilities, vendors, regulators, and environmental groups. Case studies of existing LWR's were conducted to determine the principal contributory factors to delays in the licensing and construction schedules. Finally, technological options other than conventional LWR's (redesigned LWR's, smaller LWR's, HTGR's, and CANDU reactors) were examined to assess significant differences in siting and licensing.

The case studies focussed on three units under construction and near completion, one with an exemplary construction history, another with an average history, and a third with a protracted and difficult history. An attempt was made to sort out the regulatory contributions to construction delays. In particular, the impact of NRC-mandated backfits was explored.

The results were summarized in a report to OTA and presented to a workshop on reactor technology and regulation. The OTA report, Nuclear Power in an Age of Uncertainty, was published in January 1984.

OTA Contract No. 233-8400.0

Project Officer:

Alan Crane

(202)228-6427

Cost: \$25,000

U.S. Department of Energy
Office of Environmental Assessment

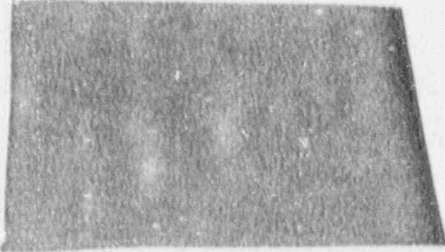
SAFETY GOALS FOR NUCLEAR POWER PLANTS: A COMPARISON OF RISK CRITERIA

For the Regulatory Analysis Division of the DOE office of Environmental Assessment, SC&A is performed an analysis of NRC's proposed safety goals for nuclear power plants. These safety goals include numerical criteria for acceptable levels of risk to individuals and populations in the area around reactor sites.

Other regulations, standards, and guidelines applicable to individual components of the nuclear fuel cycle were compiled. Radiation exposure limits applicable to both workers and members of the general public were converted to risk and compared with the numerical guidelines in the proposed safety goals. The compatibility between the safety goals and existing standards were assessed.

It was determined that the societal risk guideline is well outside the range of population risk limits applicable to other activities in the nuclear fuel cycle, and moreover provides no incentive for selecting sites with low surrounding population densities.

Consad Research Corporation Subcontract #62X-92307C



U.S. Environmental Protection Agency
Office of Radiation Programs

SUMMARY OF AND RESPONSE TO PUBLIC COMMENTS ON
PROPOSED GUIDANCE FOR OCCUPATIONAL EXPOSURES
TO IONIZING RADIATION

In 1981, the Environmental Protection Agency proposed Federal Radiation Protection Guidance for Occupational Exposures. The originally proposed guidelines incorporated nine recommendations covering limits on external and internal exposures, requirements for monitoring and supervision, and new provisions for the unborn. In response to the proposed guidance a significant file of public comments was amassed. These comments originated from the following four sources:

- i) Letters submitted in response to the notice in the Federal Register.
- ii) Transcripts of the four opening hearings conducted in April and May 1981.
- iii) Written testimony submitted as part of the public hearings.
- iv) Post-hearings' submission of comments.

SC&A prepared a suitable outline of topics for the categorization of comments. The nearly 4000 pages of public comments received by the Agency were then consolidated, summarized, and organized into these topic categories, and designated by respondent affiliation.

Then, following close direction from EPA, SC&A personnel assisted the Agency in preparing responses to the summarized comments. Particular attention was given to revisions in the Guidance made by EPA since it was originally proposed.

Versar Subcontract #583-1



U. S. Environmental Protection Agency
Office of Radiation Programs

SUMMARY OF PUBLIC COMMENTS ON
PROPOSED STANDARDS FOR RADIONUCLIDES
PURSUANT TO SECTION 112 OF THE CLEAN AIR ACT

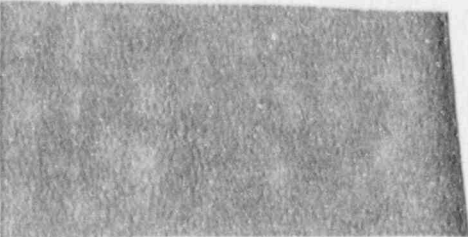
In March of 1983, the Environmental Protection Agency proposed standards for sources of emissions of radionuclides pursuant to Section 112 of the Clean Air Act. Standards were proposed for Department of Energy facilities, Nuclear Regulatory Commission licensed facilities, uranium mines, and the elemental phosphorus industry. Negative declarations were filed for coal-fired utility and industrial boilers, the phosphate industry, the mineral extraction industry, and the uranium fuel cycle covered by 40 CFR 190.

Hearings on the proposed standards were held in Washington and Denver and public comments were solicited.

SC&A prepared an outline of topics for categorization of comments, and comments were organized according to this outline, and labelled according to respondent affiliation. For each category, comments were consolidated and summarized in a format suitable for response. SC&A then assisted the Agency in responding to some of the summarized comments.

Final standards for radionuclides under the Clean Air Act (40 CFR Part 61) were promulgated in February 1985.

Versar Subcontract #583-1



U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research

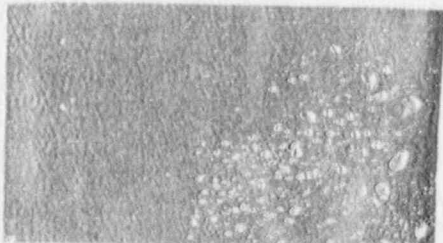
IMPACT OF REVISED STANDARDS FOR PROTECTION AGAINST RADIATION
(10 CFR PART 20)

The U.S. Nuclear Regulatory Commission (NRC) is proposing revised standards for protection against radiation (Part 20 to Title 10, Code of Federal Regulations). These revised standards incorporate the system of dose limitations recommended by the International Commission on Radiological Protection (ICRP-26). In particular, NRC is proposing risk-weighted guidelines for combining doses received by individual organs from internal and external exposures. Also, new occupational limits on annual dose equivalent are proposed.

SC&A, together with an economic analysis firm (Jack Faucett Associates), estimated the impact on the industry of these proposed revisions to the NRC regulations. This was accomplished by conducting a number of case studies, and by reassessing the results of previous work conducted by SC&A for the Environmental Protection Agency. In particular, case studies were conducted on five nuclear power plants, a university research reactor, a uranium mill, a uranium conversion facility, and a nuclear pharmacy. For each of these facilities, site visits were conducted with the corporate health physicist and his staff. The revision was disaggregated into its component parts and each part was discussed individually. During the course of the work, several necessary changes in the revised regulation were identified and reported to the NRC.

SC&A presented the results of its cost evaluation to the Advisory Committee on Reactor Safeguards (ACRS), and the evaluation was used by the staff in the preparation of NRC's Regulatory Impact Analysis.

Jack Faucett Associates subcontract under EPA Contract #68-01-6486
and Union Carbide Corporation Subcontract #41X-40125V



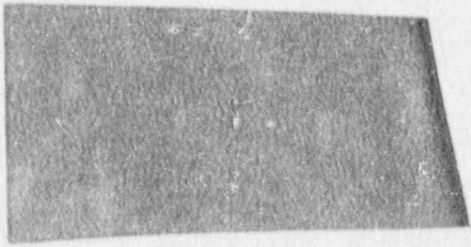
U.S. Environmental Protection Agency
Office of Radiation Programs

REVIEW OF THE COSTS OF
DECOMMISSIONING NUCLEAR FACILITIES

Under statutory authority provided by the Atomic Energy Act of 1954, the Environmental Protection Agency (EPA) has the responsibility for the development of radiation standards applicable to the decommissioning of nuclear facilities. EPA is considering standards for the full range of nuclear facilities, including Department of Energy laboratories and production facilities, commercial light water reactors and supporting fuel cycle facilities, and other Nuclear Regulatory Commission licensees with the potential for residual contamination at the end of life.

SC&A, together with an economic analysis firm (Jack Faucett Associates) reviewed the available literature on the decommissioning of facilities that have handled radionuclides. In a report to the EPA, the adequacy and completeness of the cost estimates for these decommissioning efforts were assessed, and gaps in the data were determined. Also, several preliminary schemes for categorizing these facilities were proposed as an aid to the Agency in developing standards and criteria.

Jack Faucett Associates Subcontract #311-1



U.S. Environmental Protection Agency
Office of Radiation Programs

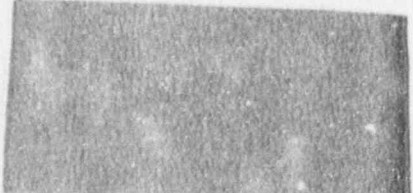
SEARCH FOR A DE MINIMIS LEVEL OF RISK

In establishing radiation standards, regulatory agencies generally assume that all exposures to radiation, regardless of how small, result in adverse health effects. This assumption is also frequently applied to the regulation of human exposure to chemicals. Although this conservative approach may be prudent, particularly if the agent is a known or suspected carcinogen, it may also result in the misallocation of societal resources. This consideration has resulted in the search for a "de minimis" level of risk -- below the range of regulatory concern.

SC&A, in collaboration with an economic consulting firm (Jack Faucett Associates), sought a quantitative definition of a de minimis level of risk, using the revealed preference method. Starting with the fatality statistics maintained by the National Center for Health Statistics (NCHS), a candidate list of diseases and accidents was compiled for analysis. For each of the categories of risk on the candidate list, an attempt was made to determine if government entities have or are planning to expend resources to reduce the level of risk below the existing level.

Graphical displays of the presence or absence of government expenditures versus the level of risk were developed to aid in interpreting the results. A statistical comparison of the categories of risk analyzed was performed using discriminate analysis to determine the level of risk which best separates the categories of risk into two groups. The results suggested no evidence of a de minimis level of risk down to a lifetime risk level of 0.1×10^{-6} , the lowest level of risk in the NCHS data base.

Jack Faucett Associates Subcontract #311-1



U.S. Environmental Protection Agency
Office of Radiation Programs

COSTS OF COMPLIANCE WITH PROPOSED
CLEAN AIR ACT STANDARDS FOR RADIONUCLIDES
FOR MEDICAL RESEARCH FACILITIES

In 1977, Congress amended the Clean Air Act to address emissions of radioactive materials. The Environmental Protection Agency subsequently listed radioactive materials as hazardous air pollutants under Section 112 of the Clean Air Act. Then in 1982, the Court ordered EPA to publish proposed regulations establishing emission standards for radionuclides, acting in response to a suit filed by the Sierra Club. EPA proposed standards for radionuclides in April 1983. Separate standards were proposed for Department of Energy Facilities, NRC licensee facilities, elemental phosphorous plants, and uranium mines.

SC&A investigated the compliance costs to medical research facilities of the proposed standards for Nuclear Regulatory Commission licensees. The investigation included case studies of approximately 30 users who had the potential to exceed the proposed limits. The users were selected by screening a large number of medical institutions for possession limits and distances to the nearest human receptors. The case studies also identified the controls used, the additional controls required to bring these facilities into compliance with the proposed standard, and the estimated costs of these additional controls. The study concluded that few, if any of the facilities would be unable to comply with the proposed standards, but that a significant fraction would have difficulty in demonstrating compliance.

Jack Faucett Associates Subcontract under EPA Contract 68-01-6486



U.S. Nuclear Regulatory Commission
Office of Policy Evaluation

TECHNICAL ASSISTANCE ON SEVERE
ACCIDENT RESEARCH AND POLICY DEVELOPMENT

As a consequence of the Three Mile Island nuclear power plant accident, the Nuclear Regulatory Commission initiated a high priority program to establish a policy for current and future generation nuclear reactors regarding severe accidents. Accordingly, an extensive research program was initiated by NRC's Office of Nuclear Reactor Research called the Severe Accident Research Program Plan (SARP).

SC&A provided technical assistance to the NRC Office of Policy Evaluation by reviewing the pertinent NRC and IDCOR (Industry Degraded Core) reports related to severe accidents, and identifying areas of uncertainty that could be significant to regulatory decisions on severe accident policy. Additionally, potential design changes were identified that could reduce the risks associated with severe accidents.

The work also included an extensive review of existing Probabilistic Risk Assessments (PRAs). From this review, SC&A estimated the overall uncertainty in the evaluation of the generic LWR risk. In support of this evaluation, the following topics were explored:

- Uncertainty in the source term
- Contribution of external events to risk
- Contribution to risk of station blackout and loss of decay heat removal
- Contribution to risk and uncertainty from low frequency sequences
- Contribution to risk from outliers
- Accident sequences which have been neglected in source term assessments
- Contribution to uncertainty from lack of knowledge regarding core migration into the lower plenum
- Contribution to risk and uncertainty from human error

NRC Contract No. 19-84-341
Project Officer:
Ed Goodwin

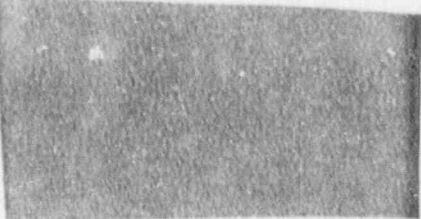
U.S. Environmental Protection Agency
Office of Radiation Programs

CONCEPTUAL DESIGN AND COST ESTIMATE OF METHODS FOR
LOW LEVEL RADIOACTIVE WASTE DISPOSAL

The EPA Office of Radiation Programs is developing environmental standards for the land disposal of low-level radioactive wastes. Two advanced methods for low-level waste disposal under evaluation are the French design, known as an Earth Mounded Concrete Bunker (EMCB), and the Westinghouse/Hittman design, which incorporates encapsulation of wastes in concrete containers known as SUREPAKS. These disposal methods have received considerable interest from the states and industry.

SC&A (under a subcontract with Jack Faucett Associates) made preliminary cost evaluations of the disposal of low-level radioactive wastes using these methods. Costs were expressed as increments from the conventional shallow land burial technique.

Jack Faucett Associates Subcontract #311-1



Electric Power Research Institute
Nuclear Power Division

STEAM GENERATOR CORROSION PRODUCT BEHAVIOR

Under a contract with the Electric Power Research Institute, SC&A developed a computer model of corrosion product (sludge) buildup in the secondary side of a pressurized water reactor steam generator.

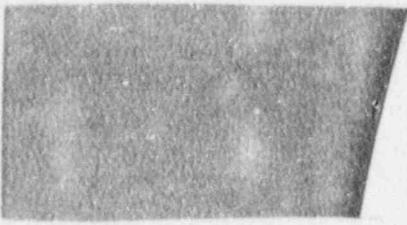
While the model was developed for application to a steam generator, its generality will permit it to be used to estimate particulate fouling behavior in other heat exchanger applications and for both gases and liquids.

Corrosion products, in the form of dissolved and finely divided metal oxides, enter the steam generator with the feedwater. They deposit on the tubes and on horizontal surfaces like the tube sheet and can contribute to accelerated corrosion and eventual tube leakage. The objective of this study was to develop a quantitative, comprehensive model to predict the rate of sludge buildup in various regions of the steam generator. The model includes the processes of convection, deposition, re-entrainment and particle growth.

The model can be used to determine optimum cleaning cycles and the effect of thermal and hydraulic design changes upon sludge behavior.

The model and its applications are discussed in a report entitled, "A Model of Sludge Behavior in Nuclear Steam Generators," EPRI NP-4620, June 1986.

