SAB95001

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

NOV 10 1994

OFFICE OF THE ADMINISTRATOR
SCIENCE ADVISORY BOARD

MEMORANDUM

SUBJECT: FY94 Edition of the Annual Report of the SAB Staff

FROM: Donald G. Barnes
Staff Director
Science Advisory Board (1400)

TO: See Addressees Below

Attached you will find the FY94 Edition of the Annual Report of the Science Advisory Board (SAB) Staff[1]: The year of Reinvention. I send it to you in appreciation of your collective efforts in making FY94 a successful one for the Board and as a useful reference for you and your program.

The box score (Remember those?) goes something like this:

# Members	# Consult.	# Meetings	# Conf calls	# Products	# Staf
98	252	59	15	40	21

Among the highlights in the volume are the following:

1. The origin and history of the Board -- Section 3
2. A Committee-by-committee summary of activities -- Section 4
3. "Special Features" -- Section 4:

   a. The SAB "Self-Study" --40 recommendations for improvements.
   b. The Environmental Futures Project -- A major release slated for January.
   c. The SAB and the EAP Lab Study -- And then play the Huggett card.
   d. A New Product: The Advisory -- For the hard to fit office on our Christmas list.

4. Staff office changes -- Section 4
5. Committee charters -- Appendix A

---

[1]This is an unauthorized report, in the sense that the SAB Executive Committee does not formally approve these annual efforts.

6. SAB members and consultants -- Appendix B
7. SAB committee organization and leadership -- Appendices C & D
8. Abstracts of all SAB reports -- Appendix F

Enjoy; we certainly did!

Attachment

Addressees:
Administrator
Deputy Administrator
Chief-of-Staff
Assistant Administrators
Regional Administrators
Selected Office Directors
Congressional Research Service
EPA Lab Directors

FOREWORD

In keeping with what appears to be the Year of the Reinvention, launched by Vice President Gore's *National Performance Review* in FY93, much of the Science Advisory Board's year involved reinvention. First, the Executive Committee welcomed the Administrator's appointment of new Members and a new Chair: Dr. Genevieve Matanoski of Johns Hopkins University. Dr. Matanoski quickly initiated a critical examination of the purpose and performance of the Board, which involved sending out hundreds of questionnaires to SAB Members and "customers," interviewing current and past leadership of the Environmental Protection Agency (EPA), and--through the efforts of the Program Evaluation Division of the Office of Policy, Planning, and Evaluation--gathering input from more than 50 Agency people, from the Administrator's Office to scientists at the bench. The results of this self-study, subtitled "Reinventing the SAB" will be released in early FY95. The report will be a worthy successor to the similar effort in FY89 ("*Mission and Functioning of the SAB*"). That study has guided the Board's operations for the past five years. In a parallel effort, the Management and Operations Division will be updating their 1989 report on the inner workings of the Office of the Science Advisory Board. With these two documents in hand, a reinvented SAB will be well-positioned to respond to the challenges leading to the next century and to the years beyond.

However, the SAB is not waiting for the final reports to begin the reinvention process. For example, in FY94 EPA's top management asked the SAB to investigate technical approaches for identifying what the major environmental problems might be 5 and 20 years into the future. Dr. Raymond Loehr has led the effort as Chair of the Environmental Futures Committee in a coordinated effort that has included activity by several of the Board's standing committees. Other notable reinventions have included developing the "Advisory," a mechanism for providing formal reactions to and suggestions for an Agency product before it has been fully developed. The Advisory is intended to promote further development of sound scientific products, while reducing the possibility of unanticipated negative review at the end of the process. Also, in FY94, the Board conducted in-depth studies of the ORD's budget and the Agency's laboratory operations, which resulted in the Board's most holistic re-

> ***... a reinvented SAB will be well-positioned to respond to the challenges leading to the next century and beyond.***

examination of these topics since its *Future Risk* report in 1988. We are also exploring innovative ways of disseminating news of our activities and our reports to the interested public via the Internet and the "Information Superhighway." Most of our FY94 reports are now "online" and freely available to anyone with Internet access; calendars, Federal Register notices, and meeting agendas will soon follow.

This year's Annual Report documents many other reinventions designed to provide more comprehensive, more useful, and more timely advice on what remains the fundamental focus of the SAB; i.e., the technical (scientific, engineering, and economic) underpinnings of EPA positions. Our aim is that the Board, the Agency, and the public will all be the beneficiaries of these efforts.

This document reflects the valued input of all of the Staff of the Office of the Science Advisory Board. Without their dedicated effort throughout the year, this record could not have been written. Particular note should be made of the contribution of Samuel Rondberg who served as principal editor of this year's report, introducing additional format and style changes that have enhanced the medium to better fit the message.

Donald G. Barnes, PhD
Staff Director
October, 1994

THE SCIENCE ADVISORY BOARD: THE YEAR OF REINVENTION

TABLE OF CONTENTS

TABLES

APPENDICES

APPENDICES (Continued)

1. EXECUTIVE SUMMARY

1.1 Introduction to the Report

This purpose of this Annual Report is to: (a) provide a succinct introduction to the Science Advisory Board (SAB); (b) provide a summary of the SAB activities for Fiscal Year 1994; and (c) offer a near-term projection of future SAB activities.

Section 2 is a brief introduction to the Report. Section 3 provides background information on the SAB, its organization, history, membership, and resources. Section 4 contains summaries of the activities of each of the SAB Committees during FY94, as well as providing details on the major reinvention activities, and on changes in the SAB Staff Office. Section 5 provides some projections for FY95.

This Report also includes a number of specialized appendices, presenting: charters and leadership information for our Committees; Membership information; organizational charts; guidelines on service on the SAB; lists of meetings; abstracts of FY94 reports; and biographical information about the SAB Staff.

1.2 Introduction to the Board

The purpose of the Board is to provide qualified, independent technical advice to the Administrator of EPA on scientific, engineering, and economic underpinnings of Agency positions (see charters in Appendix A). The SAB often functions as a peer review panel, assessing the technical rationales underlying current or proposed Agency positions. In recent years it has initiated a number of activities on its own; e.g., a commentary on the relative risks of radon in drinking water vs. radon gas in homes, a commentary on strategic planning the Office of Research and Development's engineering program, retrospective studies on the impacts of past reports by the Engineering and Radiation Committees, and the SAB's reinvention self-study.

The SAB was formally chartered in 1978 by the Environmental Research, Development, and Demonstration Authorization Act, although its roots extend back to the birth of EPA in 1970 and beyond. The Board is a Federal Advisory Committee, complying with the Federal Advisory Committee Act, and is composed of non-governmental scientists, economists, and engineers appointed by the EPA Administrator. The Guidelines for Service on the SAB are included in Appendix B1. Appendix B2 describes the various ways in which

experts are affiliated with the Board. The 100 Members of the Board (see Appendix B3) are appointed by the Administrator and operate through ten standing Committees, coordinated through an Executive Committee (see the organizational chart in Appendix C and Staff Support and Committee Leadership information in Appendix E). The Members of the Board are some of the most qualified technical experts in the country, as evidenced by the credentials of the FY94 Committee Chairs (see Table II). The work of the Board is supported by some 250 Consultants to the Board (see Appendix B4), who are also non-governmental scientists, engineers, and economists appointed by the SAB Staff Director. Technical experts employed by the Federal Government who have special skill or knowledge in particular areas participate as Liaisons to several Committees, as needed.

The SAB's operations are supported by a Staff Office of 18 employees and an FY94 budget totaling some $2.2 million. These resources enabled the Board to conduct 74 meetings (of which 15 were conference calls) and issue 15 full reports and 15 short reports (generally less than 10 pages, including 10 Letter Reports and five Commentaries), one Advisory (a new form of report discussed in Section 4.3.4), and eight Notifications of Consultations (see Tables III and IV).

The SAB carries out projects at the request of the Agency, at the request of Congress, and on its own volition. In recent years, the number of requests for SAB action have been 3-5 times the number that the Board can address. Therefore, the Board has adopted criteria for use in establishing priorities among the various requests, determining the degree to which such requests:

... the number of requests for SAB action have been 3-5 times the number that the Board can address.

a) Impact overall environmental protection
b) Address novel scientific problems or principles
c) Integrate science into Agency actions in new ways
d) Influence long-term technological development
e) Respond to emergencies
f) Deal with problems that transcend Federal agency or other organizational boundaries.
g) Strengthen the Agency's basic capabilities
h) Serve Congressional and other leadership interests

The reports produced by the SAB have had a positive impact on many aspects of the Agency's operations and policies:

- The rigor of the Agency's technical positions
- The allocation of Agency resources for scientific/technical activities
- The directions taken by the Agency in emerging science policy
- The directions taken by the Agency in planning
- The directions and form of public debate of scientific, engineering, and economic issues

With all of these activities, attention and impacts, the Board has maintained a broad base of support both within and outside the Agency.

1.3 Review of FY94 Activities

During FY94, the SAB's various Standing- and *ad hoc* Committees conducted 73 public meetings and 1 closed meeting, all of which were announced in the Federal Register. This number includes 15 public conference calls held for planning, writing, and discussion purposes. A wide variety of topics were covered: from the indirect effects of emissions from an incinerator to means of assessing the risks to human reproduction posed by various agents; from a wide-ranging review of the Agency's capabilities and organization to conduct research to assessing the ecological functioning of human-modified marsh systems. Appendix F provides a full listing of FY94 SAB meetings and reports (with abstracts).

In addition to its traditional activities of holding meetings and producing reports, the Board and Staff initiated action to reinvent the Board as an institution, and improve the ways in which it functioned. Some examples of the SAB's reinvention activities include:

- The SAB's Reinvention Study
- The SAB's participation in the reinvention of the Agency's laboratories and research management.
- The introduction of the SAB's "Advisory" document
- Launching the Environmental Futures project -- a reinvention of ways to anticipate the future

At the Staff Office level, reinvention has included improved communications and customer service by:

- Making SAB reports available via the EPA "Gopher" to anyone with Internet access
- Setting up an SAB "List Server," to allow Internet "self-subscribers" to receive automatically email copies of Federal Register notices for SAB meetings, agendas, calendars, etc.

1.4 Projections and Conclusions

Fiscal Year 1995 will be another busy time of production and change for the Board. Early in the year, the Board will deliver the Environmental Futures study to the Administrator; concurrently, implementation of the more than 40 recommendations in the Reinvention study will begin. Use of the Internet for public access and communication will increase. At the request of the SAB Staff Office Director, the Agency's Management and Organization Division will launch a study of the Office's structure and functions.

The FY95 agenda-building exercise is well underway, and has surfaced many important issues, some of which will generate considerable public interest; e.g., reviews of cancer risk assessment guidelines, the Agency's reassessment of the risks posed by "dioxin," soil cleanup standards for sites with radionuclide contamination, a "second look" at possible health effects of electromagnetic fields, a retrospective study of the cost/benefits of the Clean Air Act, and a new methodology for calculating cost/benefit ratios in Regulatory Impact Analyses. In addition, as in the past, FY95 is likely to bring to the Board a number of important topics that cannot be anticipated at this time.

2. INTRODUCTION TO THE REPORT

2.1 Purpose of the Report

The Science Advisory Board (SAB) is a legislatively mandated group of non-governmental scientists, engineers, and economists charged with providing independent technical advice on environmental issues to the EPA's Administrator and others; e.g., Congressional committees. Generally, the SAB does not get involved in or provide advice on regulatory policy aspects of problems confronting the Agency, since such matters are the province and responsibility of the EPA Administrator. Additional details of the objectives, responsibilities, composition, and activities of the SAB are included in the charter of the organization (See Appendix A).

Informed observers acknowledge the SAB's remarkable history and its continuing importance in the protection of public health and the environment.

Informed observers acknowledge the SAB's remarkable history and its continuing importance in the protection of public health and the environment. However, some people both within and outside of the Agency are hard-pressed to describe the extent of the Board's activities or the detailed nature of its findings. This is due, in part, to the complex structure of the Board and the aperiodic issuing of its reports. To some, the SAB is viewed as a hurdle which must be cleared on the way to issuing regulations; much like having to defend one's thesis on the way to getting an advanced degree. To others, the SAB is seen as a court of last resort in which competing scientific arguments are objectively and dispassionately evaluated.

For some puzzled observers of the SAB, the biggest problem is simply finding out "What does the SAB do?" A somewhat flippant, but accurate, answer to that question is: "The SAB makes a difference." For example, the SAB makes a difference in the type and conduct of scientific and engineering research at EPA. The SAB makes a difference in the way in which the resulting data are interpreted and used to support regulatory positions. The SAB also makes a difference to SAB Members and Consultants (M/Cs) and SAB staff by giving them the satisfaction of seeing their information and guidance used appropriately by the Agency to address environmental problems.

This Report is intended to reveal the SAB to a wide audience: to those both inside and outside the Agency, to those who understand the Board, those who think they understand the Board, and

those who know enough to know that they don't understand the Board. The intent is that each reader gain a broader perspective of the SAB, its activities, and its impact.

Specifically, the purpose of the Annual Report of the Science Advisory Board Staff is three-fold:

- To provide a succinct introduction to the SAB.
- To provide a summary of the SAB's activities for FY94.
- To offer a near-term projection of future SAB activities.

The Report is designed to provide "a group photo" of the SAB--its people, its products, and its prospects--in sufficient detail that the interested reader can distinguish the major features and identify paths for investigating the finer details.

2.2 Content of the Report

The Report consists of five principle sections, plus appendices supplementing the discussion in the main sections. Following the Executive Summary (Section 1) and this Introduction (Section 2), Section 3 provides basic background information on the SAB. Here the reader will find brief discussions on the history of the Board, its organization and Membership, and its principal activities and procedures. Specific examples are described that illustrate the way in which the SAB impacts positively on the functions and operations of the Agency.

Section 4 focuses on SAB activities during FY94. This portion of the Report contains descriptions of the activities of each of the Board's Committees during the past year, as well as specific examples of the way in which FY94 was a year of "Reinvention." In addition, changes in the SAB Staff assignments and operations of the Office are highlighted. Section 5 provides a glimpse into what FY95 holds in store for the Board.

The Appendices contain important information, such as organizational charts, Membership lists, abstracts of SAB reports, and the like. These Appendices provide a source of more detailed information about specific aspects of the SAB.

3. INTRODUCTION TO THE BOARD

3.1 SAB Formation, Authority and Function

The SAB was established by Congress to provide independent scientific and engineering advice to the EPA Administrator on the technical basis for EPA regulations. Expressed in terms of the current parlance of the risk assessment/risk management paradigm of decision making (National Research Council, *Managing Risk in the Federal Government*, 1983), the SAB deals with risk assessment issues (hazard identification, dose-response assessment, exposure assessment and risk characterization) and only that portion of risk management that deals strictly with the technical issues associated with various control options. Issues of Agency and Administration policy are generally beyond the scope of SAB mandate and involvement.

The SAB, in its present form, was established in 1978 by the Environmental Research, Development, and Demonstration Authorization Act (ERDDAA) (42 U.S.C. 4365). Predecessor bodies date back to the early 1970s. In carrying out the mandate of ERDDAA, the SAB provides "such scientific advice as may be requested by the Administrator, the Committee on Environment and Public Works of the United States Senate, or the Committees on Science and Technology, Interstate and Foreign Commerce, or Public Works and Transportation of the House of Representatives." Because the Science Advisory Board is a Federal Advisory Committee, it must comply with the Federal Advisory Committee Act (FACA) (5 U.S.C. App. C) and related regulations. Consequently, the Board has an approved charter, which must be renewed biennially, announces its meetings in the *Federal Register*, and provides opportunities for public comment on issues before the Board.

As a practical matter, the function of providing credible technical advice to EPA and Congress antedates ERDDAA and its nascent SAB. The roots of the SAB can be traced back through various predecessor committees within EPA and--prior to the creation of EPA--into other agencies, such as the Department of Health, Education and Welfare. Since 1978, however, the SAB has operated as a Staff Office, reporting directly to the Administrator.

Members of and Consultants to the Board constitute a distinguished body of scientists, engineers, and economists who are recognized, non-governmental experts in their respective fields. These individuals are drawn from academia, industry, and environmental communities throughout the United States and, in some limited cases, other countries (see Appendices B3

and B4 for a listing of Members and Consultants, respectively).

Increasingly, the Agency has placed a premium on basing its regulations on a solid scientific foundation. Consequently, over the past 16 years the SAB has assumed growing importance and stature. It is now formal practice that many major scientific points associated with environmental problems are reviewed by the SAB. For example, the Clean Air Act (CAA) requires that decisions related to the National Ambient Air Quality Standards (NAAQS) be reviewed by the Clean Air Scientific Advisory Committee (CASAC), which is administratively housed within the SAB.

Generally, the Board functions as a technical peer review panel. The SAB conducts its business in public view and benefits from public input during its deliberations. Through these proceedings Agency positions are subjected to critical examination by leading experts in the field in order to test the currency and technical merit of those positions. At the same time, the SAB recognizes that EPA is sometimes forced to take action to avert an emerging environmental risk before all of the rigors of scientific proof are met. To delay action until the evidence amounts to incontrovertible proof might court irreversible ecological and health consequences. In such cases, the Agency makes certain assumptions and extrapolations from what is known in order to reach a rational science policy position regarding the need (or lack thereof) for regulatory action. Here, the SAB serves as a council of peers to evaluate the soundness of the technical basis of the science policy position adopted by the Agency.

3.2 SAB Organization and Membership

The SAB Charter (Appendix A1) states that "The objective of the Board is to provide advice to EPA's Administrator on the scientific and technical aspects of environmental problems and issues," that "The Board will consist of a body of independent scientists and engineers (and now economists) of sufficient size and diversity to provide the range of expertise required to assess the scientific and technical aspects of environmental issues," and that "No Member of the Board shall be a full-time employee of the Federal Government." The Charter requires formation of an Executive Committee and inclusion of the Clean Air Scientific Advisory Committee (see separate charter, also in Appendix A). Otherwise the Board may organize itself as needed to meet its responsibilities.

The Board's Executive Committee serves as the focal point for the coordination of scientific reviews by the Board's standing committees. Appendix C con-

tains a chart of the FY94 SAB organization. The Executive Committee meets four times a year to act on Agency requests for reviews, to hear briefings on pertinent issues, to initiate actions/reviews by the Board which it feels are appropriate, and to approve final reports prior to transmittal to the Administrator. (Reports from CASAC and the newer separately chartered CAACAC are submitted directly to the Administrator, without need for prior Executive Committee review or approval.)

Five Committees have historically conducted most Science Advisory Board reviews:

- Clean Air Scientific Advisory Committee (CASAC)
- Ecological Processes and Effects Committee (EPEC)
- Environmental Engineering Committee (EEC)
- Environmental Health Committee (EHC)
- Radiation Advisory Committee (RAC)

In recent years, five additional committees have been added:

- Indoor Air Quality/Total Human Exposure Committee (IAQC): Mandated in the Superfund Amendments and Reauthorization Act in FY86
- *Research Strategies* Advisory Committee (RSAC): Requested by the Administrator in response to SAB recommendations in FY88
- Drinking Water Committee (DWC): Evolved from the EHC in FY90
- Clean Air Act Compliance Analysis Council (CAACAC): Mandated in the 1990 Clean Air Act Amendments
- Environmental Economics Advisory Committee (EEAC): Requested by the Administrator in response to the Board's *Reducing Risk* report in FY90

The activities of these committees are supplemented by a variety of subcommittees, as well as by *ad hoc* committees which are created as required.

The Board has been successful in tapping a continuing vein of top technical talent to fill its leadership positions. Those scientists and engineers who have led the SAB (and predecessor organizations) for the past 20 years are listed in Table I. Table II testifies to the caliber of individuals who have served as chairs of SAB Committees in FY94.

Although the number of appointed Members is flexible, the FY94 SAB consisted of 100 Members appointed by the Administrator, generally for two year terms, renewable for two more terms in some cases. Service as Committee Chair can lead to an additional four years of

continuous service. A formal guideline on Membership service was adopted by the Executive Committee in FY93 and employed since (see Appendix B1).

Over 300 technical experts, invited by the Staff Director, serve on an "as needed" basis as Consultants to the Board on various issues where their expertise is relevant. The number of Consultants is flexible, and their one-year terms can be renewed. Consultants are required to meet the same standards of technical expertise as do the Members. The term "Member or Consultants" (M/C) is used throughout this report to refer to these experts. Appendices B3 and B4 contains a list of the FY94 M/Cs on the Board. Nearly all of them serve as "Special Government Employees (SGEs)," subject to all appropriate restrictions, including conflict of interest statutes (18 U.S.C. Sections 202-209). Appendix B2 contains a description of the types of affiliation with the Board.

The SAB Staff consists of 18 EPA employees: a Staff Director, an Assistant Staff Director, and the Director of the Committee Evaluation Staff; six scientist/engineers serving as Designated Federal Officers (DFOs), and nine support staff.

The duties of the Staff include identifying potential issues for SAB attention, focusing questions for review by the Board, working with the Board to identify and enlist appropriate Members and Consultants, interfacing between the Board and the Agency and the public, coordinating logistics for reviews, and producing minutes and reports for submission to the Administrator. Appendix D details information on the Staff support for each Committee.

TABLE I SAB Leadership Over the Past Two Decades

Executive Committee Chairs	Affiliation	Dates
Dr. Emil Mrak	University of California	1974-1978
Dr. John Cantlon	Michigan State University	1979-1981
Dr. Earnest Gloyna	University of Texas	1981-1983
Dr. Norton Nelson	New York University	1983-1988
Dr. Raymond Loehr	University of Texas	1988-1993
Dr. Genevieve Matanoski	Johns Hopkins University	1993-Present

SAB Staff Directors	Date
Dr. Thomas Bath	1975-1977
Dr. Richard Dowd	1978-1981
Dr. Terry Yosie	1981-1988
Dr. Donald Barnes	1988-present

TABLE II FY 1994 SAB Committee Chairs

Executive Committee (EC)

Dr. Genevieve Matanoski (MD, Dr. P.H.)

Professor of Epidemiology and Director of Occupational and Environmental Epidemiology Program, Johns Hopkins School of Hygiene and Public Health
Certified Specialist in General Preventive Medicine, American Board of Preventive Medicine
Member, American Public Health Association
Member, American College of Epidemiology
Member, International Epidemiological Association
Member, Society of Epidemiological Research
Member, Bioelectromagnetics Society
Former Chair, SAB Radiation Advisory Committee

Clean Air Act Compliance Analysis Council (CAACAC)

Dr. Richard Schmalensee

Director, Center for Energy and Environmental Policy Research, Massachusetts Institute of Technology
Member, Editorial Board, Journal of Economics and Management Strategy
Member, Board of Directors, Long Island Lighting Company
Associate Editor, Journal of Economic Perspectives
Fellow, Econometric Society

Clean Air Scientific Advisory Committee (CASAC)

Dr. George Wolff

Principal Scientist, General Motors Environmental and Energy Staff
Fellow, Air and Waste management Association
Member, American Meteorology Association
Vice Chairman, Editorial Review Board, Journal of the Air and Waste Management Association
Adjunct Professor, University of Michigan, School of Public Health

Drinking Water Committee (DWC)

Dr. Verne A. Ray

Assistant Director of Safety Evaluation Department, Pfizer, Inc.
Member, Society of Toxicology
Member, Environmental Mutagen Society
Member, Genetic Toxicology Association

TABLE II FY 1994 SAB Committee Chairs (Continued)

Environmental Economics Advisory Committee (EEAC)

Dr. A. Myrick Freeman (Co-chair)

Professor of Economics, Bowdoin College
Member, American Association for the Advancement of Science
Member, American Economics Association
Member, Association of Environmental and Resource Economists
Member, Society for Risk Analysis

Dr. Paul Portney (Co-chair)

Vice President and Senior Fellow, Resources for the Future
Member, Secretary of Energy Advisory Board's Task Force on Economics and Modeling
Member, Board of Directors, Management Institute for Environment and Business
Associate Editor, Journal of Policy Analysis and Management

Environmental Engineering Committee (EEC)

Dr. Ishwar P. Muraka

Business Development Manager, Environment and Vital Issues, Electric Power Research Institute
Member, Soil Science Society of America
Member, Air and Waste Management Association
Member, Biometrics Society
Member, American Statistical Society
Member, American Society of Agronomy
Member, Council for Agricultural Sciences and Technology

Ecological Processes and Effects Committee (EPEC)

Dr. Kenneth L. Dickson

Director, Institute of Applied Science and Dept. of Biological Science., University of North Texas
Member, American Fisheries Society
Member, Society of Environmental Toxicology and Chemistry
Member, North American Benthological Society
Member, J. K. G. Silvey Society

TABLE II FY 1994 SAB Committee Chairs (Continued)

Environmental Health Committee (EHC)

Dr. Frederica Perera

Assistant Clinical Professor, Columbia University School of Public Health
Member, New York Academy of Science
Member, American Society of Preventive Oncology
Member, International Society for Preventive Oncology
Member, Environmental Mutagen Society
Member, American Association for Cancer Research
Member, American Public Health Association
Member, Society for Epidemiologic Research

Indoor Air Quality/Total Human Exposure Committee (IAQC)

Dr. Joan M. Daisey

Head, Center for Atmospheric and Biospheric Effects Technology, Lawrence Berkley Laboratory
Member, American Chemical Society
Member, American Association for Aerosol Research
Member, Air Pollution Control Association
Member, International Society of Exposure Analysis
Member, Editorial Review Board Aerosol Science and Technology

Radiation Advisory Committee (RAC)

Dr. James E. Watson, Jr.

Professor, Department of Environmental Sciences and Engineering, University of North Carolina
Fellow, Health Physics Society (Past President)
Member, Radiological Health Section, American Public Health Association
Member, North Carolina Radiation Protection Commission
Member, National Academy of Sciences Radioactive Waste Disposal Panel

Research Strategies Advisory Committee (RSAC)

Dr. Roger O. McClellan

President of the Chemical Industry Institute of Toxicology
Member, National Institute of Medicine
Member, American Veterinary Medical Association
Member, Radiation Research Society

3.3 SAB Activities

3.3.1 Overview

The types of projects, as well as the range of subject matter, reviewed by the SAB continue to grow. The Board takes on reviews at the request of Congress, the Administrator, and EPA's various program offices, as well as on its own initiative. In general, the trend over time has been for more SAB reviews, addressing more varied subjects, requested by a wider range of individuals and organizations. Most of the outputs of the Board are in the form of full reports. Such reports are generally the result of the peer review of some Agency document(s) and go into considerable detail regarding the findings and recommendations of the Board, as well as answering specific questions in the Charge to the Board.

Increasingly, the SAB has moved toward using shorter, more timely communications to the Administrator. These communications are of two forms: letter reports and commentaries. Letter reports are similar in origin, content, and purpose to full reports; simply shorter. Commentaries are unsolicited SAB advice about technical issues that the Board feels should be drawn to the Administrators attention.

In addition, in recent years the SAB has introduced the "consultation" as a means of conferring--in public session--with the Agency on a technical matter before the Agency has begun substantive work on an issue. The goal of the consultation is to leaven EPA's thinking on an issue by brainstorming a variety of approaches to the problem very early in the development process. There is no attempt or intent to express an SAB consensus or generate an SAB report. The Board simply notifies the Administrator that such a consultation has taken place.

In FY94, the Board introduced a new vehicle for communicating with our clients -- the "Advisory," which provides critical input on technical issues during the development process (see Section 4.3.4).

Tables III - VI (following) provide statistical information on the Board's activities and resources as a whole, and details on the various Committees' meetings and reports.

Table III displays the SAB's operating expenses for the past five fiscal years (1990-1994). The increase in total costs over the years reflects a 20% increase in the number of Board Members, a modest increase in the number of Staff, increases in Federal pay and allowances, and general increases in the cost of airline travel and hotel/meeting accommodations.

Table IV summarizes the Board's meeting and report generation activities over the past 15 years. A glance at the most recent years (FY93 and FY94) shows a relatively constant level of meeting activity (77 public meetings in FY 93 vs. 74 in '94), but a decrease in the number of reports completed -- 37 in FY93, and 30 in FY94. These changes result primarily from the planned investment of staff resources in the Environmental Futures project and the activities associated with the SAB Reinvention study. Both the Futures project and the Reinvention study were *de novo activities of the Board*, and required substantially greater resources to carry out than does the typical SAB review of an existing EPA document. In addition, the Staff was actively involved in producing a report on "streamlining" of the Agency -- including the SAB -- at the request of the Administrator. Table V displays overall levels of activities by individual Committees; Section 4.2 (and following) present details of topics reviewed and identifies reports completed by each Committee.