EPRI Agreement RP2160-8



State of New Mexico
Environmental Evaluation Group

EVALUATION OF THE IMPLICATIONS OF NRC
TRANSPORTATION REGULATIONS ON WASTE SHIPMENTS TO WIPP

The Department of Energy (DOE) has developed a Type B packaging system (TRUPACT) for transporting CH-TRU wastes from the DOE facilities to the Waste Isolation Pilot Plant (WIPP). In the design of the package, the DOE took exception to two provisions of NRC packaging requirements. Although the enabling legislation exempts the WIPP from regulation by the NRC, the DOE committed to comply with applicable NRC regulations in the WIPP Environmental Impact Statement.

The two applicable provisions of NRC regulations are the double containment requirement on shipments of plutonium exceeding 20 curies and the prohibition on continuous venting of Type B packages through filters. For each of these provisions, SC&A researched the origin of the requirement, and evaluated the rationale for the DOE's exception. Additionally, approaches were suggested for resolution, including a risk analysis to evaluate the efficiency of double containment.

The work was presented at a meeting between the Department of Energy and the State of New Mexico. In part as a result of this meeting, the TRUPACT is being re-designed to comply with NRC regulations.

Letter Contract



Brookhaven National Laboratory
Department of Energy

REVIEW OF DEPARTMENT OF ENERGY
REACTORS AGAINST NRC REACTOR
SAFETY CRITERIA

In an evaluation of the need to upgrade the safety of Department of Energy (DOE) reactors, Brookhaven National Laboratory (BNL) reviewed Nuclear Regulatory Commission safety criteria which apply to commercial reactors in order to determine their applicability to DOE reactors operating at power levels in excess of 20 MW(t). These criteria include Regulatory Guides and IE Bulletins, Circulars, and Information Notices. At the time of the evaluation, there were 12 affected DOE reactors, two of which were fast reactors.

SC&A assisted BNL in this effort by reviewing all of the IE Information Notices. These documents inform licensees about problems encountered at a licensed facility relating to hardware or human factors. Over the three year period of the evaluation (1980-1982), an average of approximately 40 IE Information Notices were issued annually. In performing the evaluation, the contents of the IE Notices were categorized into 18 areas of reactor safety.

Brookhaven Contract #571782-S

Project Officer:

Bill Brynda

(516)282-4413

Cost: \$15,000

U.S. Environmental Protection Agency
Office of Radiation Programs

COSTS OF THE PROPOSED GUIDANCE ON OCCUPATIONAL
EXPOSURES TO IONIZING RADIATION

Under authority transferred from the Federal Radiation Council (FRC), the Environmental Protection Agency is authorized to establish guidelines on occupational exposure to ionizing radiation. Since then, the guidance has been substantially revised.

The originally proposed guidelines incorporated nine recommendations covering limits on external and internal exposures, requirements for monitoring and supervision, and new provisions for the unborn. At the time that the guidelines were proposed, a rough cost estimate was incorporated in the background information. The purpose of this project was to revise the cost estimate so that the appropriate cost/benefit and value/impact analyses could be performed in support of the rulemaking. SC&A, together with an economic analysis firm (Jack Faucett Associates), performed this cost evaluation.

To estimate industry-wide costs of the new guidelines, 25 case studies were conducted to determine the impact on specific organizations. The case studies were drawn from hospitals, physicians, dental offices, firms involved in radioisotope manufacturing and distribution, industrial radiography, well logging, and the nuclear fuel cycle. Cost items which were evaluated included training, record-keeping, badging, monitoring, outside health physics services, additional workers, shielding, capital equipment, and revised work practices.

The results indicated that the Guidance, in its original form, was too cumbersome and costly. Accordingly, the Guidance was substantially revised, and was eventually promulgated under the signature of the President.

Jack Faucett Associates Subcontract under EPA Contract 68-01-6486

U.S. Environmental Protection Agency
Office of Radiation Programs

FEDERAL AGENCY RESPONSE TO GUIDANCE
ON THE USE OF DIAGNOSTIC X-RAYS


In 1978, EPA promulgated guidance on the use of diagnostic X-ray machines by Federal agencies. This X-ray guidance, signed by the President, applies to employee health programs involving the use of diagnostic X-rays, including routine screening of individuals for employment. The guidance contains 12 recommendations, including provisions for professional supervision, equipment performance, and elimination of routine screening examinations.

SC&A, under a subcontract with Jack Faucett Associates, reviewed the status of implementation by Federal agencies of the guidance, and the impact of implementation on the agencies. The work involved interviews with medical and radiation protection personnel in 27 Federal agencies, 10 of which provide health care to employees or members of the public. When available from the Agency, the costs incurred and the benefits received by the agency, employee, patient, or others in implementing their guidance to the current level of compliance were estimated.

The primary impact of the guidance was the elimination by Federal agencies of a large number of routine pre-employment and periodic chest X-rays previously required of Federal employees and patients of federally-operated medical facilities.

The document is being published as an EPA report.

Jack Faucett Associates Subcontract under EPA Contract 68-01-6486



U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation

DETERMINATION OF THE IMPLEMENTING REQUIREMENTS
OF CERTAIN GENERIC SAFETY ISSUES

The NRC Division of Safety Technology is responsible for establishing priorities for reactor safety issues. Many of the safety issues that have been prioritized by the NRC have resulted in the implementation of multi-plant actions (MPAs). These MPAs are licensing actions that apply to a class of reactors. SC&A is assisting the NRC by correlating the generic safety issues to the resulting MPAs, in order to track the issues to completion.

For each generic issue assigned to SC&A for tracking, the following information was collected and documented:

- Brief History of the Generic Issue
- Statement of Requirement(s)
- Identification of the Document Approving the Requirement(s)
- Identification of the Document(s) Implementing the Requirements, Including the MPA Number, Where Appropriate

PNL Subcontract No. B-N1601-A-V

Project Officer:

Warren Minners

(301)492- 3510

Cost: \$29,000

U.S. Nuclear Regulatory Commission
Office of Resource Management

DEVELOP A METHOD TO ESTIMATE VOLUMES OF LOW LEVEL
WASTE GENERATED AS A RESULT OF
REGULATORY REQUIREMENTS

The NRC Office of Resource Management has been changed with the responsibility of providing other parts of the Agency with estimates of the costs of regulatory requirements. Science and Engineering Associates, Inc. (SEA) provided the NRC with generic cost estimates of low-level waste disposal at nuclear power plants. As a subcontractor to SEA, SC&A was responsible for developing a method for estimating waste volume generated as a result of regulatory requirements. The following waste streams were considered:

- Ion Exchange Resins
- Concentrated Liquids
- Filter Sludges
- Compactible Trash
- Noncompactible Trash

SC&A conducted site visits to two nuclear power plants which tracks waste volumes by point of origin - a PWR and a BWR - in the course of the study.

This method was discussed in an NRC report, Generic Cost Estimates for the Disposal of Radioactive Wastes, NUREG/CR-4555, March 1986), and was presented at the Second Radioactive Exchange Decisionmakers' Forum (May 1986).

Science & Engineering Associates Subcontract #85/116-S2



Department of Energy
Energy Information Administration

REGULATORY INFLUENCES ON THE
HIGH COSTS OF NEW NUCLEAR POWER PLANTS

Over the past several years, capital costs of nuclear power plants in the latter stages of construction have escalated well beyond anyone's reasonable expectations. In some cases, the discrepancies between originally estimated and actual capital costs approximate an order of magnitude. In a few cases, plants with billions invested and presumably close to completion have been cancelled. At a recent workshop sponsored by the Office of Technology Assessment, utility executives stated that no new nuclear power plants would be ordered in the United States until the industry was assured that costs were under control.

It has been repeatedly alleged that new and changing safety requirements imposed by the Nuclear Regulatory Commission are responsible for most, if not all of the cost growth. The purpose of this study was to test this hypothesis by analyzing actual construction cost data at two plants. Two plants of different vintages were selected as case studies. These two plants had the same utility management, the same NSSS vendor, the same A-E/constructor, and were originally intended to be twins. They were separated in time by approximately seven years, and each plant incurred a cost growth of nearly 300%. The A-E scope changes were reviewed in detail for each plant to determine the causative factors for the cost growth.

It was concluded that, contrary to expectations, the role of regulation in the growth in costs was more pronounced in the earlier plant. Moreover, a noticeable shift occurred from an ad-hoc mode of regulation for the first plant to a more prescriptive process in the second. These results indicate that regulation may have been in the process of stabilizing in the late 1970s and early 1980s, rather than the opposite, which is generally held.

Martin Marietta Subcontract No. 41X19785V



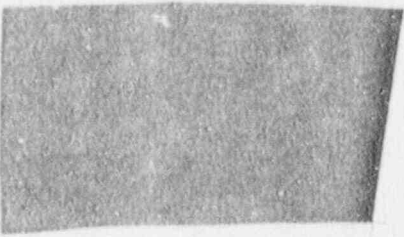
U.S. Department of Energy
Office of Civilian Radioactive Waste Management

ESTIMATES OF THE COST OF SHIPPING
SPENT NUCLEAR FUEL BY RAIL

The Office of Civilian Radioactive Waste Management has been charged with the responsibility of developing and periodically updating costs for the disposal of spent fuel and high-level radioactive waste. Roy F. Weston, Inc., provided the DOE with a "Total-System Life-Cycle Cost" methodology for forecasting disposal costs. As a subcontractor to Weston, SC&A was responsible for evaluating the appropriateness of the method used to derive the costs of transporting spent nuclear fuel by rail from the utilities to interim and/or ultimate disposal facilities.

Using current tariffs, it was determined that the estimated rail transportation costs used in the "Total-System Life-Cycle Cost" forecast adequately reflect the rail transportation charges specified by class commodity tariffs. It was also determined that the legality of the rates specified by the class commodity tariffs which apply to spent nuclear fuel shipments is being challenged in actions brought before the Interstate Commerce Commission (ICC) by both the DOE and the utilities. Therefore, alternative rate bases which would result in lower costs were investigated. These include the applicability of the "Coal Rate Guidelines - Nationwide," developed by the ICC and rates based on maximum allowable ratios of revenues to variable costs.

Roy F. Weston Subcontract No. DE-SCA-NE44301



Nuclear Safety Oversight Committee

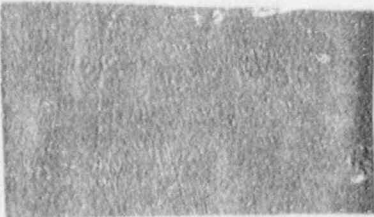
OVERVIEW OF NUCLEAR REGULATORY COMMISSION ASSESSMENT PROGRAMS

The Nuclear Safety Oversight Committee (NSOC) was established by the President in the wake of the accident at Three Mile Island and was abolished in October 1981. In July 1981, the staff of the Committee initiated a study of the NRC's major inspection, event evaluation, and safety improvement programs. SC&A assisted the staff in the analysis of NRC programs.

The purpose of the NSOC study was to establish a framework for evaluating the nation's regulatory approach to nuclear safety. A working list of major NRC assessment programs was drawn up and refined in the course of the study. More than 50 NRC staff members were interviewed to gain an insight into these programs. SC&A reviewed the following programs:

- Revision of the Standard Review Plan (SRP)
- Systematic Evaluation Program (SEP)
- Unresolved and Generic Safety Issue Reviews
- Interim Reliability Evaluation Program (IREP)
- National Reliability Evaluation Program (NREP)
- Quality Assurance Reevaluation Program
- Environmental Qualifications Program
- Systematic Assessment of Licensee Performance (SALP) Program
- Control Room Design Reviews
- Emergency Operating Procedures Reviews
- Systems Interaction Studies
- Emergency Plan Appraisals
- Fire Protection Reviews
- Implementation of the Three Mile Island Action Plan
- AEOD Engineering Evaluations and Case Studies
- Management Appraisals by the Performance Appraisal Branch (PAB)
- Inspection & Enforcement Investigations

Order # T 21098208



U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research

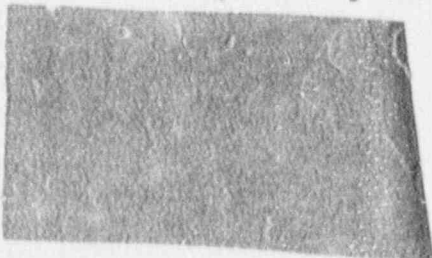
DEVELOPMENT OF A DOSE RATE DATA BASE
FOR OPERATING NUCLEAR POWER PLANTS

Many proposed regulatory requirements involve physical modifications to operating nuclear power plants. Work performed in operating reactors will frequently subject workers to radiation exposure, which can be an important consideration in an overall value-impact assessment. Although data exist on the radiation exposures associated with several tanks already performed in operating nuclear power plants, a generic methodology does not exist for the purpose of making estimates of the exposure associated with plant modifications that have yet to be performed.

The objective of this task is to construct a dose-rate data base for the major plant systems in commercial LWRs. The product of the number of in-field man-hours estimated for the postulated modification and the dose rate for the system would constitute a first-order approximation to the radiation exposure for the postulated modification.

The data base is being assembled from the survey data for area dose rates at representative operating plants. Representative plants were selected for each of the four reactor vendors based on historical exposures at the plants and the availability of readily retrievable data. Sufficient data are being collected over the spatial extent of each system and over time so as to obtain appropriate spatial and temporal averages.

Science & Engineering Associates Subcontract No. NRC-33-86-261



Executive Office of the President
Council on Environmental Quality

SUPPORT SERVICES IN THE AREA OF NUCLEAR WASTE/RADIATION

The Council on Environmental Quality (CEQ) is responsible under the National Environmental Policy Act for the conduct of studies concerning policies, programs, standards, mediation, public involvement, and international cooperation. The purpose of this contract is to assist the CEQ and related interagency coordinating groups with joint projects in the area of nuclear waste/radiation. The objectives of the contract are to provide:

- analytical support for environmental policy options;
- an independent forum for peer review of scientific and policy matters;
- opportunities to facilitate mediation and public involvement in environmental programs to encourage resolution of complicated issues or regulations; and
- support for international cooperation in matters involving global resources.

Contract No. EQ6C11

Project Officer:

John Chorsen

(202) 653-8541

Cost: Funded to \$50,000

U.S. Nuclear Regulatory Commission
Office of Resource Management

ESTIMATE OF COSTS AND RADIATION EXPOSURES
ASSOCIATED WITH REGULATORY REQUIREMENTS

In accordance with a recent emphasis on the use of value-impact techniques in its regulatory decisions, the NRC Division of Budget and Analysis has been charged with the responsibility to provide other parts of the Agency with estimates of the costs of regulatory requirements. Contractors are being used to provide assistance in evaluating costs. SC&A is a subcontractor to one of these contractors, Science and Engineering Associates.

In its initial task for the NRC, SC&A estimated the radiation exposures from startup, shutdown, defueling, and refueling of generic BWRs and PWRs. Exposure data for the startup and shutdown tasks were obtained directly from five utilities for eight units. Exposure data for defueling and refueling were obtained from the high dose job data base, being compiled for the NRC by Brookhaven National Laboratory.

In the second task, SC&A assisted in the evaluation of the costs associated with the revisions to 10 CFR Part 50, Appendix J, Leak Tests for Primary and Secondary Containments of Light-Water-Cooled Nuclear Power Plants. SC&A evaluated the impact to both the industry and the NRC of the changes to Technical Specifications engendered by the changes to Appendix J. SC&A also evaluated the impact on occupational radiation exposures of the changes.

In a third task, SC&A assisted in estimating the costs of the disposal of low-level wastes from nuclear power plants, and developed a method for predicting the volumes of wastes generated. This work was published by the NRC (Generic Cost Estimates for the Disposal of Radioactive Wastes, NUREG/CR-4555, March 1986) and the method for estimating waste volumes was presented at the Second Radioactive Exchange Decisionmakers' Forum (May 1986).

In a fourth task, SC&A assisted in compiling a book of abstracts on generic cost estimates (NUREG/CR-4627, June 1986).

Science & Engineering Associates Subcontract #85/116-S2

Project Officer:
Sidney Feid
(301) 492-3748

Aggregate cost: \$60,000

U.S. Environmental Protection Agency
Office of Radiation Programs

CONSOLIDATION AND SUMMARY OF PUBLIC
COMMENTS ON STANDARDS FOR ACTIVE URANIUM
PROCESSING SITES

The Agency proposed standards for active uranium processing sites. A public hearing was held and a significant number of public comments were received in response to the publication of the proposed standards in the Federal Register. As part of the formal rulemaking process, the Agency had to respond to these public comments, as well as the written and oral testimony submitted as part of the public hearings.

SC&A consolidated and summarized the public comments in a form suitable for response. Initially, an outline of topics and taxonomy of respondent affiliations was developed. The comments were categorized according to the outline of Finally, technical and clerical support were supplied to the Agency to assist in responding to the comments.

The standards were promulgated as final in October 1983 (40 CFR Part 192).

Versar Subcontract #583-1

Project Officer:

Stanley Lichtman

(202) 586-4600

Cost: \$15,000

STUDY OF THE TEMPORARY NUCLEAR WORK FORCE IN THE UNITED STATES


The nuclear energy industry is employing an increasing number of non-permanent radiation workers at nuclear power plants. These non-permanent workers have been variously referred to as "temporary" or "transient." Little was known about these workers, aside from their radiation exposures, which were alleged to be higher, on the average, than those of permanent station employees.

In a joint effort with Jack Faucett Associates, SC&A conducted a study to characterize the non-permanent radiation workers at nuclear power plants. The workforce was subdivided into permanent station employees, non-station utility employees, temporary station utility employees, permanent contractor employees, and temporary contractor employees. For each category of workers, data were collected on numbers of individuals by craft, age, sex, geographical origin, duration of employment, and radiation exposure. Additionally, radiation exposures were evaluated by specific job, including steam generator repair, control rod drive maintenance, decontamination, and waste management. Finally, the training in radiation safety was assessed for both permanent and temporary workers.

In evaluating the job-specific radiation exposures, it was necessary to disaggregate radiation work permits by worker category. Although this task was simplified at some plants through the use of automated data bases, tedious reviews were necessary at other plants. In total, one to three years of exposure data were obtained for 15 units at nine stations operated by six utilities.

The work was published as a report entitled, "Characterization of the Temporary Radiation Work Force at U.S. Nuclear Power Plants," AIF/NESP-028, May 1984.

Subcontract with Jack Faucett Associates under an AIF Letter Contract



Argonne National Laboratory
Energy and Environmental Systems Division

DEVELOPMENT OF A GUIDE TO ESTIMATE THE COSTS OF GENERIC
NUCLEAR REGULATORY COMMISSION REQUIREMENTS

Argonne National Laboratory developed for the Nuclear Regulatory Commission (NRC) a Handbook for Cost Estimating (NUREG/CR-3971) to reevaluate the costs associated with generic NRC requirements. The Handbook is used by the NRC, together with independent estimates of accident risks and consequences, to establish priorities within the agency for dealing with generic issues. The methodology used in the Handbook consists of a "decision tree" to allow the NRC to identify all of the significant cost elements associated with the implementation of a proposed NRC generic requirement.

SC&A developed the decision methodology for use in the Handbook and additionally performed the following three tasks. In the first task, SC&A selected two recent examples of generic backfit requirements imposed by the NRC and traced the effects of these requirements through the nuclear industry. The second task provided detailed models of the NRC and a typical nuclear utility to identify all significant functions and to detect all cost elements associated with the generic requirements. In the final task, SC&A gathered cost data references to assist the user of the guide in preparing cost estimates of each element identified in Task 2.

SC&A conducted site visits at three utilities to determine the cost impact of the two selected backfit requirements. From discussions with utility project management personnel, a common basis was developed to categorize backfit cost impacts. Additionally, the differences between estimated and actual costs were determined for the two specific backfit requirements.

Argonne Contract #31-109-38-7163

Project Officer:

Warren Minners

(301)492- 3510

Cost: \$45,000

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

REVIEW OF REGULATORY ISSUES RELATED TO HIGH LEVEL WASTE MANAGEMENT

Under subcontract with Roy F. Weston, SC&A reviewed three contemporaneous regulatory issues related to the interim storage and disposal of high level radioactive wastes.

1. Workability of the Q-List Methodology

The Q-List is a list of repository structures, systems, components and activities that have been determined to be important to safety and/or waste isolation and are thereby subject to the highest quality level of the formal QA program. A probabilistic methodology has been developed to assign items to the Q-list. This methodology was reviewed for workability against the NRC Draft Generic Technical Position.

2. Comparison Between the Regulatory Approach for the MRS and the Repository

A Regulatory Assessment Document has been developed to determine whether the conceptual design meets the requirements of 10 CFR Part 72. This document was reviewed to illustrate the similarities and differences between this regulatory approach and that evolving for the geologic repository.

3. Prioritization of Issues for the PRAM Working Group

The Preclosure Risk Assessment Methodology (PRAM) program was initiated to establish common procedures on assessment methods, computer codes, assumptions and data bases utilized in the assessments. A PRAM Working Group has been formed to assure proper coordination between DOE Headquarters and the repository projects on the preclosure safety assessment methodology. The charter for the PRAM Working Group was reviewed and a list of issues developed for the Group to consider prior to the full implementation of the PRAM.

Roy F. Weston Subcontract No. DE-SCA-NE44301

Project Officer:
David Siefkin
(202)646-6600
Cost: \$12,000

5.2 SCIENTECH, Inc.

SCIENTECH is a young, Small Business Administration Approved 8(a) engineering and management consulting firm. Originally founded in Idaho Falls, ID in 1983, SCIENTECH now has offices in the Washington D.C. metropolitan area, Dallas and San Antonio, TX, Ogden, UT, and Boise, ID. SCIENTECH's experienced and technically capable staff has grown to over [REDACTED] persons, the great majority being engineers and scientists in the nuclear field. SCIENTECH personnel have provided technical services to the NRC, DOE, DOD, NASA, and private clients in project areas such as regulatory analysis, environmental assessment, probabilistic risk assessment, thermal/hydraulic analysis, quality assurance, hardware and software development, reliability and maintainability, systems integration, and program management.

SCIENTECH's clients include:

- Advanced Nuclear Fuels (formerly Exxon Nuclear Co.)
- Atomic Energy of Canada Limited
- Brookhaven National Laboratory
- Catalytic, Inc. at the INEL nuclear fuel processing plant
- EG&G Idaho, Inc. and EG&G Services
- E.I. DuPont de Nemours Company, Inc.
- Eyring Research Institute, Inc.
- General Electric Company
- Idaho National Engineering Laboratory (INEL)
- International Atomic Energy Agency (IAEA)
- Japanese Atomic Energy Research Institute (JAERI)
- Los Alamos National Laboratory
- Organization for Economic Cooperation and Development
- Philadelphia Electric Company
- Sandia National Laboratory
- Science Applications International Corporation
- Texas Utilities Electric Company
- Tractionel, Belgium
- U.S. Department of Defense
- U.S. Department of Energy
- U.S. Nuclear Regulatory Commission
- Westinghouse Hanford Company

Projects performed by SCIENTECH that are directly relevant to this solicitation are summarized below.

- U.S. Nuclear Regulatory Commission
- Office of Nuclear Regulatory Research

SCIENTECH is currently supplying technical assistance to RES in support of the rulemaking for commercial nuclear plant license renewal. SCIENTECH has contributed to the regulatory analysis for the proposed rulemaking, concentrating on procedural issues and the relationship of the rulemaking with other NRC licensing requirements. A comprehensive database was developed using the NRC Standard Review Plan to identify regulatory interrelationships. This database is available and may have uses for other proposed actions. SCIENTECH organized and analyzed public comments in response to an advanced notice of proposed rulemaking published by the NRC. SCIENTECH is assisting in the identification of the form and content of regulatory guidance needed to support the proposed license renewal rule and will continue to support the rulemaking process for license renewal.

NRC contract number: RS-RES-88-095.
Contact: Don Cleary. Phone: 492-3936.

U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research

Under contract to RES, SCIENTECH evaluated the current status of Generic Issue 135, Steam Generator and Steam Line Overfill Issues. Several subissues were determined to be resolved and others were identified as being pursued as separate generic issues. A data search and evaluation were conducted on the frequency and effects of steam generator overfill events and potential mitigating actions were considered. A technical findings report was prepared which was the basis for resolution of this issue for the NRC.

NRC contract number: NRC-04-87-398.
Contact: Bob Baer. Phone: 492-3930

U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research

SCIENTECH has assisted the NRC in the resolution of Generic Issue 23, Reactor Coolant Pump (RCP) Seal Failures, by performing engineering evaluations in conjunction with Brookhaven National Laboratory. Proposed resolutions to reduce or eliminate public health risks associated with RCP seal failure at commercial pressurized water reactors. SCIENTECH efforts have included development of a probabilistic RCP seal failure model in conjunction with

Atomic Energy of Canada, Limited. SCIENTECH has performed the cost/benefit and regulatory analyses on the proposed resolution of GI-23. The results are published in NUREG/CR-5167, "Cost/Benefit Analysis for Generic Issue 23, Reactor Coolant Pump Seal Failures" and SCIE-23-89, Regulatory/Backfit Analysis for Generic Issue 23, Reactor Coolant Pump Seal Failures."

NRC contract number: NRC-04-87-397.
Contact: Bob Baer. Phone: 492-3930

U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research

SCIENTECH provided input to the NRC regulatory analysis for the Commission action to issue a revised Part 20 in final form. The SCIENTECH input consisted of an estimate of the number and extent of Regulatory Guide changes and the associated resource requirements placed on the NRC.

NRC contract number: NRC-04-88-096.
Contact: Alan Roecklein. Phone: 492-3740

U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research

SCIENTECH is providing technical assistance to the NRC staff in developing, reviewing and issuing the Regulatory Guides which provide guidance to NRC licensees on implementation of the recent major revision of 10CFR20. Technical support will also include preparing working drafts of implementation guidance on a number of technical topics, providing support for internal NRC review of the proposed draft guides (including regulatory analysis), and preparing revisions of the draft guides prior to their public distribution.

NRC contract number: NRC-RES-89-067.
Contact: Alan Roecklein. Phone: 492-3740

5.3 Jack Faucett Associates, Inc.

Jack Faucett Associates was founded in 1963 to provide economic consulting services to public and private sector clients. The firm's work has covered regulatory impact analysis, environmental studies, cost/benefit studies,

industry economic research, mathematical modeling and national income accounting. The current staff of professionals includes economists, statisticians, computer scientists, industrial engineers, and regional planners.

During the past decade, the firm has completed more than seventy projects dealing primarily with environmental activities. The range of topics has been almost as broad as the environmental field itself. The projects have considered air, waste water, drinking water, toxic substances, hazardous waste, noise, radiation, litter, and thermal pollution. The emphasis has been on the economic and policy aspects of environmental protection through both regulatory and non-regulatory incentives. Analyses have included the economic impacts of current and proposed regulations, the magnitude and incidence of their costs and benefits, the techniques and costs of their enforcement, and their influence on other national objectives and programs. The firm has completed more than 50 environmental/economic impact studies on behalf of Federal agencies.

Short synopses of projects directly relevant to the scope of the solicitation are contained on the following pages.

STUDY OF THE TEMPORARY NUCLEAR WORK FORCE
IN THE UNITED STATES
FOR THE
ATOMIC INDUSTRIAL FORUM, INC.

The purpose of this study was to conduct a thorough study of the use of temporary workers by the commercial nuclear power industry. This temporary work force has grown rapidly over the past ten years as a result of the addition of operating stations, extended maintenance and replacement activities as plants age, and substantial new regulations covering plant safety design and procedures requiring large pools of workers. Prior to this study, an industry-wide consensus of the status, risk and composition of the temporary work force did not exist. The first objective of this study was thus to recommend a set of definitions for the entire work force, and to establish a detailed taxonomy of temporary workers for use in the study. Having defined the work force and related appropriate categories the size of the temporary work force was estimated for a three year period. This was accomplished by a combination of telephone surveys, mail surveys, and site visits to nuclear power reactors and contractors (or vendors) to collect the required data.

Project #307
Package 947

MEASUREMENT OF DE MINIMIS
FOR
OFFICE OF RADIATION PROGRAMS
U.S. ENVIRONMENTAL PROTECTION AGENCY

This effort supported the development of compliance strategies for regulating individual exposure to hazardous air pollutants. In establishing standards for exposure to ionizing radiation, the assumption is generally made that all exposures, no matter how small, result in some detrimental health effects. An important question to be considered in evaluating radiation protection standards is whether to include very small individual exposures in the analysis. An important input to the resolution of the question is the level of exposure, and consequently the commensurate level of risk, below which government agencies do not commit resources to drive the risk still lower. This hypothetical level of risk is defined as the de minimis level of risk.

The purpose of this project was to analyze a sample of risks in the areas of disease control, product safety, protection from natural disasters and other common areas of risk reduction activity by Federal, State and local agencies. Approximately 50 examples were selected for analysis to determine the level of government risk reduction activity associated with each risk. Risk was measured in terms of the lifetime probability of premature death. The sample cases were analyzed to establish the ranges of risk for which government activity is almost always initiated, sometime initiated and almost never initiated. The results of this analysis indicate that there is no evidence for the existence of a de minimis threshold within the observed range of risks, which extended to a lifetime risk level of one in ten million.

Project #811/3
Package 1537 (1661/1714)

PREPARATION OF THE ENVIRONMENTAL IMPACT STATEMENT
FOR THE CONSOLIDATION OF THE NUCLEAR REGULATORY COMMISSION
FOR
GENERAL SERVICES ADMINISTRATION

The Nuclear Regulatory Commission (NRC) was directed by Congress to consolidate its 2500 headquarters employees now working in eight buildings in Montgomery County, Maryland, and in one building in the District of Columbia into one location. The General Services Administration (GSA) was directed by the U.S. House of Representatives to analyze the comparative advantages of three sites in the District, and the U.S. Senate directed GSA to add three sites in Montgomery County to its considerations. GSA contracted with JFA to prepare an Environmental Impact Statement for the six alternative sites.

The chief environmental impacts that differ among sites are:

- o existing community land use and zoning,
- o proposed community long range plans,
- o public transit,
- o street and highway traffic and parking, and
- o ambient air quality and noise traffic.