Table VI provides the time-to-completion data for all FY94 reports, displayed for both full reports, letter reports, and Advisories (see also Appendix G for additional detail). The number of days given under the heading "Committee Review" is the time period between the last public meeting on the issue and approval of the document by the SAB Executive Committee. The number of days under the heading "To Administrator" is the time period between the Executive Committee's approval and actual transmission of the document to the Administrator; this latter period represents time required to make final revisions directed by the Executive Committee.

The Board has an announced goal of a total time-to-completion of less than six months (180 days). On average, this goal was essentially met for full reports (189 days) and bettered for letter reports (103 days). The average time-to-completion for all reports (154 days) also bettered the goal. All of these data reflect improvement compared with FY93. The distribution of completion times for the individual

TABLE III SAB Expenses ($K) for Fiscal Years 1990-1994

Fiscal	Compensation			Travel	Other	TOTAL
Year	Staff	M/C	Total		Expenses	
1990	750	390	1,140	210	320	1,670
1991	778	459	1,237	329	162	1,728
1992	894	413	1,307	298	54	1,659
1993	1000	450	1,450	398	151	1,994
1994[1]	1050	550	1,600	450	140	2,190

[1] Estimated

reports, however, is less encouraging: only four of the 15 full reports meet our 180 day target. Performance on letter reports was better, with nine of ten meeting the target. We will continue to study the report generation process to identify those areas of delay which can be reduced or eliminated.

TABLE IV SAB Activities and Resources, Fiscal Years 1980-1994

	Committee Meetings			Reports				Staff	Operating
	Open[a]	Closed[a]	Other[b]	Full[c]	Ltr[d]	Total[e]	Members	FTEs	Costs[f]
1980	42	1	0			13	81	15.8	900
1981	12	1	0			10	72	13.2	750
1982	20	0	0			10	37	10.5	600
1983	38	1	0			11	44	9.1	650
1984	29	1	0			17	48	14.1	1050
1985	60	1	0			41	60	14.0	1200
1986	61	1	0			28	59	14.1	1200
1987	57	1	0			36	74	14.1	1350
1988	58	1	0			43	74	13.2	1400
1989	67	1	0			38	61	14.9	1550
1990	60	1	5	26	7	33	55	16.0	1650
1991	47	1	7	16	6	22	62	16.6	1750
1992	47	1	2	26	35	61	80	16.5	1650
1993	54	1	22[h]	16	21	37	95	18.0	1994
1994	58	1	15[i]	15	15	30	100	17.5	2190

a Meetings announced in the Federal Register, per the Federal Advisory Committee Act.
b Includes writing, planning, and administrative sessions do not normally require notice in the Federal Register, as well as public conference calls. Data on such sessions prior to 1990 are not available.
c A full report on a topic is a more extensive discussion of the subject, e.g., greater than 10 pages. Separate data on full vs. letter reports are not available prior to 1990.
d A letter report is a more focused discussion of a topic. Included in this category are Letter Reports, and Commentaries to the Administrator on issues of concern to the SAB.
e *Appendix G contains a list of all FY94 reports and abstracts.*
f Operating costs in thousands ($000), rounded to nearest $50K.
g Includes three separate volumes of appendices to the *Reducing Risk* report.
h Includes 12 conference call meetings that were open to the public
.i Includes 15 conference call meetings that were open to the public.

TABLE V SAB Activities by Committee for Fiscal Years 1989-1993

Committee	Fiscal Year	Number of Meetings[1] F.R.	Other	Total	Number of Reports[2] Full	Ltr/Com	Total
EC	1989	4		4			0
	1990	4	0	4	0	0	0
	1991	4	1	5	1	0	1
	1992	4	1	5	0	0	0
	1993	4	1	5	0	0	0
	1994	4	1	5	0	0	0
EC/	1989			20			5
ad hoc	1990	18	6	24[3]	7	0	7
	1991	0	0	0	0	0	0
	1992	0	0	0	0	1	1
	1993	8	5	13	0	2	2
	1994	13	0	13	1	0/0	1
CAACAC	1992	1	0	1	0	1	1
	1993	3	0	3	0	3	3
	1994	0	0	0	0	0/0	0
CASAC	1989			8			6
	1990	1	0	1	1	2	3
	1991	1	0	1	2	0	2
	1992	3	0	3	0	4	4
	1993	3	1	4	0	3	3
	1994	4	3	7	0	3/0	3
DWC	1990	4	0	4	3	2	5
	1991	8	0	8	2	0	2
	1992	5	0	5	4	8	12
	1993	6	1	7	4[5]	2	6
	1994	3	0	3	2	1/1	4
EEAC	1992	2	0	2	0	1	1
	1993	4	0	4	0	1	1
	1994	2	0	2	1	1/1	3

TABLE V SAB Activities by Committee for Fiscal Years 1989-1994 (Continued)

Committee	Fiscal Year	Number of Meetings[1] F.R.	Other	Total	Number of Reports[2] Full	Ltr/Com	Total
EEC	1989			11			3
	1990	8	0	8	4	0	4
	1991	7	1	8	2	1	3
	1992	7	1	8	3	4	7
	1993	8	1	9	4	3	7
	1994	5	3	8	1	1/1	3
EHC	1989			9			13
	1990	3	0	3	5	0	5
	1991	4	0	4	3	4	7
	1992	2	0	2	2	1	3
	1993	2	1	3	3	0	3
	1994	2	0	2	1	1/0	2
EPEC	1989			7			3
	1990	6	0	6	3	0	3
	1991	10	0	10	4	0	4
	1992	9	1	10	8	3	11
	1993	7	1	8	2[5]	2	4
	1994	10	0	10	4	1/1	6
IAQC	1989			2			1
	1990	0	0	0	0	1	1
	1991	2	0	2	1	0	1
	1992	3	0	3	2	2	4
	1993	1	0	1	1	2	3
	1994	3	0	3	2	0/0	2
RAC	1989			2			3
	1990	12	0	12	0	1	1
	1991	8	2	10	0	1	1
	1992	7	0	7	4	10	14
	1993	7	11	18	2	3	5
	1994	10	7	17	1	1/0	2

TABLE V SAB Activities by Committee for Fiscal Years 1989-1994 (Continued)

Committee	Fiscal Year	Number of Meetings[1] F.R.	Other	Total	Number of Reports[2] Full	Ltr/Com	Total
RSAC	1989			4			4
	1990	2	0	2	3	0	3
	1991	3	0	1	2	0	1
	1992	4	0	4	3	0	3
	1993	1	0	1	1	1	2
	1994	4	1	5	2	1/0	3

Where
EC Executive Committee
CAACAC Clean Air Act Compliance Analysis Council
CASAC Clean Air Scientific Advisory Committee
DWC Drinking Water Committee
EEAC Environmental Economics Advisory Committee
EEC Environmental Engineering Committee
EHC Environmental Health Committee
EPEC Ecological Processes and Effects Committee
IAQC Indoor Air Quality/Total Human Exposure Committee
RAC Radiation Advisory Committee
RSAC Research Strategies Advisory Committee

[1] For FY 90 and later indicates meetings requiring notice in Federal Register and those not requiring notice.
[2] In 1990 and later, reports are entered as Full reports, or Letter reports (which include commentaries).
[3] Includes 22 meetings of the Relative Risk Reduction Strategies Committee (RRRSC)
[4] Includes four planning sessions not listed in the Federal Register
[5] Counts the same report (EPA-SAB-EPEC/DWC-93-005) twice.

3.3.2 Criteria for Activities

In the face of more requests than current resources can support, the Board has had to decide how to set its priorities. As a part of the "self-study" initiated in FY89, the Board's Mission and Functioning Committee developed a list of criteria which characterizes the more significant projects of the past and which can guide in the selection of projects in the future. The criteria are listed below, together with examples of current reports reflecting those criteria:

a) Impact overall environmental protection:

EPA-SAB-EPEC-94-003 Review of the Draft Technical Guidelines for Biological Criteria for Streams and Small Rivers

TABLE VI Time to Completion Analysis for Reports and Letter Reports

Document Title and Document Number	Cmte	Date of Last Meeting	Processing Time (days) Committee Review	To Administrator	Total (days/months)
FULL REPORTS					
ORD Lab Study EPA-SAB-RSAC-94-015	RSAC	May 1994	18	2	20/0.67
STAA EPA-SAB-RSAC-94-011	RSAC	Mar 1994	52	3	55/1.8
RCRA RIA CV 1 EPA-SAB-EEAC-94-001	EEAC	Sep 1993	35	24	59/2.0
IAQ Research Program EPA-SAB-IAQC-94-008	IAQC	Sep 1993	141	19	160/5.3
Biocriteria of Streams EPA-SAB-EPEC-94-003	EPEC	May 1993	166	12	178/5.9
MASTER EPA-SAB-EPEC-94-012	EPEC	Oct 1993	175	14	189/6.0
NORM EPA-SAB-RAC-94-013	RAC	Oct 1993	174	26	200/6.7
Inland Testing Manual EPA-SAB-EPEC-94-007	EPEC	Jul 1993	202	6	208/6.9
RCRA RIA MMSoils EPA-SAB-EEC-94-002	EEC	Apr 1993	187	23	210/7.0
2,4-D Carcinogenicity EPA-SAB-EHC-94-005	EHC	Apr 1993	208	14	222/7.4
Arsenic Criteria Document EPA-SAB-DWC-94-004	DWC	Apr 1993	190	36	226/7.5
Indirect Combustion Exp. EPA-SAB-IAQC-94-009a/b	IAQC	Dec 1993	223	12	234/7.7
Global Climate Research EPA-SAB-EPEC-94-014	EPEC	Sep 1993	218	26	254/8.5
Industrial Excess Landfill EPA-SAB-EC-94-010	EC/ad hoc	Dec 1993	43	246	289/9.6
Disinfectant Byproducts EPA-SAB-DWC-94-006	DWC	Dec 1992	324	6	330/11.0

AVERAGE COMPLETION TIME FOR FULL REPORTS = 189 DAYS/6.3 MONTHS

TABLE VI Time to Completion Analysis for Reports and Letter Reports (Continued)

Document Title and Document Number	Cmte	Date of Last Meeting	Processing Time (days) Committee Review	To Administrator	Total (days/months)
LETTER REPORTS					
ORD Budget Review EPA-SAB-RSAC-LTR-94-008	RSAC	Apr 1994	13	8	21/0.7
SO2 Closure EPA-SAB-CASAC--LTR-94-007	CASAC	Apr 1994	50	1	51/1.7
RCRA RIA Health Effects EPA-SAB-EHC-LTR-94-003	EHC	Sep 1993	33	24	56/1.9
RCRA RIA CV 2 EPA-SAB-EEAC-LTR-94-001	EEAC	Sep 1993	34	23	57/1.9
Information Collection Rule EPA-SAB-94-DWC-LTR-94-010	DWC	Apr 1994	79	12	91/3.0
Radon Meas. Protocol EPA-SAB-RAC-LTR-94-006	RAC	Oct 1993	91	3	94/3.1
RCRA RIA Overview EPA-SAB-EC-LTR-94-002	EC	Aug 1993	103	1	104/3.5
EMAP Assessment EPA-SAB-EPEC-LTR-94-004	EPEC	Jun 1993	126	12	138/4.6
WQ Monitoring Network EPA-SAB-EEC-LTR-94-005	EEC	Jul 1993	89	55	144/4.8
Air Quality Models EPA-SAB-CASAC--LTR-94-009	CASAC	Jun 1994	272	1	273/9.1

AVERAGE COMPLETION TIME FOR LETTER REPORTS =103 DAYS/3.4 MONTHS

AVERAGE TIME FOR ALL ADVISORY DOCUMENTS = 154 DAYS/5.0 MONTHS

NB Reports listed in descending order of time to completion within category; "Review" = time between last meeting and Executive Committee Approval; "Approval" = time between Executive Committee approval and transmission to the Administrator; "Month" defined as 30 days.

b) Address novel scientific problems or principles;

EPA-SAB-EEAC-94-001 (CV-1) and EPA-SAB-EEAC-94-LTR-001 (CV-2) Review of the Contingent Valuation Methodology used in the Draft RCRA Regulatory Impact Analysis

c) Integrate science into Agency actions in new ways;

EPA-SAB-IAQC-94-009a and 009b Review of the Addendum to the Methodology for Assessing Health Risk Associated with Indirect Exposure to Combustion Emissions

d) Influence long-term technological development;

EPA-SAB-DWC-94-006 Review of the Research Program on Disinfectants and Disinfectant By-Products in Risk Reduction Laboratories

e) Respond to emergencies; (None in FY94)

f) Deal with problems that transcend federal agency or other organizational boundaries;

EPA-SAB-EPEC-94-007 Review of the Draft Testing Manual for Dredged Material Proposed for Discharge in Inland and Coastal Waters

g) Strengthen the Agency's basic capabilities;

EPA-SAB-RSAC-94-015 Review of the EPA Laboratory Study

h) Serve Congressional and other leadership interests;

EPA-SAB-RSAC-LTR-94-008 Review of the ORD Budget

3.3.3 Impacts of Activities

Each SAB activity has a unique set of consequences which can affect subsequent activity by the Agency, and, by extension, the rest of society. The listing below provides examples of the impacts of some of these activities during FY94.

a) Impacts on the rigor of the Agency's technical positions

CASAC reviewed methodology proposed by the Agency (per the requirements of Section 811 of the Clean Air Act Amendments of 1990) to estimate historical pollutant concentrations would have existed in the presence and absence of the Clean Air Act and subsequent Amendments (EPA-SAB-CASAC-LTR-94-009). The comments of the Committee focused on ways to reduce the uncertainties in the estimates.

b) Impacts on expenditures of funds

Four SAB Committees and a special Steering Committee produced a total of six reports on the proposed RCRA Regu-

latory Impact Analysis (RIA). The RCRA RIA was developed to estimate the costs/benefits of the pending RCRA Corrective Action Rule, affecting thousands of waste sites across the country. The Board identified concerns with the Agency's use of contingent valuation (the study design and its probity as used), the degree to which the selected samples were representative, the lack of validation for the assumptions of the MMSOILS model, and a general failure to characterize the uncertainties associated with non-cancer risks. The individual reports were: EPA-SAB-EEAC-94-001; EPA-SAB-EEC-94-002; EPA-SAB-EEAC-LTR-94-001; EPA-SAB-EC-LTR-94-002; EPA-SAB-EHC-LTR-94-003; and EPA-SAB-EPEC-COM-94-001.

c) Impacts on emerging science policy

The Indoor Air Quality/Total Human Exposure Committee reviewed the draft document "Addendum to the Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions." The Committee's report (EPA-SAB-IAQC-94-009a (Interim Report) and 009b (Final Report)) found merit in the model and recommended its use as an *analytical tool* to identify the chemicals most likely to accumulate in the environment, the environmental compartments most at risk of unacceptable accumulations, and the exposure pathways and chemicals most likely to result in aggregate health risks that reach levels of concern. The Committee stressed the need to establish a framework to ensure that the entire range of potential risks from stationary combustors are addressed holistically, including both direct and indirect risks, as well as local, regional, national and international concerns.

d) Impacts on Agency planning

Two examples of SAB impacting Agency planning are a) the IAQC's review of the Indoor Air Quality Research program (EPA-SAB-IAQC-94-008); and b) EPEC's review of the Global Climate Change Research program's terrestrial elements (EPA-SAB-EPEC-94-014).