The analysis included modal splits between public transit and private automobiles by the commuting employees. Residence locations of all employees (by zip codes) were used to determine the most likely commuting paths and times for each proposed location. The economic impact of each location on its immediate neighborhood and upon the behavior of its NRC employees was estimated. A fundamental issue was the economy and convenience of the organization vs. the economy and convenience of its employees.

Project 207

Package 1625

ENVIRONMENTAL IMPLICATIONS OF ALTERNATIVE
ELECTRIC UTILITY RATE STRUCTURES
FOR
U.S. ENVIRONMENTAL PROTECTION AGENCY

The objective in this study was the development of an analytical basis for policy guidance on the following questions: To what extent is present electric utility pricing policy contributing to the adverse environmental impacts from this industry? In light of adverse environmental impacts, must rate structures be redesigned in order that environmental impact be correctly priced and the burden of cleanup distributed equitably? Do the benefits from redesign of rate structures outweigh the costs?

The Jack Faucett Associates approach emphasized "second-best" marginal cost pricing. Analysis and recommendations focused on a small sample of utilities for which a data base could be assembled. On the cost side, metering, billing, and abatement costs were identified and distinguished from the "internal" costs--generation, transmission and distribution of energy. On the demand side, utilization rates and price elasticity were estimated. Expected net benefits from rate redesign using cost and demand elasticities for sample companies were estimated. Several major alternatives in rate structure were considered, including peak-period differentials, declining and inverted block, and two-part tariffs.

Project # 101
Package 1607

COST OF DECOMMISSIONING FACILITIES
HANDLING RADIOACTIVE MATERIALS
FOR
OFFICE OF RADIATION PROGRAMS
U.S. ENVIRONMENTAL PROTECTION AGENCY

This study summarized information available in the open literature on the cost of decommissioning facilities that handle or have handled radioactive materials in the U.S. A comprehensive literature search was performed using DIALOG to search the NTIS, GPO, Energyline, Congressional Information Service, and DOE Energy databases for documents containing the keywords "decommissioning," "nuclear" and "cost." A comparable search was also performed of the U.S. Department of Energy data base, Nuclear Facility Decommissioning and Site Remedial Actions, maintained by the Remedial Action Program Information Center at Oak Ridge National Laboratory.

Attention was focused on cost-related reports produced since 1973. A total of approximately 100 reports on decommissioning were reviewed.

The results of this review were presented at two levels. The higher level of presentation summarized for each category of facility the cost information available, the adequacy of the available information, and the completeness of the information. The second, more detailed level of presentation addresses each of the documents reviewed in the course of the literature search.

Project #811-2
Package 1663A

COMPLIANCE COSTS TO USERS OF
RADIOPHARMACEUTICALS UNDER NATIONAL EMISSION
STANDARDS FOR RADIONUCLIDES
FOR
OFFICE OF RADIATION PROGRAMS
U.S. ENVIRONMENTAL PROTECTION AGENCY

JFA investigated costs to users of radiopharmaceuticals resulting from implementation of EPA's proposed emission standards for radionuclides. The investigation included case studies of five users where the potential for exceeding the proposed emission limits existed. These facilities were selected by screening a large number of hospitals and nuclear pharmacies to determine which were likely to incur costs because they exceeded these limits. JFA also reviewed public comments and contacted the commenters to obtain the bases of their concerns and their suggestions of facilities to be considered. The selection was based on estimates of radionuclide usage and distances to the closest human receptors.

The results of the case studies provided estimates of radionuclide usage, levels of emissions to the environment, and distances to the nearest human receptors. Using these, maximum individual doses were estimated. The case studies also identified the controls presently used, the additional controls required to bring these facilities into compliance with the proposed standard (if not in compliance), and the estimated costs of these additional controls.

In those instances where population exposure is likely and where the local meteorology and building wake effects change diffusion estimates and thus influence the exposure, the costs of compliance for low altitude cases may be influenced also. When these influences were believed to be important, the potential changes in estimates of human exposures and the potential changes in costs of compliance were estimated.

Project #811-5
Package 1663B

FEDERAL WORKER PROTECTION FROM DIAGNOSTIC X-RAYS
FOR
OFFICE OF RADIATION PROGRAMS
U.S. ENVIRONMENTAL PROTECTION AGENCY

Under this work assignment JFA investigated the status of worker protection under federal radiation protection guidance for diagnostic x-rays and analyzed the associated economic impacts of this guidance. JFA determined the status of the radiation protection programs for diagnostic x-rays in each agency at the present time and before issuance of the presidential directive and estimated the baseline costs of implementing to the current level of protection for the purpose of estimating the impacts and benefits of the guidance. This included determining whether the agencies upgraded their levels of protection gradually or promptly and differentiation between one-time and continuing costs. JFA also estimated the cost of improving the current level of protection to complete conformance with the directive where appropriate. Approximately 25 agencies were investigated.

Project #S11-8
Package 1663C

RADIONUCLIDES: REGULATORY IMPACT ANALYSIS OF
EMISSION STANDARDS FOR ELEMENTAL PHOSPHORUS PLANTS
FOR
OFFICE OF RADIATION PROGRAMS
U.S. ENVIRONMENTAL PROTECTION AGENCY

On November 8, 1979, EPA listed radionuclides as a hazardous air pollutant under the provisions of Section 112 of the Clean Air Act. Pursuant to Section 112, EPA on April 6, 1983 proposed standards for sources of emissions of radionuclides in four categories: (1) Department of Energy facilities, (2) Nuclear Regulatory Commission licensed facilities and non-DOE Federal facilities, (3) underground uranium mines, and (4) elemental phosphorus plants. The standard proposed for elemental phosphorus plants, the subject of this analysis, was 1 curie per year of polonium-210 for each source.

Under this assignment, Jack Faucett Associates prepared EPA's regulatory impact analysis of the emission standards.

The resultant report is organized into five chapters. Chapter 1 summarizes the results of the analysis. Chapter 2 contains background information on the elemental phosphorus industry, including characteristics of demand, supply, competitive products and processes, other economic characteristics, and outlook. Chapter 3 presents the current emissions for each elemental phosphorus plant, risk levels associated with the emissions, and the cost and efficiency of each of seven technologies for controlling the emissions. Chapter 4 is a benefit-cost analysis of the standard. The chapter identifies least-cost control technologies for the plants that would be affected by the standard, describes the health benefits of controlling polonium-210 emissions, and compares costs and benefits. Chapter 5 concludes the report with an evaluation of the costs to industry of the regulation, including an analysis of the current cost structure of the industry by plant, and assesses the economic effects of the regulation.

Project #811-7
Package 1663D

LOW-LEVEL RADIOACTIVE WASTE DISPOSAL: A PRELIMINARY
REVIEW OF THE EARTH MOUNDED BUNKER AND
WESTINGHOUSE/HITTMAN CONCEPTS
FOR
OFFICE OF RADIATION PROGRAMS
U.S. ENVIRONMENTAL PROTECTION AGENCY

In this study JFA analyzed the design characteristics and costs of disposal of low-level radioactive waste by two methods: earth mounded concrete bunkers (the French system), and the Westinghouse/Hittman low-level waste disposal system. Included in the study, for each disposal alternative, were the identification of waste streams, analysis of siting requirements, and investigation of site design and operation. The study also evaluated for both systems the cost of the alternative system compared to that of conventional shallow land disposal, and the cost of the system per unit of waste disposed. Information and cost estimates were observed from the open literature and as a result of discussions with knowledgeable individuals.

Project #811-6
Package 1663E

ECONOMIC PROFILE OF THE URANIUM MINING INDUSTRY
FOR
OFFICE OF RADIATION PROGRAMS
U.S. ENVIRONMENTAL PROTECTION AGENCY

On November 8, 1979, EPA listed radionuclides as a hazardous air pollutant under the provisions of Section 112 of the Clean Air Act. On October 31, 1984, EPA published in the Federal Register an advanced notice of proposed rulemaking for National Emission Standards for radionuclide emissions from underground uranium mines. The industry profile presented in this document was developed for use in assessing the ability of underground mines to assimilate the costs of emission control measures.

JFA prepared EPA's economic profile of the industry under this assignment. The resultant report is divided into five chapters. Chapter 1 summarizes the results of the study. Chapter 2 describes the history and current status of sources of domestic uranium supply, including domestic production, inventories, and imports. Chapter 3 addresses demand for uranium, factors affecting demand, and uranium pricing. Chapter 4, Industry Structure, Conduct, and Performance, presents financial and other information on the uranium operations of each producer. Chapter 5 concludes the report with forecasts of domestic production, prices, and costs to 1990. An appendix, The Nuclear Fuel Cycle, explains the relationship between uranium mining and other activities in the production of nuclear fuel for utilities.

Project #311-13
Package 1663F

RADIONUCLIDES: REGULATORY IMPACT ANALYSIS OF
EMISSION STANDARDS FOR URANIUM MILLS (NESHAP)
FOR
OFFICE OF RADIATION PROGRAMS
U.S. ENVIRONMENTAL PROTECTION AGENCY

Under this assignment, Jack Faucett Associates prepared EPA's Regulatory Impact Analysis for proposed emission standards for uranium mill tailings at active mill sites. The study consisted of four parts. First, the project team developed a detailed profile of the uranium milling industry, including characteristics of demand, supply, competitive products and processes, other economic characteristics, and outlook. Second, the current emissions characteristics of each uranium mill plant, risk levels associated with the emissions, and the cost and efficiency of each of seven technologies for controlling the emissions were evaluated. Third, a benefit-cost analysis of the standard was performed including identification of the least-cost control technologies for the mills that would be affected by the standard, description of the health benefits of controlling emissions, and comparison of costs and benefits. The final phase of the study was an evaluation of the costs to industry of the regulation, including an analysis of the current cost structure of the industry by plant, and an assessment of the economic effects of the regulation.

Project #811-14
Package 1663G

TABLE OF POSSESSION AND AIR CONCENTRATION
FOR EXEMPTIONS TO STANDARDS FOR RADIONUCLIDES
FOR
U.S. ENVIRONMENTAL PROTECTION AGENCY

In February 1985, the Environmental Protection Agency (EPA) promulgated standards for radionuclides under Section 112 of the Clean Air Act. These National Emission Standards for Hazardous Air Pollutants (NESHAPs) were applicable to three source categories: (1) Department of Energy facilities; (2) Nuclear Regulatory Commission --licensed and non-DOE Federal facilities; and (3) elementary phosphorus plants. A NESHAP was promulgated for a fourth source category, underground uranium mines, in April of the same year.

The NESHAP for NRC-licensed and non-DOE Federal facilities included a clause which exempted facilities from reporting under Section 61.10 of the Clean Air Act, but the numerical values for exemption which were to be provided in Table 1 of Paragraph 61.106 of the NESHAP were reserved in the final rulemaking. The purpose of this project was to define these numerical values as part of an overall effort to implement the NESHAP.

The National Council on Radiation Protection and Measurement (NCRP) developed screening procedures which would allow a facility covered by the NESHAP to determine compliance with the radionuclide emissions standard without having to develop the detailed input data required by the Clean Air Act Codes (CAAC). However, these screening procedures are rather complicated, and it could be difficult for some facilities to perform the screening calculations without expending significant resources. The objective of this Work Assignment was to develop Tables of Air Concentrations and Possession Limits which would provide NRC licensees possessing small quantities of radionuclides a very simple method for determining that they were exempt from the reporting requirements of the NESHAP.

Project #341/8
Package 1663H

DETERMINE COST AND IMPACT OF PROPOSED
RADIATION PROTECTION GUIDANCE FOR WORKERS
AND REVISIONS TO 10 CFR PART 20
FOR
OFFICE OF RADIATION PROGRAMS,
U.S. ENVIRONMENTAL PROTECTION AGENCY

The purpose of this study was to estimate the potential cost impacts of the proposed guidance for worker protection from exposures to ionizing radiation and revisions to 10 CFR 20. The study was designed to comply with the OMB procedures for all cost components of the Executive Order 12291 requiring thorough economic analysis of proposed government regulation. This proposed EPA guidance makes adjustments in the existing guidance that would lead to changes in the cost of compliance by affected industry segments. In this study, a series of case studies were conducted, and the data collected through these were combined with secondary data and other studies to develop aggregate potential cost of compliance impacts.

The study included several components including 1) develop procedures for selecting case studies; 2) select significantly impacted industries; 3) identify representative establishments within each impacted industry; 4) conduct case studies; and 5) utilize case study and other data to estimate the cost of compliance with the new worker protection guidance.

Over 25 case studies were conducted including on-site visits to nuclear power plants (4), LEF facilities (2), uranium mill, UF⁶ conversion facility, hospitals (4), university reactor, industrial radiographer (3), source producers (2), nuclear pharmacy and DOE facilities (2).

Project #294
Package 2047A

EVALUATE THE COST IMPACTS OF PROPOSED REVISIONS TO OCCUPATIONAL
EXPOSURE REGULATIONS CONTAINED IN 10 CFR PART 20
FOR
OFFICE OF REGULATORY RESEARCH
NUCLEAR REGULATORY COMMISSION

This study evaluated the cost impacts of proposed changes in the regulation of occupational exposure contained in 10 CFR Part 20. The study covered all NRC licensees and NRC Agreement State licenses. The objective was to estimate for detailed components of the guidance the cost for classes of licensees. Components included:

- o Annual exposure limits
- o Weighted internal exposures
- o Training
- o Recordkeeping
- o Protection for the unborn
- o Planned special exposures

These components were evaluated for the changes from the existing regulation as they would affect individual industries. A series of 27 case studies were conducted where a senior economist and senior health physics professional visited establishments to evaluate the existing programs and to assess the opportunity for compliance with the revisions to 10 CFR Part 20 and the cost of compliance. Industries for which case studies were conducted were:

- o Commercial Power Reactors (5)
- o University Reactors (1)
- o Hospitals (4)
- o Private Medical Practices (2)
- o Industrial Radiography (3)
- o Well Logging (1)
- o Manufacturing & Distribution of Radiation Services (2)
- o Nuclear Pharmacies (1)
- o Dental Practice (1)

Project #294
Package 2047B

ECONOMIC ANALYSIS:
PROPOSED NESHAPS FOR RADIONUCLIDES
FOR
OFFICE OF RADIATION PROGRAMS
U. S. ENVIRONMENTAL PROTECTION AGENCY

On November 8, 1979, EPA listed radionuclides as a hazardous air pollutant under the provisions of Section 112 of the Clean Air Act. In 1988, EPA reviewed and updated its studies of all radionuclide source categories. Sandy Cohen and Associates was responsible for the Background Information Document on each of the twelve chapters, and Jack Faucett Associates prepared the Regulatory Impact Analyses.

The twelve source categories studied were:

- o Uranium Fuel Cycle Facilities
- o Underground Uranium Mines
- o Inactive Uranium Mill Tailings Sites
- o Licensed Uranium Mill Tailings Sites
- o High-Level Waste Disposal
- o Department of Energy Facilities
- o Department of Energy Radon Sites
- o Elemental Phosphorus Plants
- o Phosphogypsum Stacks
- o Coal-Fired Boilers
- o NRC-Licensed and Non-DOE Federal Facilities
- o Surface Uranium Mines

Each chapter was organized into five sections. Section 1 summarized the results. Section 2 contained background information of the various industries or facilities, including characteristics of demand, supply, competitive products and processes, other economic characteristics, and forecasts. Section 3 presented the current emissions for each source category, by site, the risk levels associated with the emissions, and the cost and efficiency of various potential technologies useful for controlling emissions. Section 4 was an analysis of the costs and benefits of the proposed standards. Generally, the Section 4 identified a least-cost technology, described the health effects of using this technology and compared the cost and the benefits of same. Section 5 concluded each chapter with an evaluation of the economic impacts, primarily on industry, of the proposed regulation. An analysis of the potential effects of the standard on small business was also undertaken for each source category.

ENVIRONMENTAL ACOUSTICS STUDIES AT THE
SALT RADIOACTIVE WASTE REPOSITORY SITE
FOR
U.S. DEPARTMENT OF ENERGY
AND
NUS CORPORATION

Jack Faucett Associates assisted NUS Corporation to win, through competitive bidding, a five-year contract to perform studies in environmental acoustics, ionizing radiation, visibility, air quality, and meteorology at the salt site for the U.S. Department of Energy's Civilian Radioactive Waste Management program. Jack Faucett Associates is the subcontractor responsible for advising and assisting NUS in the following work:

- collecting sound level baseline data,
- measuring sound attenuation characteristics,
- performing long-term monitoring,
- assessing and predicting impacts,
- preparing documents to support license applications,
- preparing environmental impact statements, and
- providing technical support.

The work includes an extensive field measurement program in Deaf Smith County, Texas. Measurements, using different metrics, are made of the hourly, daily, weekly, seasonal, and yearly variations in the sound levels both from sources associated with site preparation, operation, and decommissioning, and from sources not associated with these activities. The impacts the sound levels will have on residents, workers, visitors, domestic animals, and wildlife are predicted, and mitigation methods are evaluated. Propagation measurements are made at different frequencies over long distances under various meteorological conditions to determine the coefficients in propagation equations.

Project #339

Package 2217 (1493, 1667)

PAPERWORK IN NUCLEAR INDUSTRY
FOR
COMMISSION ON FEDERAL PAPERWORK

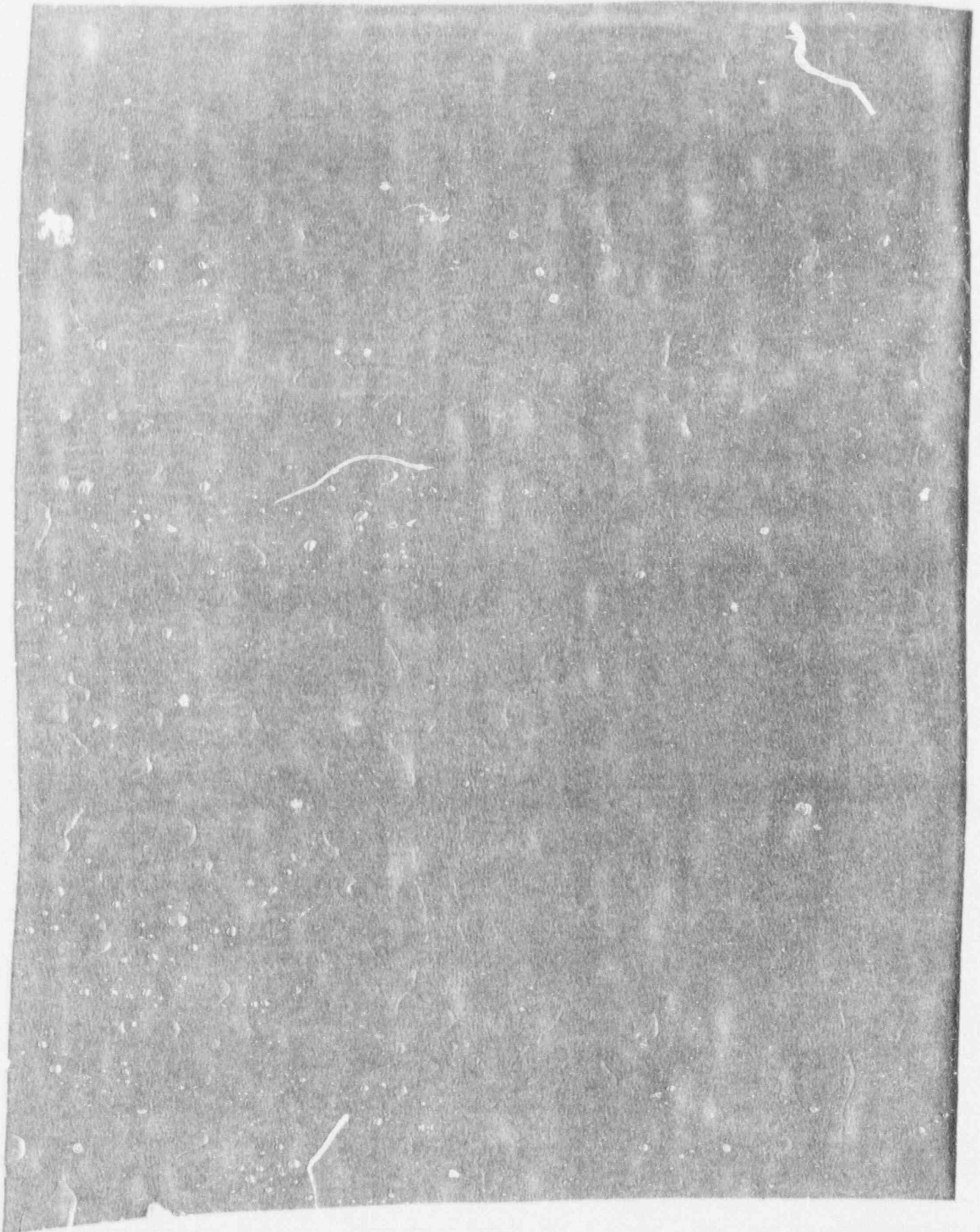
The purpose of this study was to identify the paperwork, estimate the burden associated with it, and suggest improvements for reducing the burden and increasing effectiveness. The study focused on construction and licensing of nuclear power plants throughout the country. Determination of the relationships and exchanges of information among the Nuclear Regulatory Commission, state regulatory bodies, and local governments was essential for understanding the flows of and reasons for the paperwork.

The cost to the applicant and all major components of paperwork required to comply with environmental and safety regulations were identified. Variations in applicant cost and the paperwork requirements were determined from four case studies on nuclear plants at different stages in the construction and licensing process. Analysis of applicant costs included completion of paperwork and the cost of delays in bringing the nuclear plant into operation while the paperwork was being completed. Regulations and requirements by Federal, State, and local governments were included.

Study results included short-term and long-term recommendations to reduce excessive paperwork without sacrificing a desired level of environmental control and safety.