The IAQC found that the research program was clearly-focused, as were its inter-relationships with related activity elsewhere in ORD and the rest of the Agency, other federal agencies and the private sector. The Committee was concerned, however, that these evident strengths of the planning process and the research program were not adequately captured by the Agency's description of its research plans. The Committee also recommended a more explicit linkage of the research to health effects of potential concern.

The EPEC found the specific research projects appeared to be of high quality and adequately reviewed. However, they expressed concern about aspects of program management, including absence of a clear vision of ORD's role in the National Program, lack of a strategic plan for implementing research, and inad-

equate linkage with other Agency and Federal programs. Specifically, the Subcommittee recommended that EPA take an active role in: defining the ecological effects and risk assessment needs for the National Program; specifying the methodological development, data acquisition, and assessment research tasks to meet those needs; and implementing a national integrated research program focused on a clearly defined EPA role and national needs.

e) Impacts on the public debate of scientific and engineering issues

The ad hoc Industrial Excess Landfill Panel (EPA-SAB-EC-94-010) examined the issue of possible radioactive contamination in the Industrial Excess Landfill in Uniontown, Ohio. There had been considerable debate between the Agency, Ohio EPA, and local citizens concerning what had been dumped in the landfill. When the SAB began its investigation in 1993, the controversy was several years old. Although the Panel found no evidence of radioactive contamination, it recommended a number of ways to improve interactions between the Agency and the public with regard to communicating risk.

3.3.4 Responses and Reactions to SAB Activities

Since 1984, the Board has formally requested written Agency responses to SAB reviews. The majority of the responses indicate that the Agency has acted positively on the advice given by the Board. In many instances, the Agency has initiated action on the basis of the advice rendered at the public meetings, prior to their actual receipt (via the Administrator) of the formal report from the Board. In some other cases the Agency and the Board "agree to disagree."

The majority of the responses indicate that the Agency has acted positively on the advice given by the Board.

Support for the SAB both inside and outside the Agency remains strong. The Administrator and the Deputy Administrator have made it a practice to attend Executive Committee meetings to discuss topics of mutual interest. Several Assistant Administrators also made presentations and requests at meetings of the Executive Committee in FY94. The large number of EPA requests for SAB assistance speaks to the Agency's commitment to the SAB. However, resource constraints continue to limit the extent to which the Board can respond fully to the needs of the Agency.

4 REVIEW OF FY94 ACTIVITIES

4.1 Introduction

Fiscal Year 1994 proved to be even more busy and varied for the Science Advisory Board then anticipated a year ago. The number of meetings held and the number of issues addressed during the year continued at a high level, against a backdrop of intense involvement in the Futures, Reinvention, and Streamlining efforts. Perhaps more than any other time in the Board's history, the Staff and our Members/Consultants focused their attention and energies outward to service our clients within the Agency; inward to examine how we carried out our work and related to all our clients; to the past to examine the impacts of reviews carried out over the past few years; and to the future to try and advise the Agency on problems and issues lying over the horizon.

This section of the FY94 Annual Report consists of a brief overview of the activities of each SAB Committee, specific examples of SAB reinvention at work, and changes in the Science Advisory Board Office. The activities of the individual Committees are summarized in the sections below. More details are available in the Appendices; specifically, Appendix F contains a list of all SAB meetings and Appendix F contains a list of all FY94 SAB reports, together with their abstracts.

4.2 Overview of SAB Activities

In FY94, the various Committees and Subcommittees of the SAB conducted 58 public meetings, one closed meeting, and 15 public conference calls and issued 15 full reports and 15 letter-size reports (generally under 10 pages), eight notifications of consultations, and one advisory document. Some of these reports reflected the culmination of work initiated in the previous fiscal year, just as some of the FY94 meetings will result in FY95 reports.

The SAB was involved in some way with nearly every program office of the Agency. The SAB both responded to requests for reviews from the Agency and took the initiative to delve into new areas and new approaches, providing the kind of technical advice that makes a difference in the Agency's operations.

4.2.1 Executive Committee (EC)

FY94 saw a number of changes and innovations in the Executive Committee. Chief among them was the transition of the Chairmanship from Dr. Raymond Loehr to Dr. Genevieve Matanoski. The EC held four quarterly meetings, in addition to conducting an Annual Membership meeting which featured the "rollout" of the Environmental Futures Project which included presentations by Robert Sussman (Deputy Administrator), Dr. Terry Davies (Resources for the Future), Dr. Lester Brown (World Watch Institute), and Dr. William Leffler (Shell Oil Co.).

In addition to overseeing and coordinating the work of the individual Committees, the Committee had projects of its own that were conducted through specialized subcommittees. These included:

a) The self-study of the Board (the Reinvention Study) (Chair: Dr. Matanoski). (see Section 4.3.3).
b) EPA-SAB-EC-94-010 The Industrial Excess Landfill (IEL) Committee (Chair: Dr. Robert Huggett, succeeded by Dr. Jan Stolwijk) examined technical issues raised by possible radioactivity at Superfund sites, using an Ohio site as an example.
c) The Environmental Futures Committee (Chair: Dr. Loehr). (see Section 4.3.2).
d) SAB/EFAB "Principles" Committee (SAB Chair: Dr. Loehr). This joint effort with the Environmental Financial Advisory Board explored the potential benefits of providing the Administrator with advice that integrated scientific and financial advice. The group determined that their interests and expertise were not sufficiently aligned at this time to make this a priority activity.
e) EPA-SAB-EC-94-LTR-002 The RCRA Corrective Action RIA Steering Committee (Chair: Dr. Paul Deisler) coordinated the efforts of four standing Committees (EEAC, EEC, EHC, and EPEC) in a multi-faceted review of major regulatory package.

Among those who appeared before the Executive Committee in FY94 were Robert Sussman (Deputy Administrator), David Gardiner (AA/OPPE), Dr. Lynn Goldman (AA/OPPTS), Mary Nichols (AA/OAR), Sally Katzen (OMB), and Dr. Ken Olden (Director of NIEHS)

EC Members who testified before Congress on various topics included Dr. Matanoski (ERDDAA Reauthorization), Dr. Loehr (EPA science), Dr. McClellan (the ORD budget and science at EPA), and Dr. Watson (radiation and radon).

4.2.2 Clean Air Act Compliance Analysis Council (CAACAC)

The Council did not meet during FY94. A meeting is now being planned for early in FY95 to address physical health effects issues.

4.2.3 Clean Air Scientific Advisory Committee (CASAC)

During FY 1994, the Clean Air Scientific Advisory Committee (CASAC) held three conference calls and four meetings. The conference calls were conducted to provide comments for the Retrospective Analysis of Air Quality Models required of the CAACAC by the Clean Air Act Amendments of 1990. The four CASAC meetings all addressed National Ambient Air Quality Standards issues. The first of these sessions was a final review/closure on the re-proposal of the criteria document supplement and staff paper for SO_2. The three additional meetings focused on the portions of the documents under development for the ozone standard.

Three reports were issued by CASAC in FY94:

a) EPA-SAB-CASAC-LTR-94-007 Closure on the Supplements to the Criteria Document and Staff Position papers for SO_2. The Committee felt that the documents were consistent with available scientific evidence for sulfur oxides and should provide an adequate basis for a regulatory decision,

b) EPA-SAB-CASAC-LTR-94-009 Air Quality Modeling for the Section 811 Retrospective Study. The comments of the panel focused on ways to reduce the uncertainties in estimating what historical pollutant concentrations would have been in the presence and absence of the Clean Air Act and subsequent Amendments.

c) EPA-SAB-CASAC-COM-94-005 Data Sets for PM_{10} The Committee requested that the Agency take steps to assure that crucial data sets linking exposure to particulate matter and health responses are available for analysis by multiple analytical teams.

4.2.4 Drinking Water Committee (DWC)

The Drinking Water Committee includes experts in the effects and control of chemical and microbiological contaminants in drinking water. The primary client for the Committee is the Office of Water. This year the Committee met three

times and issued two full reports, one letter report and one commentary. One of the meetings included a joint review of bioaccumulation issues with the EPEC, with a report scheduled for completion in FY95. The Committee also took active part in the Futures Project and is completing its report for that effort. Completed FY94 documents are:

a) EPA-SAB-DWC-94-004. SAB Review of Draft Drinking Water Criteria Document on Inorganic Arsenic.
b) EPA-SAB-DWC-94-006 SAB Review of the Research Program on Disinfectants and Disinfection By-Products in the Risk Reduction Research Laboratory
c) EPA-SAB-DWC-LTR-94-010 SAB Review of Information Collection Rule (Monitoring Requirements for Public Drinking Water Supplies)
d) EPA-SAB-DWC-COM-94-002 Drinking Water Committee commentary on negotiated regulation for disinfectants and by-products.

4.2.5 Ecological Processes and Effects Committee (EPEC)

In FY94, EPEC held 10 full Committee and Subcommittee meetings. The Committee continued to place priority on five areas: ecological risk assessment, EMAP, environmental quality criteria, the impacts of global climate change, and habitat biodiversity. In addition, the EPEC devoted three meetings to development of a report on analysis of future ecological issues as part of the SAB Environmental Futures Project (see Section 4.3.2).

The Committee completed a total of seven reports in FY94:

a) EPA-SAB-EPEC-94-003 Review of the Draft Technical Guidance for Biological Criteria for Streams
b) EPA-SAB-EPEC-94-007 Review of the Draft Testing Manual for Dredged Material Proposed for Disposal in Inland and near Coastal Waters
c) EPA-SAB-EPEC-94-012 Review of the Midwest Agrichemical Surface/Subsurface Transport and Effects Research (MASTER) Program
d) EPA-SAB-EPEC-94-014 Review of the Research Program on the Effects of Global Climate Change on Terrestrial Ecosystems.
e) EPA-SAB-EPEC-LTR-94-004 Review of the Draft EMAP Assessment Framework
f) EPA-SAB-EPEC-COM-94-001 Review of the Ecological Risk Assessment Portion of the Draft Regulatory Impact Assessment for the RCRA Corrective Action Rule

g) EPA-SAB-EPEC-ADV-94-001 Advisory Evaluation on A National Methodology for Wildlife Criteria.

The Committee also completed three consultations:

a) EPA-SAB-EPEC-CON-94-004 Notification of Consultation on National Saltwater Dissolved Oxygen Criteria
b) EPA-SAB-EPEC-CON-94-005 Notification of Consultation on Bioaccumulation Issues
c) EPA-SAB-EPEC-CON-94-006 Notification of Consultation on the Conceptual Plan for an Integrated Ecosystem Protection Research Program

4.2.6 Environmental Economics Advisory Committee (EEAC)

The Committee was created during FY 91 at the request from the Administrator who was responding to a recommendation in the Board's *Reducing Risk* report. The EEAC is constituted to assist and advise the Administrator and the Agency in analyzing the economic aspects of environmental decision-making, and in analyzing the long-term environmental aspects of various approaches to valuing and/or discounting ecological resources and systems.

During FY 94, the Committee conducted two public meetings and released two reports, one Commentary, and one Notification of Consultation:

a) EPA-SAB-EEAC-94-001 Review of the RCRA Regulatory Impact Analysis Contingent Valuation Methodology (CV 1)
b) EPA-SAB-EEAC-LTR-94-001 Review of the RCRA Regulatory Impact Analysis Contingent Valuation Methodology Application (CV 2)
c) EPA-SAB-EEAC-COM-94-003 Commentary on the Peer Review of Research
d) EPA-SAB-EEAC-CON-94-003 Notification of a Consultation on the Comprehensive Environmental Economic Policy Evaluation System (CEEPES)

4.2.7 Environmental Engineering Committee (EEC)

The Environmental Engineering Committee (EEC), by virtue of its agenda, its Membership, its clients, and its collaborations with other organizations and SAB Committees, remains one of the most active and diversified Committees of the Board.

The EEC conducted eight meetings: three full Committee meetings, three conference calls, and two Subcommittee

meetings addressing six topics::

a) Soil Screening Levels
b) Waste Minimization and Combustion
c) Strategic Research and Development Planning
d) Ground-Water Monitoring Network Research
e) EPA's Draft Technology Innovation Strategy
f) Environmental Futures

The Committee completed one report, one letter report, one Commentary, and two Notifications of Consultation:

a) EPA-SAB-EEC-94-002 Review of the RCRA RIA MMSoils Model
b) EPA-SAB-EEC-LTR-94-005 Review of the Water Quality Monitoring Network
c) EPA-SAB-EEC-COM-94-004 Commentary on Strategic Research Planning
d) EPA-SAB-EEC-CON-94-002 Notification of Consultation on Soil Screening Levels
e) EPA-SAB-EEC-CON-94-008 Notification of Consultation on Waste Minimization and Combustion

4.2.8 Environmental Health Committee (EHC)

The Environmental Health Committee (EHC) shares responsibilities for health effects reviews with several committees of the Board (DWC, IAQC, RAC, and CASAC). The principal focus for EHC has been issues related to development and use of guidelines for health risk assessments. The EHC has continued to maintain a close relationship with the other SAB health-related Committees, and with the Scientific Advisory Panel (SAP) of the Office of Pesticides, "sharing" Members for several reviews.