Project #168
Package #133

6. MANAGEMENT CONTROLS



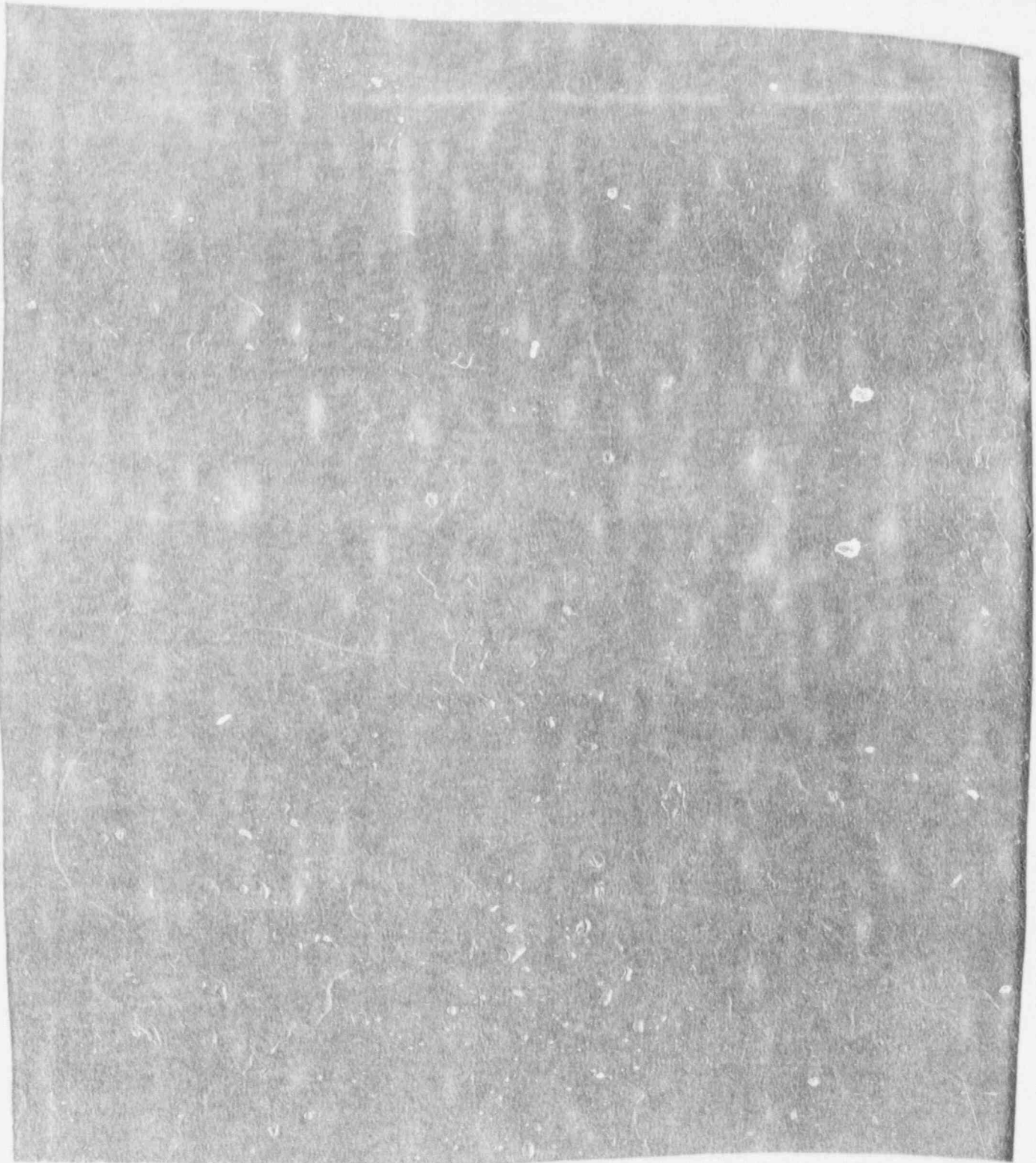
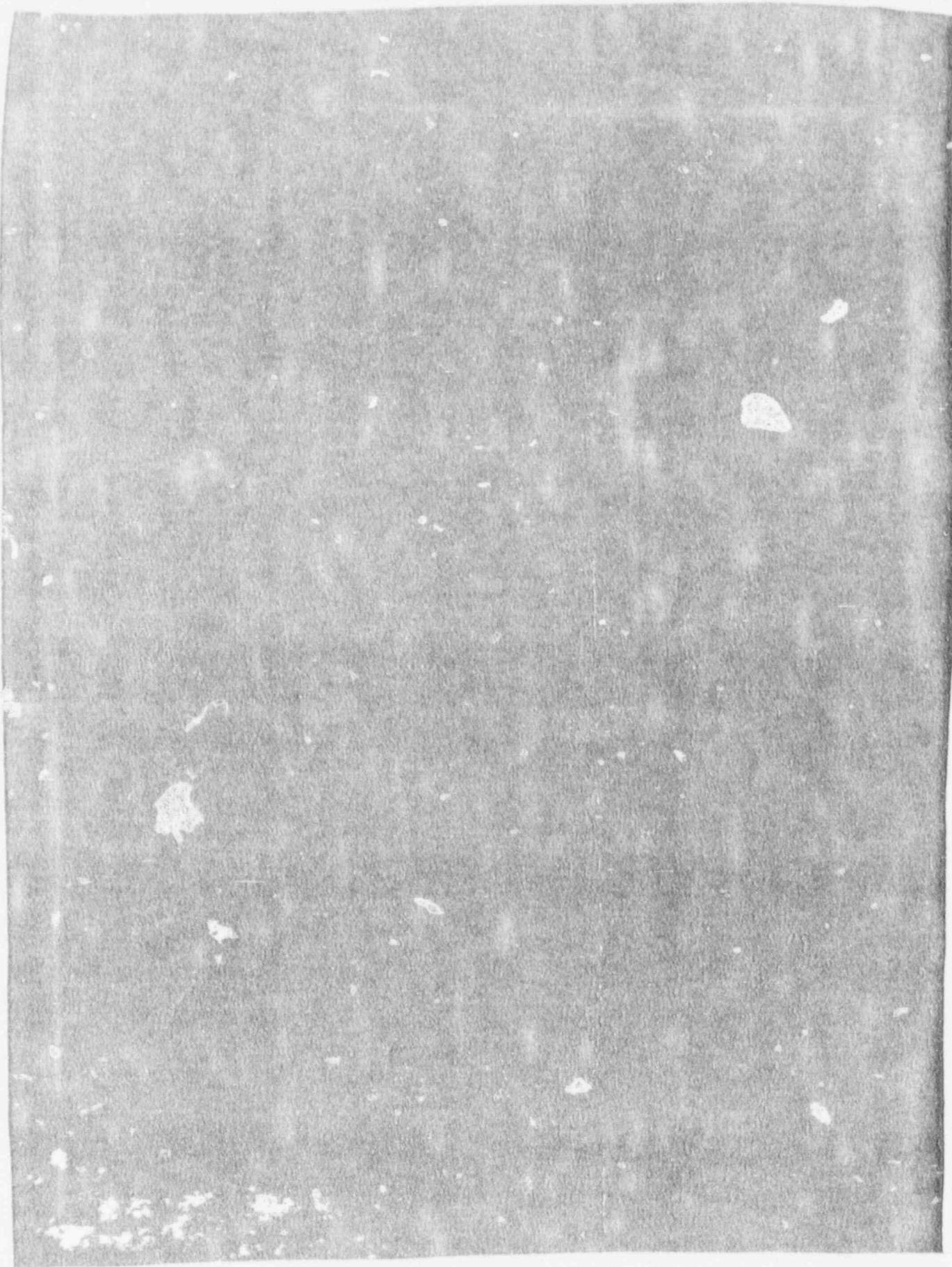
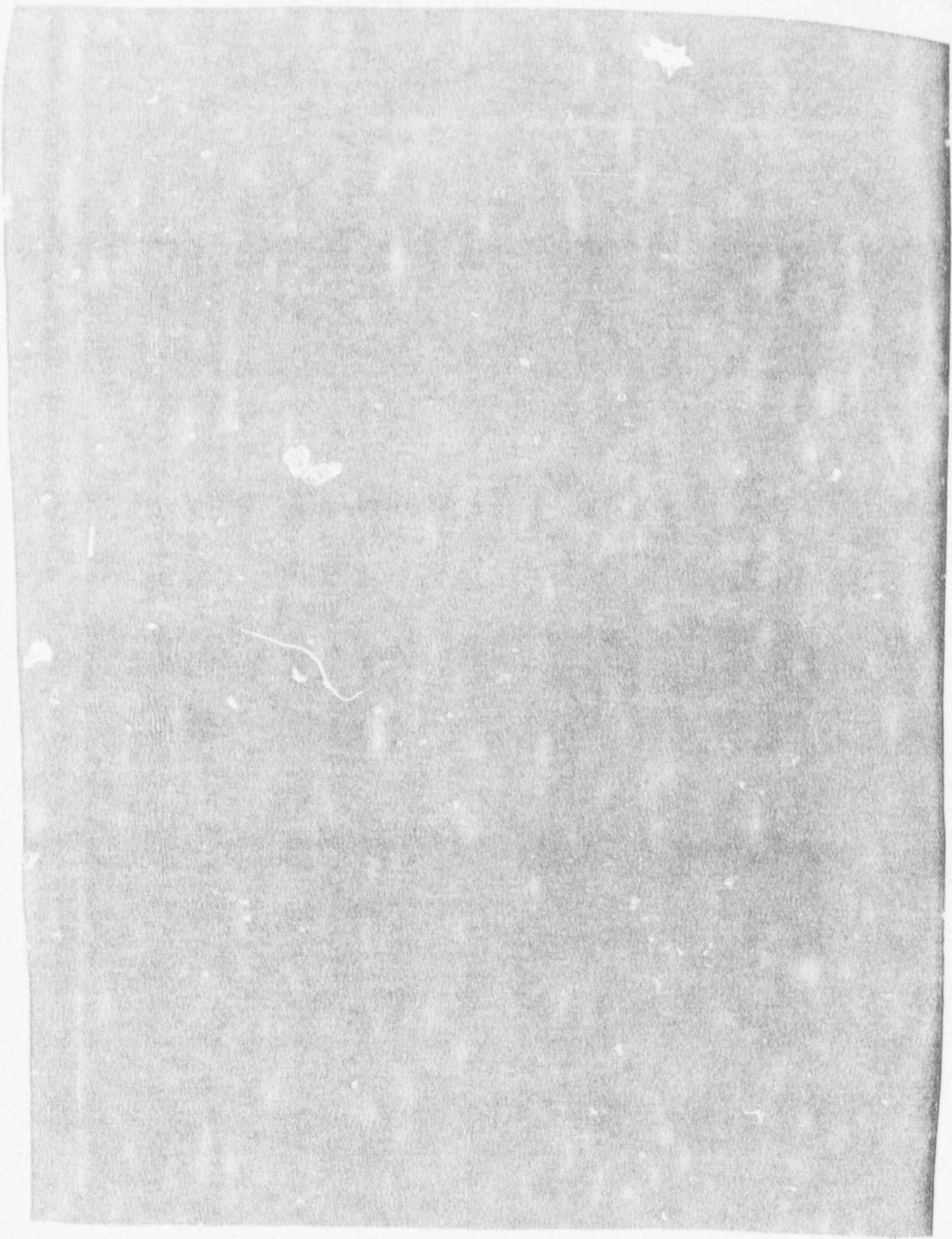
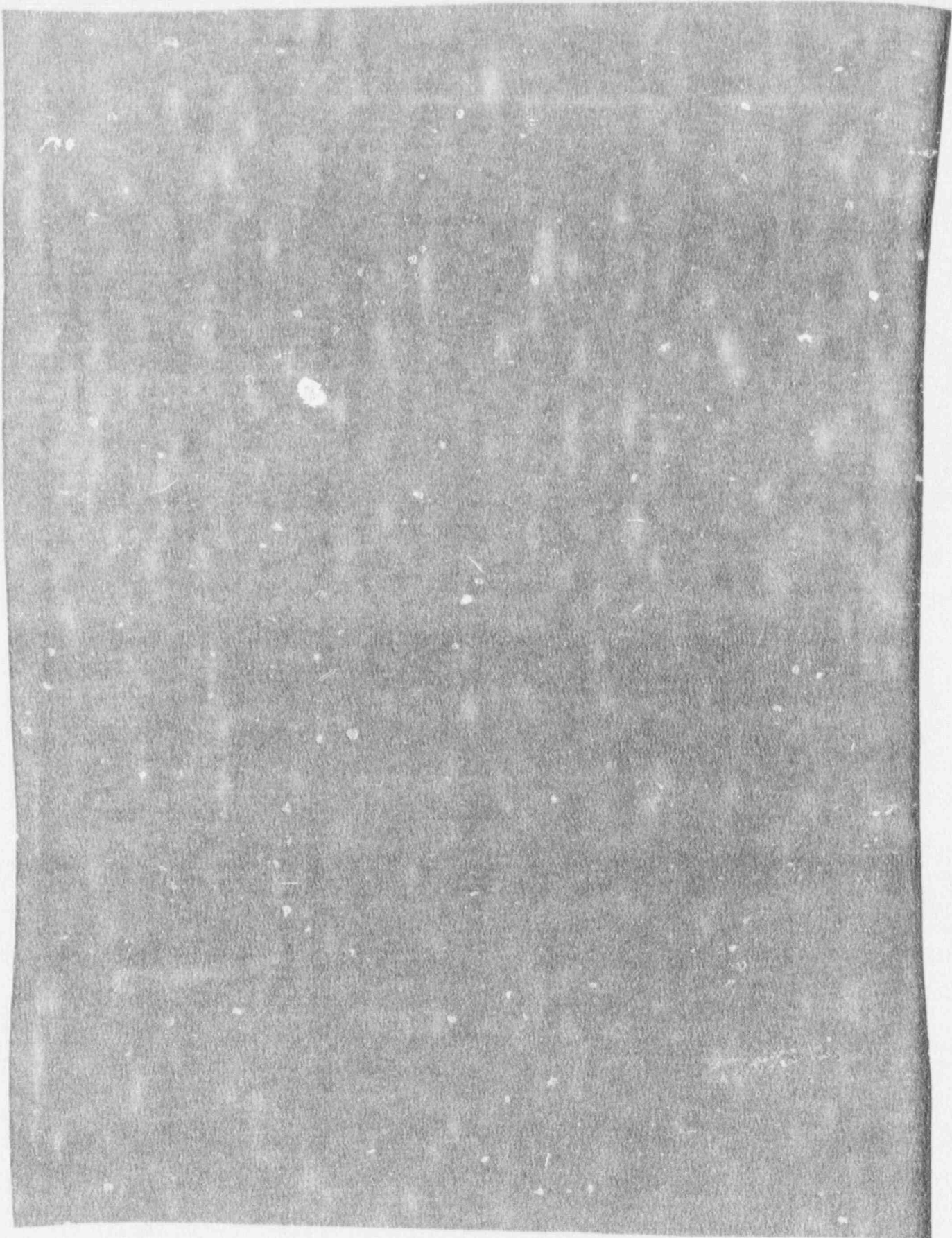
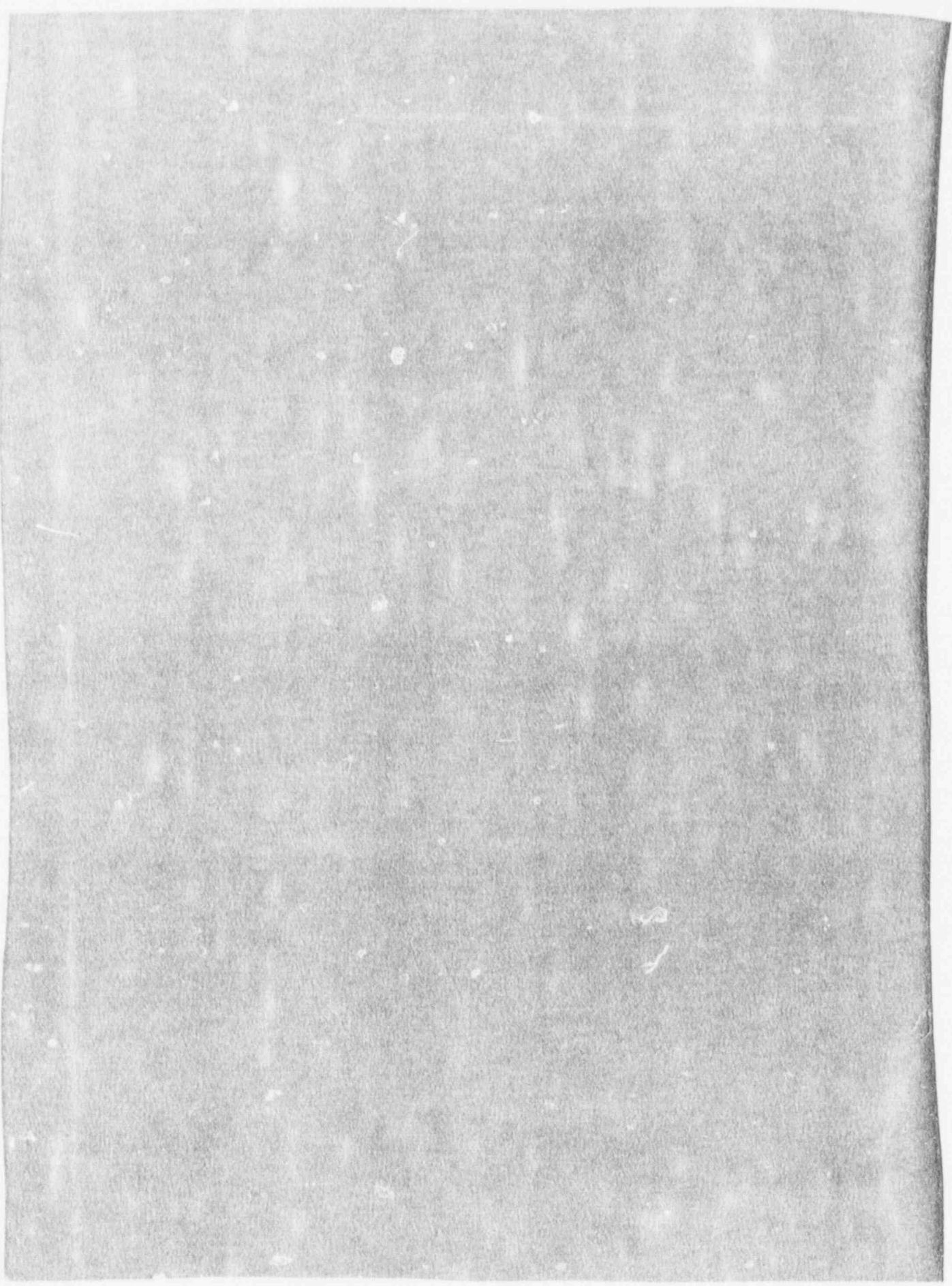


Figure 6-1: Organization Structure

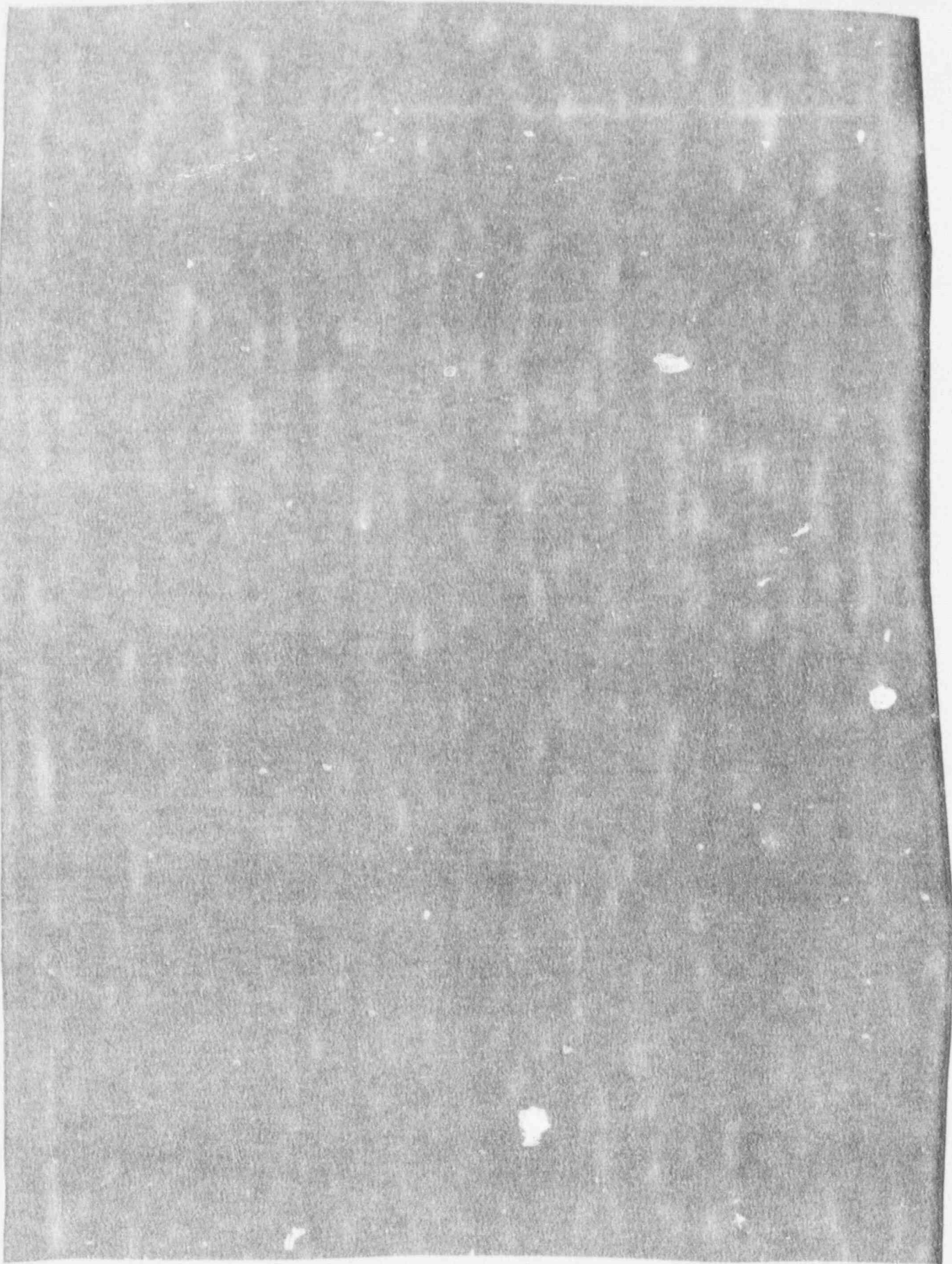


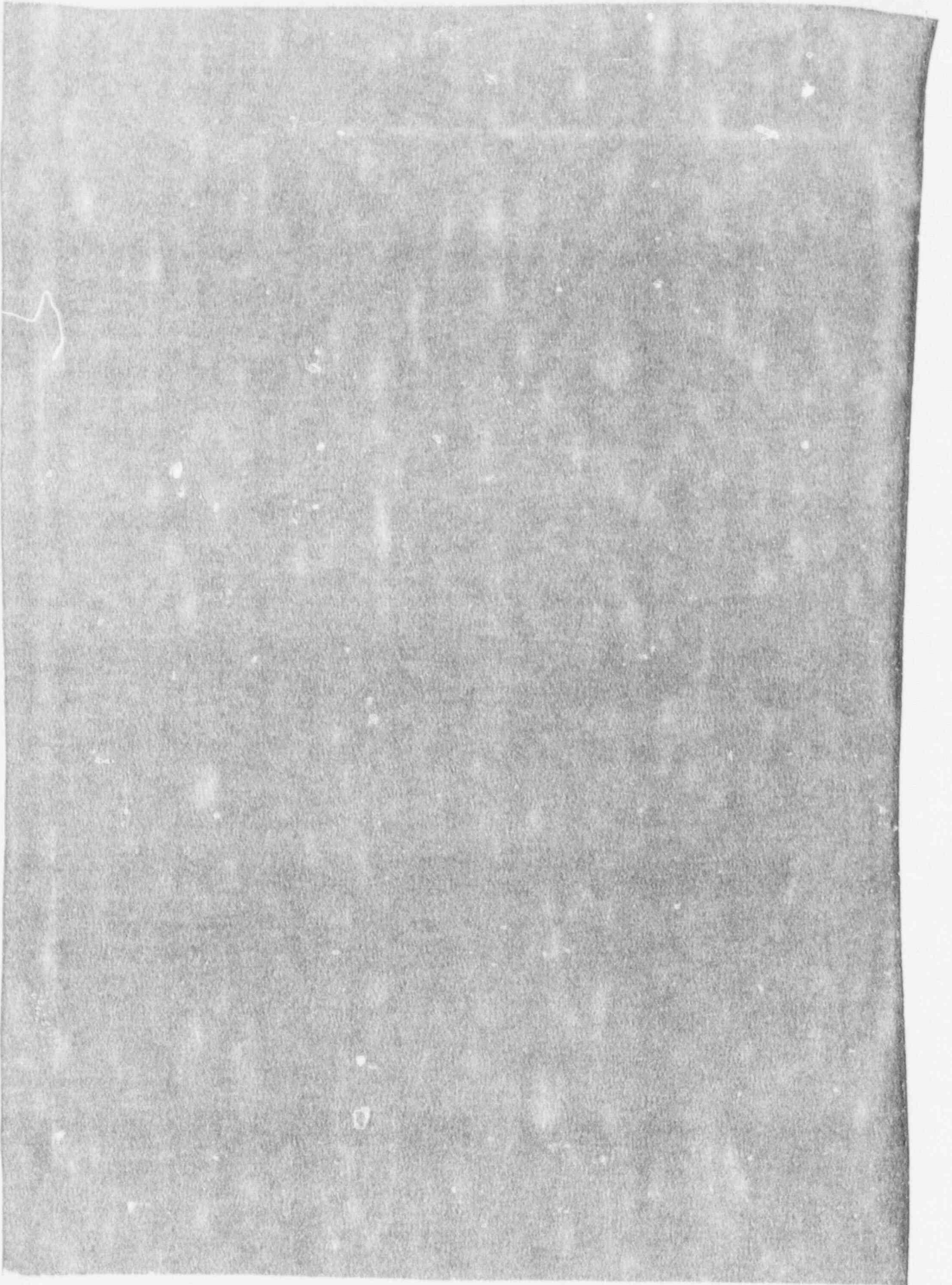


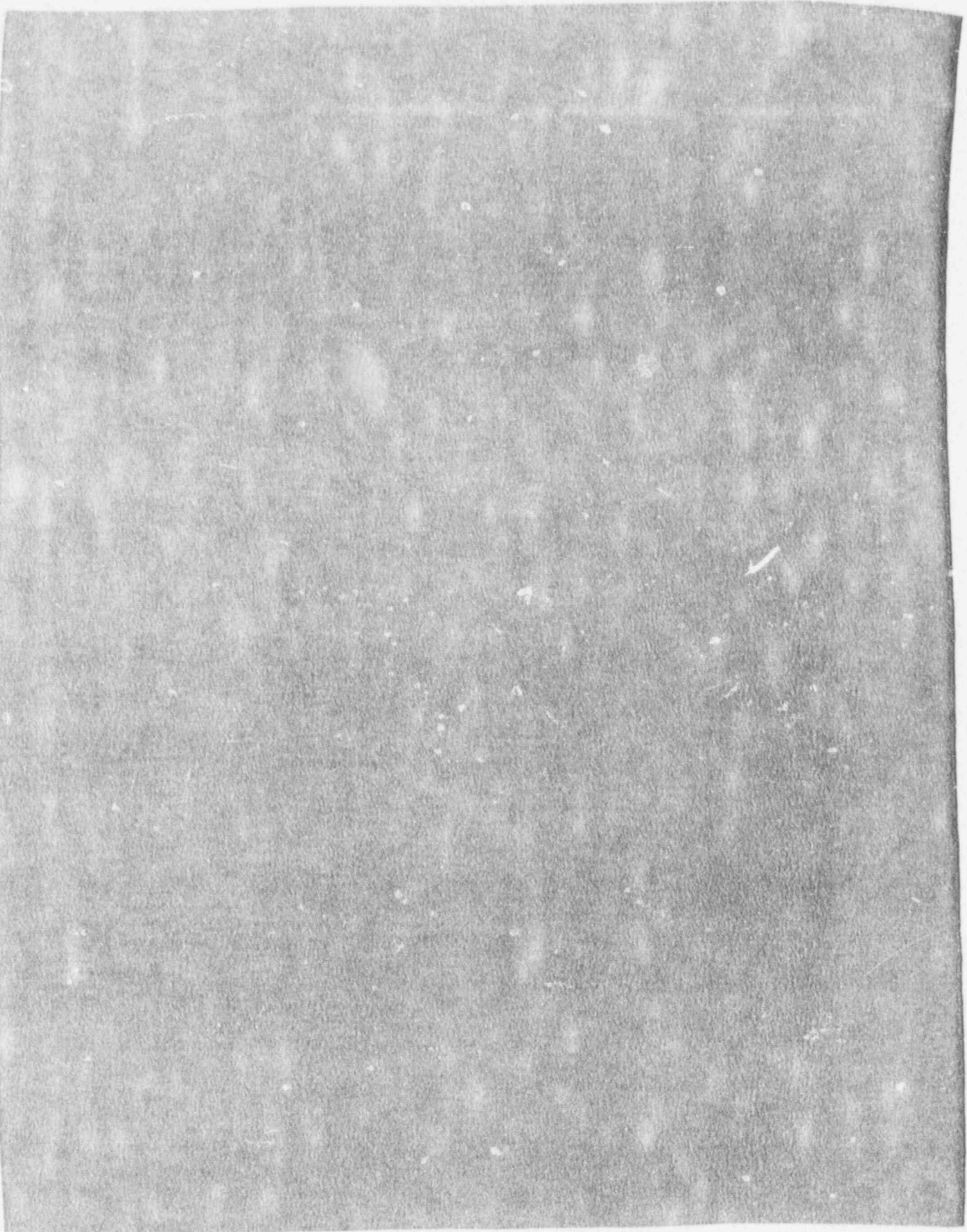


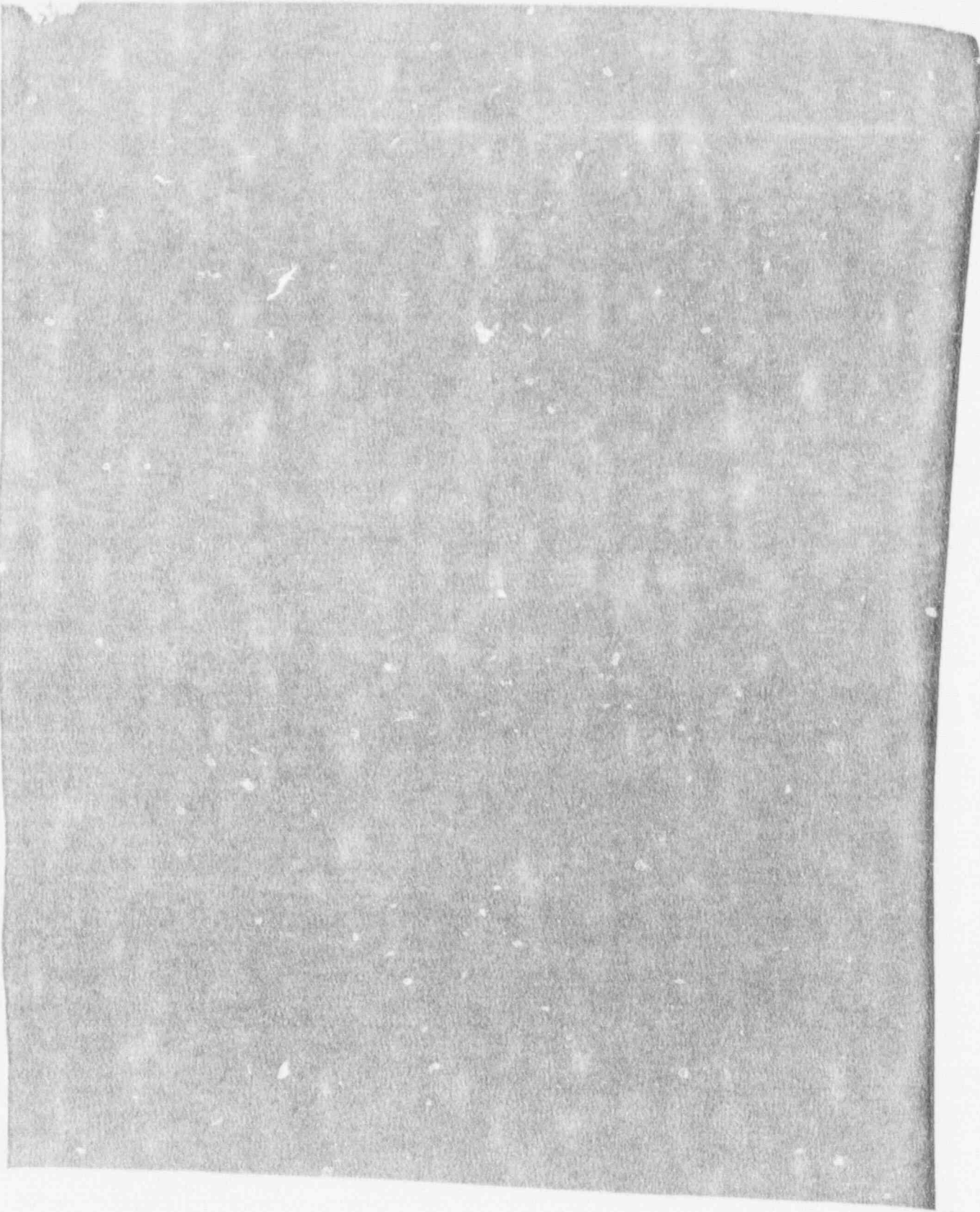


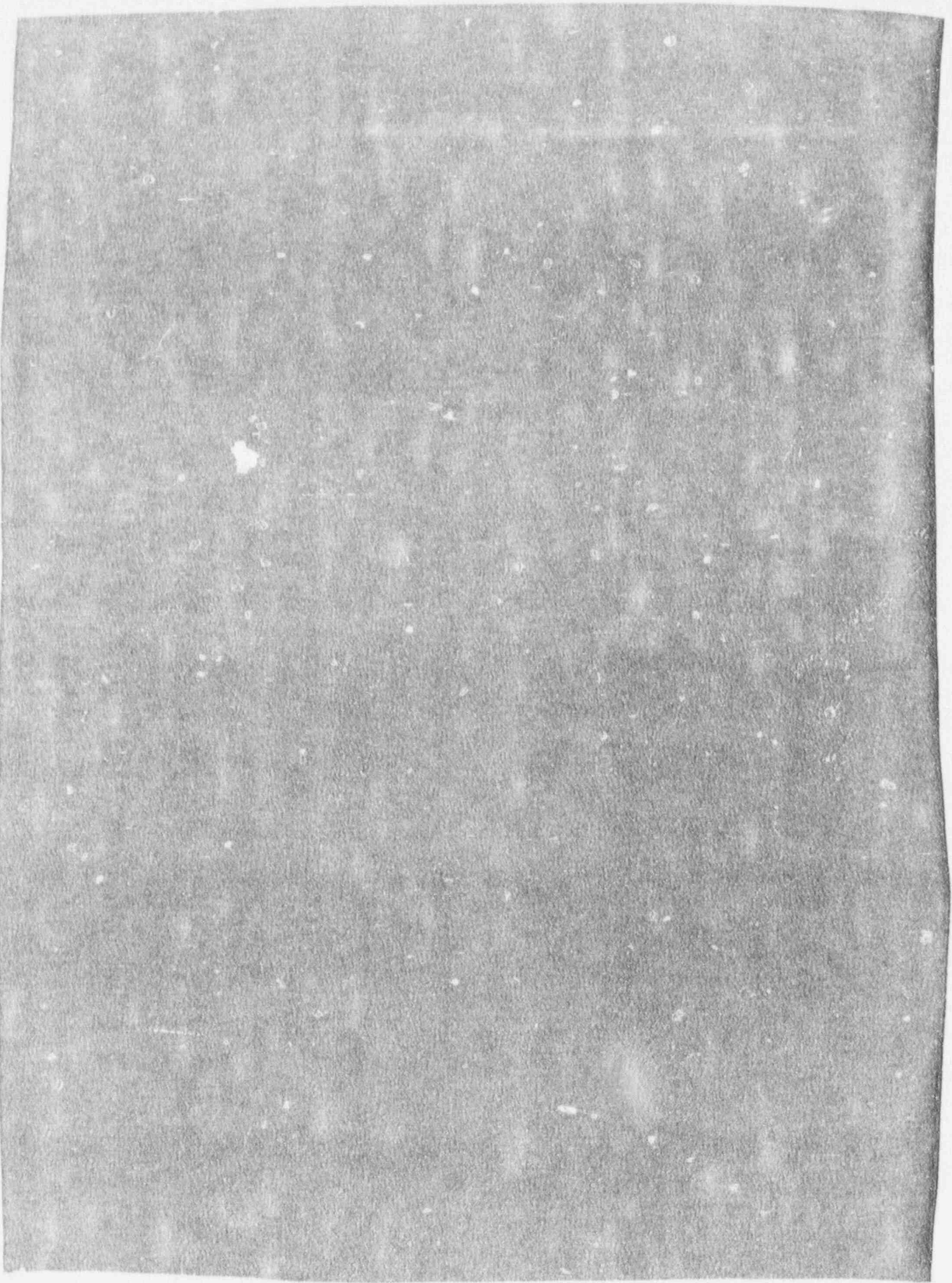


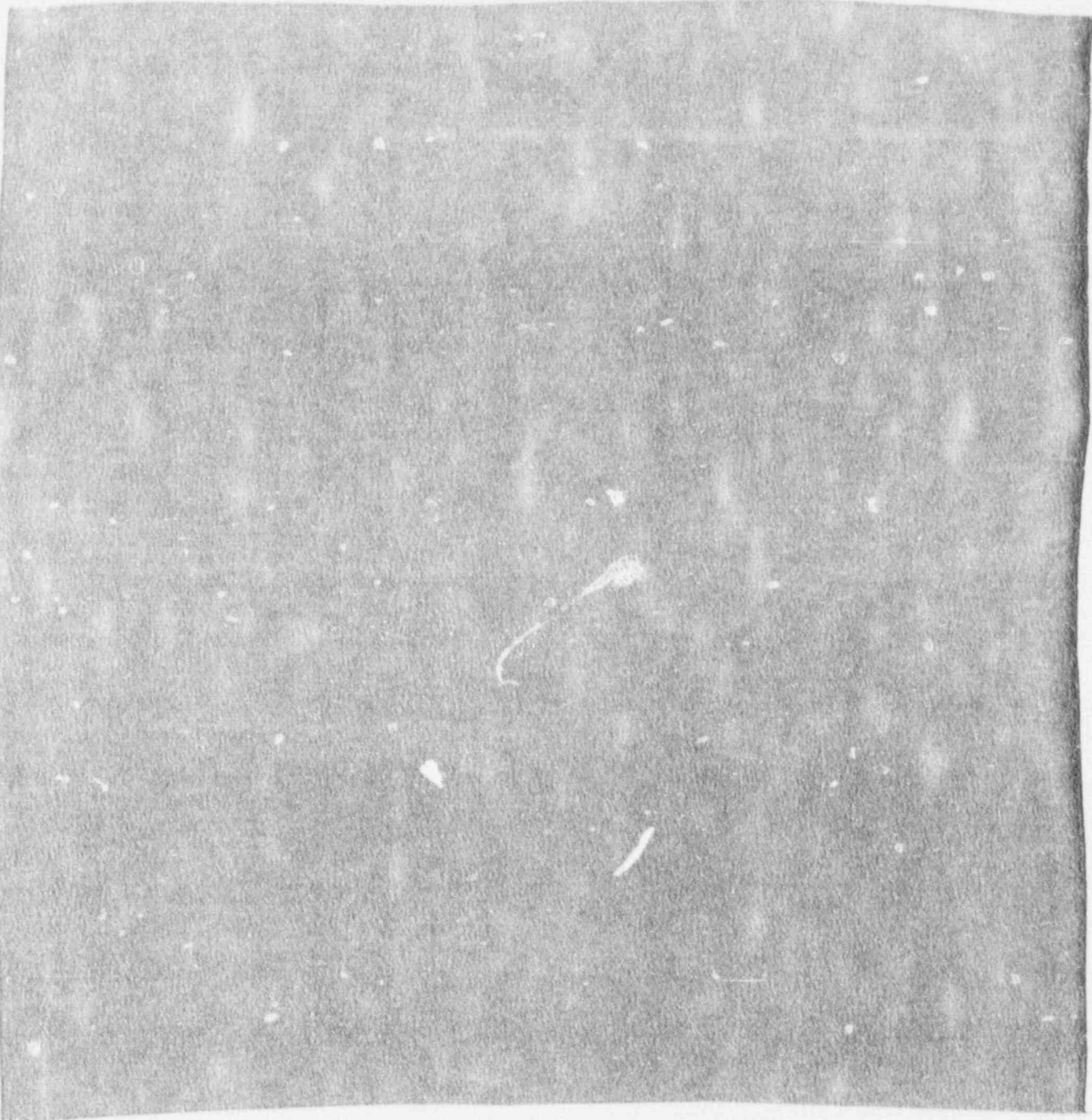














APPENDIX B. LETTERS OF COMMENDATION FROM SC&A's CLIENTS

The best measure of the capabilities of a firm is the reputation it has with its clients. As the following letters of commendation attest, SC&A's clients hold our firm and our Associates in the highest esteem.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

DEC 17 1986

Dr. Sandy Cohen
SC&A, Inc.
8200 Riding Ridge Place
McLean, VA 22102

Dear Dr. Cohen:

I want to thank you, and all those who participated on behalf of SC&A, for your effective contribution to the Cost and Statistical Analysis Staff (CSAS) of the U.S. Nuclear Regulatory Commission (NRC).

In late 1983, at the direct urging of the Commission, the Cost Group was established to provide overall direction and oversight to cost analysis issues associated with regulatory impact analyses (RIA). As you are aware, the development of RIA's in support of regulatory requirements has become an increasingly important and highly visible activity within the NRC.

Through your contributions, the CSAS has instituted a generic cost estimating methodology that enables the NRC to generate meaningful cost estimates in a highly efficient manner. Your efforts with respect to specific regulatory requirements have also resulted in high quality products that have played an important role in NRC's decision making process. Your commitment to this contract, your innovative and intelligent approach to each of the tasks assigned, and your responsiveness to NRC needs, oftentimes in the face of very tight scheduling requirements, are all greatly appreciated.

Sincerely,

A handwritten signature in cursive script that reads "Sidney E. Feld".

Sidney E. Feld, Chief
Cost and Statistical Analysis Staff
Division of Budget and Analysis
Office of Resource Management

Atomic Industrial Forum, Inc.
7101 Wisconsin Avenue
Bethesda, MD 20814-4805
Telephone: (301) 654-9260
TWX 7108249602 ATOMIC FOR DC

National
Environmental
Studies
Project

A. Scott Leiper
Project Manager

May 28, 1987

To: NESP Task Force on "Dose Estimating Software"
Subject: May 19 meeting results

The Task Force met on May 19 at the Gaithersburg office of Bechtel Power Corporation for a demonstration of the software designed by SC&A. Both Sandy Cohen and Don Loomis, the programmer, were present. A list of the Task Force members who attended the meeting is enclosed.

Those present seemed to find the software well designed and user-friendly. A few minor changes were suggested in order to make the package more adaptable to the end-user.

Questions did arise concerning legal implications and response to inquiries regarding the software. These matters are still being discussed.

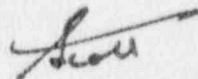
After the modifications proposed at the meeting have been made, the software will go through a final field testing at a utility which has a representative on our Technical Advisory Group (TAG). This final test and review will serve as TAG approval for publication.

The projected time for publication as a NESP report is early August. It will consist of a user's manual and both a compiled and uncompiled version of the program. We plan to distribute the report in a three-ringed binder in order to accommodate the plastic diskette sleeves and to allow the user to add his own notes to the manual.

SC&A has done another really first rate job for us and we are all looking forward to the completion of this important and useful project.

Please call if you have any questions or concerns.

Sincerely,



ASL:pmm
Enclosure

cc: Sandy Cohen



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 3 1983

Mr. Sanford Cohen
SC&A, Inc.
8200 Riding Ridge Place
McLean, Virginia 22102

Dear Sandy:

I would like to take this opportunity to thank you for your high-quality performance on the occupational exposure study. Your company's energy and enthusiasm for gathering the appropriate information and performing the required tasks has made this a very thorough study, as evidenced by your well-written reports. Your responsiveness to our needs during the course of the project created a cordial and productive atmosphere within which to conduct this study. It was a pleasure working with you.

Sincerely,

A handwritten signature in cursive script that reads "Andrew J. Leiter".

Andrew J. Leiter

ARGONNE NATIONAL LABORATORY

3700 SOUTH CASS AVENUE, ARGONNE, ILLINOIS 60439

November 20, 1984

Dr. Sanford Cohen
SC&A, Inc.
8200 Riding Ridge Place
McLean, VA 22102

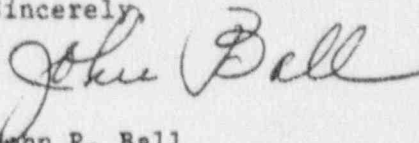
Dear Dr. Cohen:

The NRC has recently published NUREG/CR-3971, "A Handbook for Cost Estimating." The publication of this report marks the successful completion of the project to which you were a major contributor. As you are aware, this project was established amid some skepticism by our NRC sponsors that any useful tool could be developed to assist the NRC analyst in the complex task of estimating the national cost of generic requirements. Prior to publication, this report was reviewed extensively within the NRC and was submitted to outside peer review by the Atomic Industrial Forum. The comments received from the reviewers were very complimentary in terms of the technical content and usefulness of the methods presented in the report.

The success of this project was due, in large part, to your efforts in helping to develop the cost model and in characterizing the functional responses for the model and to your sound professional judgment which helped keep the project scope within bounds. Your contributions to the presentations which we made to the sponsors over the course of the project were instrumental in maintaining strong and effective communication with the sponsors. I want to commend you for the quality of your contribution to this project and for your willingness to contribute to activities that went beyond the scope of your contract.

I look forward to working with you again.

Sincerely,



John R. Ball
Project Manager,
Special Projects and
Industrial Applications Group
Energy & Environmental Systems Division

JRB/jc