The EHC met twice during the year (one meeting including participation by an SAP Member). The Committee released one report and one letter report during the past year:

a) EPA-SAB-EHC-94-005 Review of the Potential Carcinogenicity of 2,4-D
b) SAB-EHC-LTR-94-003 Review of the RCRA Regulatory Impact Analysis Health Benefits Estimates

The Committee's report on its review of the draft Guidelines for Reproductive Toxicity Risk Assessment should be released early in FY 95.

4.2.9 Indoor Air Quality/Total Human Exposure Committee (IAQC)

The IAQC addresses many of the exposure assessment issues that come before the Board, particularly those related to the indoor air environment.

The Committee met three times during FY94, and issued two full reports. One of these, dealing with indirect exposure to combustor emissions, was preceded by an interim letter to the Administrator. In addition to these reports, the Committee has taken an active role in the Futures Project and is completing its report as the year ends. Completed reports are:

a) EPA-SAB-IAQC-94-008. Review of Indoor Air Issue Plan
b) EPA-SAB-IAQC-94-009a and EPA-SAB-IAQC-94-009b (Interim letter to the Administrator and final report) Review of the Agency's draft Addendum to the Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions.

4.2.10 Radiation Advisory Committee (RAC)

The Radiation Advisory Committee is most closely aligned with the Office of Radiation and Indoor Air (ORIA), although the Office of Water, and the Office of Health and Environmental Assessment (OHEA) are also clients. In FY 94, the RAC's activities focused on completing a review of ORIA's Diffuse Naturally-Occurring Radioactive Material (NORM) Waste Characterization and Preliminary Risk Assessment Draft Scoping Document and the Radon Measurement Protocol Evaluation Study. The RAC also conducted consultations and briefings on a number of topics. A considerable time was also spent on two self-initiated activities -- the RAC Retrospective, the Radon Science Initiative, and the RAC report on future issues and challenges in environmental radiation, which will be completed in FY95.

The RAC and its subcommittees conducted ten public meetings and seven public teleconferences. The completed reports were:

a) EPA-SAB-RAC-94-013 Review of the Office of Radiation and Indoor Air Draft Document on Diffuse Naturally-Occurring Radioactive material (NORM)
b) EPA-SAB-RAC-LTR-94-006 Radon Measurement Protocol Evaluation Study

c) EPA-SAB-RAC-CON-94-001 Consultation on Cleanup Standards
d) EPA-SAB-RAC-CON-94-007 Notification of Consultation on Low Level Waste Standards

4.2.11 Research Strategies Advisory Committee (RSAC)

During FY 94, the RSAC held four Committee and Subcommittee meetings, and one conference call. These meetings addressed the ORD budget (requested by the Congress); the review of ORD's Scientific and Technical Achievement Awards (STAA); and the Review of the EPA Laboratory Study (highlighted in section 4.3.3 of this report). As a result of the interest in the SAB report, Dr. McClellan, Chair of RSAC testified before Congress and briefed the Deputy Administrator and Senior Agency managers on the recommendations of the Committee. The Committee released the following reports:

a) EPA-SAB-RSAC-94-015 Review of Mitre Corp. Draft Report on the EPA Laboratory Study
b) EPA-SAB-RSAC-94-019 Recommendations for Scientific and Technical Achievement Awards (STAA)
c) EPA-SAB-RSAC-LTR-94-008 Review of the President's FY95 Budget Request for the EPA Office of Research and Development

4.3 Examples of the SAB's Reinvention Activities

4.3.1 "Reinventing the Science Advisory Board" -- a Self-Study

In 1989 the SAB conducted a "self-study" (the "Mission and Functioning Report" or MAF) to assess its activities, management, and performance and to recommend changes for improving the institution. The SAB began FY94 with a new Chair, a relatively new Administrator, and a continuing evolving Board: all of which argued for another self-study. Therefore, in the spirit of the Vice President's emphasis on reinventing government, Dr. Matanoski headed a subgroup of the Executive Committee to "reinvent the SAB."

As background for this study, the Board solicited and received input from more than 100 people, including Agency political appointees (both past and present), Agency personnel (ranging from managers to bench scientists), Board Members, representatives of other agencies, and members of the public.

The main substance of the report is captured in its Findings and Recommen-

dations and relates to eight major topics:

SAB Mission
SAB Function
SAB Structure
Selection of SAB Projects
Timeliness
SAB Membership
Inter-Committee and inter-advisory group interactions
Communications

The self-study has been an important exercise for the Board. Like the 1989 MAF report, this study demonstrates the benefit of openly seeking constructive criticism from its various customers inside the Board, the Agency, and the public.

...these data will provide the reinvention fuel to power the SAB to the brink of the next century.

The major conclusions have much in common with the earlier report:

a) The SAB works and makes a difference.
b) The SAB continually responds to changing conditions in an evolutionary, not revolutionary way.
c) The SAB's effectiveness is directly tied to its real and perceived independence from the Agency.
d) The SAB can serve the Agency in a number of different ways:
   1) Advising role; cf., consultations and advisories
   2) Rigorous peer review role; cf., reports
   3) Self-initiated activities; cf., commentaries
e) There is room for continual improvement, especially in the area of timeliness, Membership, and communications.

This report will be complemented by a study of the SAB Staff Office to be conducted by the Management and Organization (M&O) Division of the Agency's Office of Administration and Resource Management. It will constitute an updating of the 1989 M&O study of the SAB Staff Office.

The more than 40 recommendations from this study should be implemented during FY95. Coupled with the recommendations from the upcoming M&O study, these data will provide the reinvention fuel to power the SAB to the brink of the next century.

4.3.2 Reinventing the Future - The Environmental Futures Study

In July, 1993, Administrator Carol Browner and Assistant Administrator for Policy, Planning, and Evaluation David Gardiner asked the SAB to initiate an Environmental Futures Project to investigate methods and issues which the Agency might use to anticipate and address the potential risks of emerging environmental problems. In October, 1993, the Board sponsored a kick-off session at its Annual Meeting to familiarize Members with the use of various techniques to anticipate future problems. At this meeting, expert "futurists" discussed the use of scenarios and foresight techniques which had been employed by other organizations for long-range planning.

...population pressures for natural resources, a rising standard of living, and international trade will be the primary driving factors for profound and rapid changes in the future.

Throughout this year, the Environmental Futures Committee, an *ad-hoc* Committee of the Executive Committee, chaired by Dr. Raymond Loehr (University of Texas-Austin) has interviewed additional professional futurists from industry, research foundations, and environmental groups during its monthly meetings and at special fact-finding sessions. The Committee also received extensive background materials and staff support for these meetings from the OPPE staff. The Committee will have met a total of fourteen times to collect information and refine its ultimate recommendations to the Agency be the time it delivers its report in the Winter of 1994.

In the course of this project, the SAB has gleaned some valuable insights from experts in various fields of technology, energy, transportation, social systems, demographics, agriculture, and communication sciences about developments which lie over the horizon, the drivers of change (e.g., energy consumption, population growth), and the potential consequences of those changes. The Committee's overall impression is that population pressures for natural resources, a rising standard of living, and international trade will be the primary driving factors for profound and rapid changes in the future.

The complex interaction of these factors makes it essential that decision makers consider the broad implications of their policies so that they are preventive, focused, and effective.

As a result of this activity, the Environmental Futures Committee has identified five major areas which they believe have a predicted high potential for future

environmental concerns, and which merit targeted scientific investigation:

a) Future interregional pollutant loadings as a result of energy choices worldwide
b) Future health risk endpoints beyond cancer
c) The oceans beyond the estuaries
d) The disposition of natural resources beyond near-term development
e) Future environmental stressors.

The EFC are likely to recommend that the Agency use "Look-out" panels to scan for weak signals of environmental changes as part of a bottom-up approach for monitoring. They will also likely recommend that the Agency review scenarios developed by other Federal Agencies such as Census Bureau, Department of Energy, and the Department of Defense to identify environmental impacts from changes anticipated in their scenarios.

Although the EFC has identified these five issues and recommended general means to address them, they also believe that understanding the process of applying foresight techniques may be as important to the Agency as responses to the specific issues. Three salient findings support this contention. First, most predictions are likely to be wrong, and they must be continually revised based on changes in the underlying assumptions or on new data obtained by monitoring. Second, foresight requires one to consider how future events are likely to occur. By developing an understanding of the mechanisms of change, one can identify better measurements and monitoring systems and target the drivers of change and critical stakeholders to develop solutions. Third, a foresight process is a logical complement to the annual strategic planning and budget processes. The EFC report will consist of an overview report, describing its major findings and recommendations, and a detailed appendix describing the Committee's activities, process for developing recommendations, contacts, and a list of issues considered. In addition, five Standing Committees are expected to transmit separate reports to the Administrator providing their Committee-level perspective on what may be tomorrow's problems.

4.3.3 Reinventing ORD-The EPA Laboratory Study

In FY 94, EPA conducted a major review of all of its research and technical support laboratories (Office of Research and Development (ORD), Program Office Support, and Regional Environmental Services Divisions laboratories). The goal of this study was to evaluate the soundness of the overall laboratory infrastruc-

ture, its management, and the quality of its scientific support for Agency policies and regulations. The Research Strategies Advisory Committee (RSAC) was asked to review a report produced for the Agency which described the capabilities and direction of the ORD laboratories. RSAC provided oral comments on the scope of the study in February and reviewed the draft report of the Mitre Corporation, the Agency's contractor for the study, in May. The Committee Chair briefed the Deputy Administrator following the RSAC meeting and later provided a telephone briefing for the Agency's senior managers. RSAC emphasized five major recommendations for improving the management and organization of ORD and its laboratories. They urged that the Administrator act as the advocate for a well funded program of strategic research; that the Agency take corrective action to create a more effective, efficient, mission-oriented research management system; that ORD headquarters be part of the organizational change; and that the study also add data about human resources before any reorganization plan is developed. Finally, The Committee noted, with reluctance, that if reorganization at this time is chosen, RSAC favors the concepts of the Carnegie Commission so called "Mega Laboratories" organized along risk assessment themes. As a result of the study, the RSAC's comments, and those of a National Academy of Public Administration (NAPA) panel, the EPA has determined that the research grants program will be expanded nearly five-fold; half of the research budget (including grants) will be devoted to long-term strategic research; and ORD Headquarters staff will be reduced by fifty percent. The Agency is developing and implementing a plan to create the four mega laboratories noted above.

The recommendations of the RSAC were submitted to the Administrator and forwarded concurrently to the Lab Study Steering Committee (composed of senior Agency managers and laboratory directors, and led by the Acting AA/ORD and the AA/OARM). The SAB's recommendations were subsequently adopted by the Administrator. The principles expressed in the SAB report reflected the long experience that several of the Members have had with the Agency's research program and the many reviews of the Agency's R&D budget over the years. These recommendations lay an excellent foundation for a positive reinvention of research and development at the Agency.

4.3.4 Reinventing Advice: The Advisory

In recent years the Board has worked with the Agency to provide advice early in the process of developing a position on scientific and technical matters. The Consultation, introduced just a few years ago, addresses an issue of concern to the Agency through a public discussion that occurs at a time when the Agency's approach to the problem is still being formulated. No SAB consensus is sought. No formal report is written; just a notification that the Consultation has taken place. The intent is to leaven the Agency's thinking as it generates and builds a position on a technical matter. Some time later (e.g., many months or even a few years), the Agency returns with a well-articulated position that is submitted to the SAB for rigorous peer review on the technical merits of that position.

However, in some cases the Agency has a need for advice in the midst of its development process in order to determine whether they are on the right track or whether there are alternatives that they should be considering. This is particularly true of cases that may be years in the development stage. The Agency would receive more benefit from corrective advice during the process than from a critical, negative review at the end of the process.

The Board is sympathetic to that need. At the same time, the Board is also concerned that the Agency's final position receive a rigorous, objective, and independent peer review. Playing the "thesis advisor" role during the development of the Agency's position would compromise the SAB's credibility as an independent peer reviewer at the end of the process.

In FY94 the SAB has addressed these competing needs by introducing the "Advisory," together with explicit guidance on how it is to be used. In form, the Advisory is similar to a report: i.e., a formal report to the Administrator, following a public meeting, at which an Agency document was considered along with an explicit charge to focus the activity. However, the Agency document was not a final--or even a draft final--report. Rather it was "a work in progress," describing the state of the Agency's thinking, the progress to-date, and the proposed direction and schedule for completing the activity. In the manner of a thesis advisor the Board (EPEC, in this case: EPA-SAB-EPEC-ADV-94-001) provided comments and suggestions that should help the Agency move forward.

The Executive Committee approved the Advisory but remained conscious of the need to provide an objective, independent peer review of the final product. Therefore, they stipulated that the SAB panel that reviews the final Agency product must be "substantially different" from the panel that generated the Advisory.

They noted the benefit of having at least some Members who participated in the Advisory as a part of the final peer review group. They also noted that there would have to be a substantial presence of new faces in order to provide a credible independent review of the final document. These new faces could be a combination of new Members who appear on the Committee between now and the final review, liaison Members from other committees who did not participate in the Advisory, and/or ad hoc Consultants added for this specific purpose.

Initial reactions to the Advisory concept have been generally positive, although there is some concern about how the final review will be conducted. All parties agree that it is useful for the SAB to continue to explore "reinventions" that enable the Board to better meet the needs of the Agency.

4.3.5 Reinvention in the SAB Staff Office

During FY94 Staff Members have been aggressively searching for, and adopting, new and better ways of doing their work -- while at the same time working with designated Board Members on the formal Reinvention Study (see Section 4.3.1).

In FY93, committee administration and tracking required by FACA were consolidated under the Committee Evaluation and Support Staff (CES). In FY94, additional steps towards rationalizing the administrative functions of the Staff Office were taken, e.g., centralizing processing of personnel actions for the 350 Members/Consultants; consolidation of payroll functions for Members/Consultants; processing of procurement requests and Federal Register Notices; processing and distribution of SAB reports; production of the SAB newsletter (*Happenings*); and reporting on budget/administrative issues.