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

JAN 24 1983

Mr. Sanford Cohen
S. Cohen and Associates, Inc.
8200 Riding Ridge Place
McLean, VA 22102

Dear Mr. Cohen:

Sandy

I have received the several copies of the report "Cost of Compliance with Occupational Exposure Revisions to 10 CFR Part 20" which Jack Faucett Associates and SCA have recently completed for us. In my opinion, it represents the best data base for a value/impact statement that I could hope to get at this time, particularly under the monetary restraints in effect. Your informal discussions with me were informative and timely. They permitted many revisions in the working drafts to be made at the early development stages and resulted in a more efficient rulemaking.

I have enjoyed working with you in the past and hope that our technical efforts will result in our working together in the future. Best wishes for your continued success.

Sincerely,

A handwritten signature in cursive script, appearing to read "Bob".

Robert E. Baker, Task Leader
10 CFR Part 20 Revision
Health Effects Branch
Office of Nuclear Regulatory Research

TECHNOLOGY ASSESSMENT BOARD

TED STEVENS, ALASKA, CHAIRMAN

MORRIS K. UDALL, ARIZ., VICE CHAIRMAN

IRIN G. HATCH, UTAH

GEORGE E. BROWN, JR., CALIF.

CHARLES MCC. MATHIAS, JR., MD.

JOHN D. DINGELL, MICH.

ROBERT M. KENNEDY, MASS.

LARRY WINN, JR., KANS.

FRANK P. MULLINS, S.C.

CLARENCE E. MILLER, OHIO

COOPER EVANS, IOWA

JOHN H. GIBBONS

Congress of the United States

OFFICE OF TECHNOLOGY ASSESSMENT

WASHINGTON, D.C. 20510

JOHN H. GIBBONS
DIRECTOR

January 19, 1983

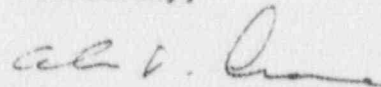
Mr. Sanford Cohen
SC&A, Inc.
8200 Riding Ridge Place
McLean, Virginia 22102

Dear Mr. Cohen:

We have now received the final report of your study for us on nuclear reactor regulation. The report clearly reflects a commitment to quality and thoughtfulness all too rare in contractor reports. Your effort has made a significant contribution to our project and will help raise the level of debate on regulatory reform. It is especially noteworthy that this report was produced within the original schedule and budget. Your presentations at the workshop were also quite effective.

I look forward to working with you again in the future.

Sincerely,



Alan T. Crane
Project Director

Atomic Industrial Forum, Inc.
7101 Wisconsin Avenue
Bethesda, Maryland 20814
Telephone: (301) 654-9280
TWX 7108249602 ATOMIC FOR DC

National
Environmental
Studies
Project

Melinda S. Renner
Assistant Project Manager

July 26, 1984

Dr. Sanford Cohen
SC&A, Inc.
8200 Riding Ridge Place
McLean, VA 22102

Dear Dr. Cohen:

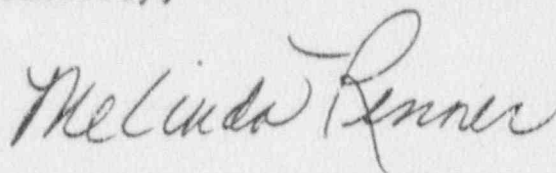
I am pleased to forward for your files the enclosed bound copies of our report, "Characterization of the Temporary Radiation Work Force at U.S. Nuclear Power Plants" (AIF/NESP-028), for which you acted as co-principal investigator.

You and your staff at SC&A, particularly David Goldin, performed in a very professional and responsible manner throughout the course of this contract, consistently meeting deadlines and delivering well-written interim and final reports. You conducted the data gathering effort in a manner that was unobtrusive to utility staffs and actually generated more interest in our final product.

The industry Task Force for this study appreciated the enthusiasm you demonstrated during the project. I hope NESP may have the opportunity to work with you again in the future.

Thank you for a job well done.

Sincerely,



MR:mm
Enclosure

cc: Joel I. Cehn



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 3 1989

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

Larry J. Coe, Senior Project Manger
S. Cohen and Associates
8200 Riding Ridge Place
McLean, Virginia 22102

Dear Mr. Coe:

Many thanks for your contribution to the "Technical Background Supplement in Support of Rulemaking Adjustment Activities for Reportable Quantities of Radionuclides." Your diligent work on the analysis of the risk from coal and coal ash piles due to radionuclide releases was important to the rule development process. The report was technically excellent, and, considering the complexity of the issues involved, it was completed in an extremely timely fashion which must have cost you many evening and weekend hours. Your enthusiasm and responsiveness to the concerns of the regulatory development workgroup made it a pleasure to work with you. We commend you highly on a job well done.

Sincerely,

A handwritten signature in cursive script that reads "Henry L. Longest II".

Henry L. Longest II
Director

Office of Emergency and Remedial Response

A handwritten signature in cursive script that reads "Richard Guimond".

Richard Guimond
Director

Office of Radiation Programs

cc: Sandy Cohen, SC&A



Electric Power
Research Institute

8 January, 1987

Mr. Sanford Cohen
S. Cohen and Associates, Inc.
8200 Riding Ridge Place
McLean, Virginia 22102

SUBJECT: EFFORTS BY STUART K. BEAL ON EPRI PROJECT
RP 2160-8

Dear Mr. Cohen:

EPRI takes this opportunity to thank you and Mr. Stuart K. Beal for Stu's outstanding performance on EPRI project RP 2160-8.

The final report, "A Model of Sludge Behavior in Nuclear Plant Steam Generators," EPRI NP-4620, provides a new mathematical model with important insights into the processes by which large amounts of sludge accumulate on the tubesheets of PWR steam generators. The creative and resourceful approaches used by Stu to identify, model, and analyze this complex subject is most appreciated. Again, thank you for the fine work by Stu Beal.

Sincerely,

C. Lamar Williams

C. Lamar Williams, Project Manager
Steam Generator Project Office

CLW:vrt99

cc: Stuart K. Beal



Department of Energy
Washington, D.C. 20545

January 25, 1983

Dr. Sanford Cohen
SC&A, Inc.
8200 Riding Ridge Place
McLean, Virginia 22102

Dear Dr. Cohen:

Thank you for your note and very great congratulations on getting through the impossible first year.

I can say nothing but good things about your work for HERAP. Your reports have been: sharply targeted; perceptive; on time; and extremely useful.

I look forward to seeing you at Contractor IV.

Sincerely,

A handwritten signature in dark ink, appearing to read "Nat".

Nathaniel F. Barr, Manager
Health and Environmental Risk
Analysis Program
Human Health and Assessments
Division
Office of Health and Environmental
Research, Office of Energy Research