The Staff is encouraging as many Members as possible to conduct correspondence, transmit drafts/comments on reports, and conduct their Committee business via electronic mail. All SAB Staff has been trained to exploit features built into the Agency email system -- the use of electronic distribution lists which allow the dispatch of information to an entire Committee with one action; and the associated capability to fax materials directly from a computer file to one or a hundred locations with a single command. These steps are in harmony with the Administrator's announced goal of "a paperless office."

Completed SAB reports are now accessible through the EPA Gopher (email address: gopher.epa.gov), and are readily available to any one in the world with Internet access. Early in FY95, Federal Register notices, calendars, and other information will be automatically emailed

as soon as they are posted to persons who have self-subscribed to the SAB "List Server." These innovations not only make SAB reports and other information more widely available in a more timely fashion, they also reduce the administrative burden of taking telephone calls or processing mail from persons wishing these materials.

Other FY94 innovations include the following:

a) Examination of the Flexiplace concept, highlighted in the Vice President's National Performance Review
b) Adoption of a computer-based method of generating required travel orders and vouchers
c) Sending more than two dozen boxes of old files to the archives
d) Systematically ranking projects to prioritize reviews requested by the Agency
e) Continued increase in the representation of women and minorities on the Board
f) Increased interest from other Federal agencies (e.g., DOE and OSHA) in SAB activities and how the SAB "concept" could be transferred to their organizations

4.4 SAB Staff in Transition

Ms. Joanna Foellmer, who has served on the SAB Staff in various capacities since 1980, followed up her recent training and rotational assignments provided by the Greater Leadership Opportunities (GLO) program by accepting a position with the Staff of the President's Commission Risk Assessment and Risk management, where she is putting her "SAB-honed" skills to good use.

Ms. Patricia Thomas recently joined the Committee Evaluation Staff from the ORD, serving as a Management Analyst. She has rapidly made herself indispensable to the smooth administration of the Staff Office, as has Ms, Vickie Richardson, who comes to the SAB's CES from the Department of Defense, and is working efficiently as an Administrative Technician.

Mr. Rasheed Tahir, our Stay in School (SIS) assistant for over two years, received his Bachelor of Arts degree and became a full-time Federal Bureaucrat with the Department of the Treasury's Office of the Comptroller of the Currency. Ms. Monique Ford is a welcome addition as a new SIS working in the Staff Director's Office.

For six months during the year, Mr. Jason Holstine (from Ohio State University) served as an Intern working with CES on organizing computer databases for our M/C listings, and other data-related tasks.

Mr. Robert Flaak, Assistant Staff

Director, undertook a four-month detail to the Agency's Science Policy Council where he was instrumental in helping the Program and Regional Offices develop standard operating procedures to implement the Administrator's new Peer Review Policy. As a result of this policy, peer review will play an increasingly important and visible role in support of decision-making at the Agency. Bob returned to his role on the SAB staff at the end of September.

Biographical sketches of the SAB senior staff are located in Appendix H.

5. PROJECTIONS AND CONCLUSIONS

FY95 is likely to be another exciting and busy time for the Board. Early in the year, the Board will deliver the Environmental Futures study to the Administrator. Release of this report should spark considerable dialogue within the Agency and between the public and the Agency as to broad perspectives and strategies for environmental protection. In December, SAB Members and Staff will present five separate reports on aspects of the Environmental Futures project to the national meeting of the Society for Risk Analysis.

Concurrently, the Board will complete and start implementing the Reinvention study. Although there is still further work to be done, the broad outlines of the study and its messages are clear, and initial responses are already in preparation. These include increased emphasis on communications (e.g., use of the Internet), and imaginative staffing arrangements (e.g., creating a rotational position on the SAB Staff to bring junior Agency scientists and analysts into the Staff Office for assignments up to one year in length). Another focus for FY95 will be integration of the SAB's review activities with the workings of the newly implemented peer review policy.

FY95 will also see a follow-up to the 1989 study of the SAB Staff Office's management processes by the Agency's Management and Organization Division. The earlier study led to many improvements and innovations, particularly as regards building our computer capability and centralizing administration. The new effort will examine the results of the earlier advice and provide additional suggestions for "doing the right thing right."

The FY95 agenda-building exercise is already well underway, and has surfaced many important issues. Several topics are obviously of great significance to the Agency, and can be expected to generate considerable public interest. These topics include reviews of health risk assessment guidelines for cancer, the long-awaited review of the EPA's reassessment of the health risks posed by exposure to "dioxin," soil cleanup standards for sites with radionuclide contamination, a "second look" at possible health effects of electromagnetic fields, and a review of the methodology for calculating cost/benefit ratios underlying Regulatory Impact Analyses. In addition, FY95 is likely to bring to the Board a considerable number of important topics that cannot be anticipated at this time. As in the past, the SAB anticipates being faced with many more requests for reviews than can possibly be supported. Judicious selection should result in maximum output for the available resources.

APPENDIX A
CHARTERS

A1. Charter of the Science Advisory Board
A2. Charter of the Clean Air Scientific Advisory Committee
A3. Charter of the Council on Clean Air Compliance Analysis

Appendix A1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY ADVISORY COMMITTEE CHARTER

SCIENCE ADVISORY BOARD

1. PURPOSE AND AUTHORITY. This Charter is reissued to renew the Science Advisory Board in accordance with the requirements of the Federal Advisory Committee Act, 5 U.S.C. App. 11 SS 9(c). The former Science Advisory Board, administratively established by the Administrator of EPA on January 11, 1974, was terminated in 1978 when the Congress created the statutorily mandated Science Advisory Board by the Environmental Research, Development, and Demonstration Authorization Act (ERDDAA) of 1978, 42 U.S.C. 4365. The Science Advisory Board charter was renewed October 31, 1979; November 19, 1981; November 3, 1983; October 25, 1985; November 6, 1987; and November 8, 1989.

2. SCOPE OF ACTIVITY. The activities of the Board will include analyzing problems, conducting meetings, presenting findings, making recommendations, and other activities necessary for the attainment of the Board's objectives. Ad hoc panels may be established to carry out these special activities in which consultants of special expertise may be used who are not members of the Board.

3. OBJECTIVES AND RESPONSIBILITIES. The objective of the Board is to provide independent advice to EPA's Administrator on the scientific and technical aspects of environmental problems and issues. While the Board reports to the Administrator, it may also be requested to provide advice to the U. S. Senate Committee on Environment and Public Works or the U. S. House Committees on Science and Technology, Energy and Commerce, or Public Works and Transportation. The Board will review scientific issues, provide independent scientific and technical advice on EPA's major programs, and perform special assignments as requested by Agency officials and as required by the Environmental Research, Development, and Demonstration Authorization Act of 1978 and the Clean Air Act Amendments of 1977. Responsibilities include the following:

Reviewing and advising on the adequacy and scientific basis of any proposed criteria document, standard, limitation, or regulation under the Clean Air Act, the Federal Water Pollution Control Act, the Resource Conservation and Recovery Act, the Noise Control Act, the Toxic Substances Control Act, the Safe Drinking Water Act, the Comprehensive Environmental Response, Compensation, and Liability Act, or any other authority of the Administrator;

Reviewing and advising on the scientific and technical adequacy of Agency programs, guidelines, methodologies, protocols, and tests;

Recommending, as appropriate, new or revised scientific criteria or standards for protection of human health and the environment;

Through the Clean Air Scientific Advisory Committee, providing the technical review and advice required under the Clean Air Act, as amended in 1990;

Reviewing and advising on new information needs and the quality of Agency plans and programs for research, development and demonstration;

Advising on the relative importance of various natural and anthropogenic pollution sources;

As appropriate, consulting and coordinating with the Scientific Advisory Panel established by the Administrator pursuant to section 21 (b) of the Federal Insecticide, Fungicide and Rodenticide Act, as amended; and

Consulting and coordinating with other Agency advisory groups, as requested by the Administrator.

4. COMPOSITION. The Board will consist of a body of independent scientists and engineers of sufficient size and diversity to provide the range of expertise required to assess the scientific and technical aspects of environmental issues. The Board will be organized into an executive committee and several specialized committees, all members of which shall be drawn from the Board.

The Board is authorized to constitute such specialized committees and ad hoc investigative panels and subcommittees as the Administrator and the Board find necessary to carry out its responsibilities. The Administrator will review the need for such specialized committees and investigative panels at least once a year to decide which should be continued. These committees and panels will report through the Executive Committee.

The Administrator also shall appoint a Clean Air Scientific Advisory Committee of the Board to provide the scientific review and advice required by the Clean Air Act Amendments of 1990. This group, established by separate charter, will be an integral part of the Board, and its members will also be members of the Science Advisory Board.

5. MEMBERSHIP AND MEETINGS. The Administrator appoints individuals to serve on the Science Advisory Board for two year terms and appoints from the membership a Chair of the Board. The Chair of the Board serves as Chair of the Executive Committee. Chairs of standing committees or ad hoc specialized subcommittees serve as members of the Executive Committee during the life of the specialized subcommittee. Each member of the Board shall be qualified by education, training, and experience to evaluate scientific and technical information on matters referred to the Board. No member of the Board shall be a full-time employee of the Federal Government. Most members will serve as special Government employees.

There will be approximately 50-60 meetings of the specialized committees per year. A full-time salaried officer or employee of the Agency will be present at all meetings and is authorized to adjourn any such meeting whenever this official determines it to be in the public interest.

Support for the Board's activities will be provided by the Office of the Administrator, EPA. The estimated total annual operating cost will be approximately $1,689,000 and the estimated Federal permanent staff support will be 14.6 work years.

6. DURATION. The Board shall be needed on a continuing basis. This charter will be effective until November 8, 1993, at which time the Board charter may be renewed for another two-year period.

7. SUPERSESSION. The former charter for the Science Advisory Board, signed by the Deputy Administrator on November 8, 1989 is hereby superseded.

October 27, 1993
Agency Approval Date

F. Henry Habicht II
Deputy Administrator

November 8, 1993
Date Filed with Congress

Appendix A2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY ADVISORY COMMITTEE CHARTER

CLEAN AIR SCIENTIFIC ADVISORY COMMITTEE of the Science Advisory Board

1. PURPOSE. This charter is reissued to renew the Clean Air Scientific Advisory Committee of the Science Advisory Board in accordance with the requirements of section 9(c) of the Federal Advisory Committee Act, 5 U.S.C. App. 11 SS 9(c).

2. AUTHORITY The Committee was specifically directed by law on August 7,1977, under section 109 of the Clean Air Act, as amended [ACT], (42 U.S.C. 7409), and the charter was renewed on August 6, 1979; July 22, 1981; August 1, 1983; July 23, 1985; August 5, 1987; August 7, 1989; and August 7, 1991.

3. OBJECTIVE AND SCOPE OF ACTIVITY. The Committee shall provide independent advice on the scientific and technical aspects of issues related to the criteria for air quality standards, research related to air quality, source of air pollution, and the strategies to attain and maintain air quality standards and to prevent significant deterioration of air quality. The Committee shall hold meetings, perform studies, make necessary site visits, and undertake other activities necessary to meet its responsibilities. The Committee will coordinate its activities with other Committees of the Science Advisory Board and may, as it deems appropriate, utilize the expertise of other committees and members of the Science Advisory Board. Establishment of subcommittees is authorized for any purpose consistent with this charter. The Committee will report to the Administrator of the U.S. Environmental Protection Agency.

4. FUNCTIONS. The Committee will review criteria documents for air quality standards and will provide independent scientific advice in response to the Agency's request and, as required by section 109 of the Act shall:

Not later than January 1, 1980, and at five year intervals thereafter, complete a review of the criteria published under section 108 of the Clean Air Act and the national primary and secondary ambient air quality standards and recommend to the Administrator any new national ambient air quality standards or revision of existing criteria and standards as may be appropriate,

Advise the Administrator of areas where additional knowledge is required concerning the adequacy and basis of existing, new, or revised national ambient air quality standards,

Describe the research efforts necessary to provide the required information,

Advise the Administrator on the relative contribution to air pollution concentrations of natural as well as anthropogenic activity, and

Advise the Administrator of any adverse public health, welfare, social, economic, or energy effects which may result from various strategies for attainment and maintenance of such national ambient air quality standards.

5. COMPOSITION AND MEETINGS. The Administrator will appoint a Chairperson and six members including at least one member of the National Academy of Sciences, one physician, and one person representing State air pollution control agencies for terms up to four years. Members shall be persons who have demonstrated high levels of competence, knowledge, and expertise in the scientific/technical fields relevant to air pollution and air quality issues. Members of the Committee become members of the Science Advisory Board, and the Chairperson of the Committee, or his designee, shall serve as a member of the Executive Committee of the Science Advisory Board. Most members will serve as Special Government Employees. The Committee will meet three to six times per year. A full time salaried officer or employee of the Agency will be present at all meetings and is authorized to adjourn any such meeting whenever this official determines it to be in the public interest. Support shall be provided by EPA through the Offices of the Science Advisory Board. The estimated annual operating cost totals approximately $185,000 and two work years of staff support.

6. DURATION. The Committee will be needed on a continuing basis. This charter will be effective until August 7, 1995, at which time the Committee charter may be renewed for another two-year period.

Carol M. Browner
Administrator

November 8,1993
Date Filed with Congress

October 27, 1993
Agency Approval Date

Appendix A3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY ADVISORY COMMITTEE CHARTER

Council on Clean Air Compliance Analysis

1. PURPOSE. This Charter establishes the Council on Clean Air Compliance Analysis in accordance with requirements of the Federal Advisory Committee Act, 5 U.S.C. App.11 SS 9(c).

2. AUTHORITY. The Council was specifically directed under section 812 of the Clean Air Act, as amended on November 15, 1990 (42 U.S.C. 7401 et seq.).

3. OBJECTIVE AND SCOPE OF ACTIVITY. The Council shall provide independent advice on technical and economic aspects of analyses and reports which the Agency prepares concerning the impacts of the Clean Air Act on the public health, economy, and the environment of the United States. The Council shall hold meetings, make necessary site visits and undertake other activities, necessary to meet its responsibilities. The Council will coordinate its activities with other committees of the Science Advisory Board and may, as it deems appropriate, utilize the expertise of other committees and members of the Science Advisory Board. Use of consultants and establishment of subcommittees is authorized for any purpose consistent with this charter providing subcommittees report back to the full Council. The Council will report to the Administrator of the U.S. Environmental Protection Agency.

4. FUNCTIONS. As required by the Clean Air Act Amendments of 1990, the Council shall:

review the data to be used or any analysis required under section 812 and make recommendations on the use of such data,

review the methodology used to analyze such data and make recommendations on the use of such methodology, and prior to the issuance of a report to Congress required under section 812, review the findings of such report, and make recommendations concerning the validity and utility of such findings.

At the Agency's request, the Council will:

review other reports and studies prepared by the Agency relating to the benefits and costs of the Clean Air Act, and

provide advice on areas where additional knowledge is necessary to fully evaluate the impacts of the Clean Air Act and the research efforts necessary to provide such information.

5. COMPOSITION AND MEETINGS. The Council shall consist of at least 9 members, appointed by the Administrator for terms of two years, after consultation with the Secretary of Commerce and the Secretary of Labor. Most members will be appointed as Special Government Employees subject to the conflict-of-interest restrictions. The Administrator shall appoint a chairperson. Members of the Council shall be recognized experts in the fields of economics analysis, the health and environmental effects of air pollution, environmental sciences, or such other fields that the Administrator determines to be appropriate. The chairperson of the Council shall serve as a member of the Executive Committee of the Science Advisory Board. Other members of the Council may be members of the Science Advisory Board and may also serve on its various other committees or study groups. It is expected that the Council will meet two to four times per year. A full time employee of the Agency, who will serve as the Designated Federal Officer, will be present at all meetings and is authorized to adjourn any meeting whenever it is determined to be in the public interest. Support shall be provided by EPA through the offices of the Science Advisory Board. The estimated annual operating cost totals approximately $150,000 and 1.5 work-years of staff support.

6. DURATION. The Council will be needed on a continuing basis, and may be renewed beyond its initial two-year period following the date of enactment of the Act establishing this Council, as authorized in accordance with section 14 of the Federal Advisory Committee Act.

F. Henry Habicht II
Deputy Administrator

March 31, 1992
Date Filed with Congress

March 13, 1992
Agency Approval Date

APPENDIX B
MEMBERSHIP

APPENDIX B1
GUIDELINES FOR SERVICE ON THE SCIENCE ADVISORY BOARD

Background

The Science Advisory Board (SAB) was established in 1974 by the Administrator. In 1978 the SAB received a Congressional mandate to serve as an independent source of scientific and engineering advice to the EPA Administrator.

The SAB consists of approximately 100 Members, who are appointed by the Administrator. These members serve on specific standing committees. The Chairs of the Committees also serve as members of the Executive Committee, which oversees all of the activities of the Board.

In many of its activities, the members of the Board are supplemented by Consultants, who are appointed by the SAB Staff Director after conferring with the Chair of the Committee on which the consultant is to serve. Also, on occasion, Panels will be supplemented by "liaison members" from other governmental agencies. These people are invited by the Staff Director to participate in an ad hoc manner in order to bring their particular expertise to bear on a matter before the Board.

Both the Executive Committee and the permanent Committees may choose to conduct issue-specific business through Subcommittees that are chaired by SAB members. Reports from Subcommittees are reviewed by the respective permanent Committees. The Executive Committee reviews all reports, independent of their origin, prior to formal transmission to the Administrator. The sole exceptions are reports from the Clean Air Scientific Advisory Committee and the Clean Air Act Compliance Analysis Council, which are a separately chartered FACA committees operating within the SAB structure.

Criteria for Selection of Members and Consultants

The SAB is chartered as a Federal Advisory Committee, subject to the rules and regulations of the Federal Advisory Committee Act (FACA) (Public Law 92-463). The charter provides guidance and restrictions on selection of SAB members. The four most significant of which are:

a) Members must be qualified by education, training and experience to evaluate scientific and technical information on matters referred to the Board.

b) The composition of Board committees, subcommittees and panels must be "balanced", representing a range of legitimate technical opinion on the matter.

c) No member of the Board may be a full-time government employee.

d) Members are subject to conflict-of-interest regulations.

The scientific and technical quality and the credibility of those selected is a paramount consideration. Secondary factors considered include the geographic, ethnic, gender, and academic/private sector balance of committees. Other factors that contribute to, but do not determine, the selection include demonstrated ability to work well in a committee process, write well, and complete assignments punctually.

Nominations for membership/consultantship on the Board are accepted at any time. On a biannual basis, the SAB Staff Office publishes a notice in the Federal Register formally soliciting the names of candidates for SAB activities.

Terms of Appointment

Members serve at the pleasure and by appointment of the Administrator. In order to provide suitable terms of service and to insure the infusion of new talent, the following guidelines are generally followed:

Members are generally appointed in October for two-year terms which may be renewed for two additional consecutive terms. Chairs of the standing committees are also appointed for two-year terms which may be renewed for one additional term. If a member is appointed as Chair, this term of service (2-4 years) is added to whatever term of service he/she may accrue as a member. For example,

Years as member	Followed by years as Chair	Followed by years as member	Total years
2	0	0	2
2	2 or 4	0 or 2	4-6
4	2 or 4	0	6-8
6	2 or 4	0	8-10

Reappointment as a member is possible after a two-year hiatus from the SAB, during which time the individual may be called upon to serve as a consultant for a specific issue.

Consultants are appointed to provide the necessary expertise for specific issues. Their terms of appointment are for one year, beginning at any time, and are renewable annually. Their formal appointments may be continued beyond completion of a given project so that their expertise can be quickly assessed in future with a minimum of paperwork.

In general, interagency liaisons participate for the term of issue resolution only.

Member and Consultant Selection Process

Members are appointed by the Administrator based on nominations forwarded by the SAB Staff Director and the Chair of the Executive Committee. These nominations, in turn, are based on recommendations made by the Designated Federal Official (DFO--the member of the SAB Staff with principal responsibility for servicing standing Committees) and the Chairs of the standing Committees. The DFO has the responsibility for developing a list of candidates, utilizing all credible sources, including members of the SAB, other DFOs, EPA staff, staff at the National Academy of Sciences\National Research Council, trade groups, environmental groups, professional organizations, scientific societies, regulated industries, and the informed public.

On occasion, an *ad hoc* Membership Subcommittee of the Executive Committee has been established to assist in the selection process. This group is consulted about possible names and used as a "sounding board" when decisions are being made about appointments. The Membership Subcommittee's principal role is to maintain the integrity of the process and to probe the extent to which objective selection criteria and procedures are being followed. They also raise questions about adherence to the

Statement of Intent on Women and Minorities, adopted by the Executive Committee in 1990, which was designed to increase the representation of these groups on the Board.

Consultants are appointed by the Staff Director following a similar procedure.

Panel Selection Process

In general, once the Board and the Agency have agreed upon a topic for SAB review, the subject is assigned to one of the standing Committees. The Committee Chair and the DFO have primary responsibility for forming a review Panel (the full Committee or a Subcommittee, as the case may be.) The Panel will contain some or all members of the Committee. In many instances, consultants may also be added to the Panel in order to obtain specialized expertise on the particular issue under discussion.

A key aspect in the Panel selection process is the "charge", the mutually agreed upon description of what the Agency would like the review to accomplish and/or what the SAB expects to focus upon. The most helpful charge is one that prescribes specific areas/questions that need attention and/or answers. At a minimum, the elements of the charge should be sufficiently precise that the SAB can determine what additional consultant expertise is needed to conduct the most helpful review.

Often the DFO begins by soliciting ideas about potential members from the Agency staff who are intimately acquainted with the issue and will therefore are often aware of the most informed people. A conscious effort is made to avoid selecting individuals who have had a substantive hand in the development of the document to be reviewed. At the same time, experience has shown the utility of having some representation from individuals/groups who may have been involved in prior reviews of the issue or the document. The goal is to minimize the appearance or practice of an individual's reviewing his/her own work, while at the same time, maintaining an historical link to earlier deliberations surrounding the document/issue. Once the Agency staff has suggested nominees and provided background information on the individuals, their direct role in the panel selection process is complete. Agency staff, the requesting office, and others may be consulted at a later stage for information about nominees received from other sources.

The goal is to gather a balanced group of experts who can provide an independent assessment of the technical matters before the Board. Discrete inquiries

about the nominees are made with a number of different sources. This might include, for example, making inquiries with editors of newsletters, professional colleagues, and experts who are on "the other side" of the issue. As time and resources permit and controversy demands, names of nominees will be investigated via computer search of their publications and pronouncements in public meetings.

Frequently, a determining factor for selection is the availability of the individual to participate in the public review. In the case of multiple-meeting reviews, the SAB may enlist the assistance of a particularly skilled consultant who cannot attend all meetings, but who is willing to do additional homework and/or participate via conference call.

In some cases, the Panel Chair consults with key members of the Panel for their advice before completing the empaneling process. The final selections for consultants are compiled by the DFO in conjunction with the Chair of the Panel and are submitted to the SAB Staff Director for discussion and appointment.

Conflict-of-Interest and Public Disclosure

The intent of FACA is to construct a panel of knowledgeable individuals who are free of conflicts-of-interest. In this regard, each Panel member must complete a confidential financial information form that is reviewed by the Deputy Ethics Officer to determine whether there are any obvious conflicts-of-interest.

Legal conflict-of-interests generally arise in connection with "particular party matters." In general, the SAB (in contrast with the FIFRA Scientific Advisory Panel (SAP)) does not get involved in "particular party matters," hence, legal conflicts-of-interest are rare on the SAB. However, technical conflicts-of-interest can arise, particularly for participants from academic institutions, in connection with Panel recommendations for additional research studies. In most such cases, the DFO's work with the Panel members to apply for waivers from the conflict-of-interest concerns on this matter. The requests for waivers are evaluated on a case-by-case basis by EPA's Office of the General Council. (The Agency generally determines that the benefits to the country derived from these experts' recommendations for additional research, outweigh any technical conflict-of-interest that might be involved.)

However, the Board is also concerned about "apparent conflicts-of-interest." Consequently, Members and Consultants to the Panel are generally selected from the

"broad middle" spectrum of opinion on the technical issue under discussion. Experience has shown that achieving balance through equal representation of extreme views reduces the chance of achieving a workable consensus--pro or con--that the Agency needs to more forward.

The "public disclosure" (see Attached) process (a standard part of all SAB Panel meetings) is a mechanism aimed resolving the apparent conflicts-of-interest issues. This procedure involves an oral statement (sometimes Panel members supplement this with a written document) that lays out the individual's connection with the issue under discussion; e.g., his/her area of expertise, length of experience with the issue, sources of research grants, previous appearance in public forms where he/she might have expressed an opinion, etc. This recitation of prior and/or continuing contacts on the issue assists the public, the Agency, and fellow Panel members in assessing the background from which particular individual's comments spring, so that those comments can be evaluated accordingly.

Conclusion

These Guidelines are intended to assist the SAB in adhering to the mandates and spirit of the Federal Advisory Committee Act. By following these Guidelines the Board should be well-positioned to provide technically-sound, independent, balanced advice to the Agency. At the same time, they provide assurance that there will be adequate participation by and renewal with well-qualified experts from the various communities served by the Board.

Prepared: Oct 14, 1991
Revised: Nov 26, 1991
Revised: Oct. 12, 1994

ATTACHMENT

ATTACHMENT
Guidelines for Public Disclosure at Sab Meetings

Background

Conflict-of-interest (COI) statutes and regulations are aimed at preventing individuals from (knowingly or unknowingly) bringing inappropriate influence to bear on Agency decisions which might affect the financial interests of those individuals. The SAB contributes to the decision-making process of the Agency by evaluating the technical underpinnings upon which rules and regulations are built. SAB Members and consultants (M/Cs) carry our their duties as Special Government Employees (SGE's) and are subject to the COI regulations.

Therefore, in order to protect the integrity of the advisory process itself and the reputations of those involved, procedures have been established to prevent actual COI and minimize the possibility of perceived COI. These procedures include the following:

a) Having M/C's file, at the time of appointment, Special Form 450, Confidential Statement of Employment and Financial Interest. This form is a legal requirement and is maintained by the Agency as a confidential document.

b) Providing M/C's with written material; e.g., "Ethics in a Nutshell" and a copy of Ethics Advisory 92-11.

c. Delivering briefings to M/C's on COI issues on a regular basis.

The following is a description of an additional voluntary[1] procedure that is designed to allow both fellow M/Cs and the observing public to learn more about the backgrounds that M/C's bring to a discussion of a particular issue. In this way, all parties will gain a broader understanding of "where people are coming from" and provide additional insights to help observers and participants evaluate comments made during the discussion.

[1] Note: The disclosure procedure is voluntary, and members/consultants are not obligated to reveal information contained in their Form 450 that would overwise remain confidential.

Procedure

When an agenda item is introduced that has the potential for COI--actual or perceived--the Designated Federal Official (DFO) will ask each M/C on the panel to speak for the record on his/her background, experience, and interests that relate to the issue at hand. The following items are examples of the type of material that is appropriate to mention in such a disclosure:

a) Research conducted on the matter.

b) Previous pronouncements made on the matter.

c) Interests of employer in the matter.

d) A general description of any other financial interests in the matter: e.g., having investments that might be directly affected by the matter.

e) Other links: e.g., research grants from parties--including EPA--that would be affected by the matter.

The DFO will also publicly refer to any waivers from the COI regulations which have been granted for the purposes of the meeting.

The DFO will assure that the minutes of the meeting reflect that fact such disclosures were made and, if possible, the nature of the disclosures. In addition, the minutes should describe any situations in which, in the opinion of the DFO, an actual or perceived COI existed and how the issue was resolved.

APPENDIX B2
TYPES OF AFFILIATION WITH THE SAB

Members are individuals who serve on the SAB and who are appointed by the EPA Administrator, normally for a two year term (renewable in two-year increments up to a total of six years). Members are either can be either SGEs or Representatives (see below), although the preference is that they serve as SGEs. They are compensated for their time unless they elect to serve without compensation (WOC). Their travel and per diem expenses are paid. They are subject to conflict of interest laws and fill out all personnel paperwork. Members can vote on issues, although most SAB business is conducted by consensus.

Consultants are individuals who serve on the SAB and who are appointed by the SAB Staff Director, normally for a one-year terms, renewable on an annual basis until either their expertise is no longer needed or they elect to stop serving. Consultants are either can be either SGEs or Representatives (see below), although the preference is that they serve as SGEs. They are compensated for their time unless they elect to serve without compensation (WOC). Their travel and per diem expenses are paid. They are subject to conflict of interest laws and fill out all personnel paperwork. Consultants cannot vote on issues, although most SAB business is conducted by consensus.

Special Government Employees (SGEs) are individuals who are brought "on-board" using a personnel appointment involving a modest amount of paperwork. They are normally compensated for their time unless they elect to serve without compensation (WOC). Their travel and per diem expenses are paid. They are subject to conflict of interest laws and certain postemployment restrictions.

Representatives are individuals who serve on the SAB, but whose economic interests cannot be fully separated from those of their employer. Representatives are chosen because a) the SAB would gain technical benefit from hearing the technical views of the employee and/or b) the employer would not allow their experts to participate in any other way; cf., in some instances, service as an SGE can limit subsequent activities of that expert in future dealing with the Agency on the matter. They do not fill out any personnel paperwork. They are not compensated for their time; travel and

per diem expenses maybe covered by either their employer or EPA. They are not subject to the financial disclosure or conflict of interest laws.

Federal Experts are Federal (other than EPA) employees who participate in SAB reviews because of their peculiar experience and expertise. They speak for themselves as technical experts. They are not compensated for their time by the SAB; however, travel and per diem expenses may be paid. No paperwork other than a Travel Authorization is prepared, in cases in which EPA does the travel. They are subject to their own Agency's conflict of interest regulations, and they do not file an SF-450 (financial disclosure form) with the SAB. They are asked to participate in the formal conflict of interest disclosure at the beginning of SAB meetings, as appropriate. Federal Experts may contribute to the development of the Committee's report, but they do not vote.

Other Terms:

The Chair is the leader of an SAB Committee or Subcommittee. A Committee Chairs is an SAB member selected by the Administrator, informed by advice from the Staff Director. A Subcommittee Chair is usually an SAB member selected by the Committee Chair. Consultants and Representatives do not usually serve as Chairs.

An Invited Expert is an individual with special expertise who is brought to a meeting at SAB expense, but who is not being brought on board as a Member or Consultant. The individual's involvement with the Committee is limited to presentations and discussion. He/she does not work on the report or vote on matters before the Committee. The Travel Authorization reads Invitational Travel.

An Invited Participant is an individual who has been formally appointed as a Member or Consultant but whose paperwork has not been completed prior to the meeting. The person is reimbursed for travel expenses, but cannot receive salary prior to completion of the personnel action (SF-50). A completed SF-450 (financial disclosure form) is needed prior to formal participation on a Panel. The Travel Authorization reads Invitational Travel. He/she may contribute to the report and, in the case of someone invited to serve as a Member, may vote, if the occasion should arise.

APPENDIX B3
SAB MEMBERS FOR FY94

LAST NAME	FIRST NAME	COMM	AFFILIATION	CITY, STATE
Abriola	Linda	EEC	University of Michigan	Ann Arbor, MI
Ayres	Stephen M.	CASAC	Medical College of Virginia, VCU	Richmond, VA
Bailey	Paul	IAQC	Stoneybrook Laboratories Inc.	Princeton NJ
Bair	William	RAC	Battelle Pacific Northwest Labs	Richland, WA
Bean	Judy	DWC	University of Miami, Dept of Epidemiology	Miami, FL
Bockstael	Nancy E.	EEAC	University of Maryland	College Park, MD
Brown	Stephen L.	RAC	Risks of Radiation Chemical Compounds	Oakland, CA
Buffler	Patricia	CASAC	University of California	Berkley, CA
Bull	Richard	DWC	Washington State University	Pullman, WA
Bunn	William	EHC	Mobil Corporation	Princeton, NJ
Carns	Keith E.	DWC	Washington University	St. Louis, MO
Clesceri	Lenore	DWC	Rensselaer Polytechnic Institute	Troy, NY
Conway	Richard A.	EEC	Union Carbide Corporation	Charleston, WV
Cooper	Edwin	EPEC	UCLA School of Medicine	Los Angeles, CA
Cooper	William E.	EPEC	Michigan State University	East Lansing, MI
Crump	Kenny	EHC	ICF Kaiser	Ruston, LA
Cummings	Ronald G.	CAACAC	Georgia State University, Policy Res. Center	Atlanta, GA
Daisey	Joan M.	IAQC/EC	Lawrence Berkeley Laboratories	Berkeley, CA
Dale	Virginia	EPEC	Oak Ridge National Laboratory	Oak Ridge, TN
Deisler	Paul F.	EC/RSAC	Shell Oil Co. (Retired)	Austin, TX
Dickson	Kenneth L.	EPEC/EC	University of North Texas	Denton, TX
Dudek	Daniel J.	CAACAC	Environmental Defense Fund	New York, NY
Fabryka-Martin	Joan	RAC	Los Alamos National Laboratory	Los Alamos, NM
Fan-Cheuk	Anna	DWC	California Environmental Protection Agency	Berkley, CA
Ford	Jean	CASAC	Harlem Hospital	New York NY
Freeman	A. Myrick	EEAC	Bowdoin College	Brunswick, ME
Gallo	Michael	EHC	Robert Wood Johnson Medical School	Piscataway, NJ
Gerba	Charles P.	DWC	University of Arizona	Tucson, AZ
Gonzalez-Mendez	Ricardo	RAC	University of Puerto Rico, School of Medicine	San Juan, PR
Harwell	Mark A.	EPEC	University of Miami	Miami, FL
Hazen	Robert	IAQCC	NJ Dept. of Envir. Protection and Energy	Trenton, NJ
Henderson	Rogene	EHC	Lovelace Biomedi. & Env. Research Institute	Albuquerque, NI
Hoel	David	RAC	Medical University of South Carolina	Charleston, SC
Hoffman	Owen	RAC	SENES Oak Ridge, Inc.	Oak Ridge, TN
Huggett	Robert	EC/EPEC	College of William and Mary	Gloucester, VA

LAST NAME	FIRST NAME	COMM	AFFILIATION	CITY, STATE
Jackson	Richard	EHC	California St. Dept. of Health	Berkely, CA
Johnson	Charles	DWC	Malcom-Pimie (Retired)	Bethesda, MD
Johnson	James H.	EEC	Howard University	Washington, DC
Kachel	Wayne M.	EEC	Martin Marietta Corporation	Oak Ridge, TN
Kahn	Bernd	RAC	Georgia Institute of Technology	Atlanta, GA
Klaassen	Curtis	DWC	University of Kansas Medical Center	Kansas City, KS
Kneese	Allan	EEAC	Resources for the Future	Washington, DC
Kolstad	Charles	EEAC	University of Illinois	Urbana, IL
Kripke	Margaret	EC	M.D. Anderson Cancer Center, U of Texas	Houston, TX
Larson	Timothy V.	IAQCC	University of Washington	Seattle, WA
Leaderer	Brian P.	IAQCC	John B. Pierce Lab, Yale School of Med	New Haven, CT
Lighty	JoAnn S.	EEC	University of Utah	Salt Lake City, UT
Lioy	Paul J.	IAQC	Robert Wood Johnson Medical School	Piscataway, NJ
Lippmann	Morton	EC	New York University Medical Center	Tuxedo, NY
Liu	Benjamin	CASAC	University of Minnesota	Minneapolis, MN
Loehr	Raymond C.	EC	University of Texas at Austin	Austin, TX
Maki	Alan	EPEC	Exxon Company, USA	Houston, TX
Makhijani	Arjun	RAC	Institute for Energy and Env. Research	Takoma Park, MD
Matanoski	Genevieve	EC	Johns Hopkins University, Dept of Epidem.	Baltimore, MD
Mattison	Donald	EHC	University of Pittsburgh	Pittsburgh, PA
Mauderly	Joe	CASAC	Lovelace Biomedical & Env Institute	Albuquerque, NM
McClellan	Roger O.	RSAC/EC	Chemical Industry Instutite of Toxicology	RTP, NC
McElroy	Anne	EPEC	State University of New York - Stony Brook	Stony Brook, NY
Mendelsohn	Robert	EEAC	Yale University	New Haven, CT
Mercer	James W.	EEC	GeoTrans, Incorporated	Sterling, VA
Middleton	Paulette	CASAC	Univ. Cooperation for Atmospheric Research	Boulder, CO
Monson	Richard	EHC	Harvard School of Public Health	Boston, MA
Morandi	Maria	IAQCC	University of Texas, Health Science Center	Houston, TX
Morse	Roger	IAQC	Environmental & Technical Services, Inc.	Troy, NY
Murarka	Ishwar	EEC/EC	Electric Power Research Institute	Palo Alto, CA
Norton	Bryan	EEAC	Georgia Institute of Technology	Atlanta, GA
Nordhaus	William	EEAC/ CAACAC	Yale University	New Haven, CT
Oates	Wallace	EEAC	University of Maryland	College Park, MD
Pellizzari	Edo D.	DWC	Research Triangle Institute	RTP, NC
Perera	Frederica	EHC/EC	Columbia University	New York, NY
Pfaender	Frederic K.	EPEC	University of North Carolina	Chapel Hill, NC
Pitot	Henry C.	EHC	University of Wisconsin	Madison, WI
Pohland	Frederick	EEC	University of Pittsburgh.	Pittsburgh, PA

LAST NAME	FIRST NAME	COMM	AFFILIATION	CITY, STAT
Pojasek	Robert B.	EEC	GEI Consultants, Inc.	Winchester,MA
Portney	Paul	EEAC/EC	Resources for the Future	Washington, DC
Price	James	CASAC	Texas Nat. Res. Conservation Comm.	Austin, TX
Radike	Martha J.	EHC	University of Cincinnati	Cincinnati, OH
Ray	Verne A.	DWC/EC	Pfizer, Inc.	Groton, CT
Reitz	Richard	DWC	Dow Chemical Co.	Midland, MI
Repetto	Robert	EEAC	World Resources Institute	Washington, DC
Samet	Jonathan M.	IAQCC	Johns Hopkins University	Baltimore, MD
Schmalensee	Richard	CAACAC/EC	Massachusetts Institute of Technology	Cambridge, MA
Seeker	W. Randall	EEC	Energy & Environmental Research Corp.	Irvine, CA
Sextro	Richard	RAC	Lawrence Berkeley Laboratories	Berkeley, CA
Shaub	Walter	EEC	Corp. on Res. Recovery & the Env., Inc.	Washington, DC
Silbergeld	Ellen	EC	Environmental Defense Fund	Washington, DC
Smith	V. Kerry	EEAC	Duke University	Durham, NC
Smith	William H.	EPEC	Yale University	New Haven, CT
Snoeyink	Vernon L.	DWC	University of Illinois	Urbana, IL
Stavins	Robert	EEAC	Harvard University, JFK School of Govnt.	Cambridge, MA
Symons	James M.	DWC	University of Houston	Houston, TX
Tietenberg	Thomas	EEAC	Colby College	Waterville, ME
Upton	Arthur C.	EHC	University of New Mexico	Santa Fe, NM
Viscusi	W. Kip	EEAC	Duke University	Durham, NC
Watson	James E.	RAC/EC	University of North Carolina	Chapel Hill, NC
Wegman	David	EHC	University of Massachusetts	Lowell, MA
White	Ronald	IAQC	American Lung Association	Washington, DC
Wolff	George T.	CASAC/EC	General Motors Env. & Energy Staff	Warren, MI
Yates	Marilyn	DWC	University of california	Riverside, CA
Young	Terry F.	EPEC	Environmental Defense Fund	Oakland, CA

APPENDIX B4
SAB CONSULTANTS FOR FY94

LAST NAME	FIRST NAME	COMMITEE	AFFILIATION	CITY, STATE
Adams	William	EPEC	ABC Laboratories	Columbia, MO
Ahmed	Abdul Karim	EHC	Committee for National Inst. for Envir. (NIE)	Washington, DC
Alexander	Martin	EPEC	Cornell University	Ithaca, NY
Allen	Herbert	RSAC	University of Delaware	Newark, DE
Alm	Alvin L.	RSAC	Science Applications International, Inc.	McLean, VA
Auerbach	Stanley	EPEC	Oak Ridge National Laboratories	Oak Ridge, TN
Bartell	Steven	EPEC	Oak Ridge National Laboratory	Oak Ridge,TN
Bates	David	RAC	Univ of British Columbia	Vancouver, BC
Bauman	Bruce J.	EEC	American Petroleum Institute	Washington, DC
Beck	Barbara	CASAC	Gradient Corp.	Cambridge, MA
Beckett	William	RSAC	Yale University School of Medicine	New Haven, CT
Bedford	Barbara	EPEC	Cornell University	Ithaca, NY
Benowitz	Neal	IAQCC	University of California at San Francisco	San Francisco, CA
Berkowitz	Joan B.	EEC	Farkas Berkowitz & Company	Washington, DC
Bishop	Richard C.	EEAC	University of Wisconsin-Madison	Madison, WI
Boesch	Donald	EPEC	University of Maryland	Cambridge, MD
Bond	James A.	EHC	Chemical Industries Inst. for Toxicology	RTP, NC
Boston	Harry L.	EPEC	Oak Ridge National Laboratory	Oak Ridge, TN
Bostrom	Anne	RAC	Georgia Institute of Technology	Atlanta, GA
Brierley	Corale	EPEC	VistaTech Partnership, Ltd.	Sandy, UT
Buchsbaum	Robert	EPEC	Massachusetts Audubon Society	Wenham, MA
Burks	Sterling L.	EPEC	Oklahoma State University	Stillwater, OK
Burns	David	IAQC	University of California at San Diego	San Diego, CA
Byus	Craig	RAC	University of California at Riverside	Riverside, CA
Carlson	Gary P.	EHC	Purdue University	West Lafayette, IN
Carpenter	George F.	EEC	Michigan Dept of Natural Resources	Lansing, MI
Cartwright	Keros	EEC	Illinois State Geological Survey	Champaign, IL
Charbeneau	Randall J.	RAC	University of Texas at Austin	Austin, TX
Chien	Calvin	EEC	E.I.DuPont deNemours Company	Wilmington, DE
Chisolm	J. Julian	CASAC	Kennedy Krieger Institute	Baltimore, MD
Clifton	Kelly	RAC	University of Wisconsin-Madison	Madison, WI
Coates	Joseph	RAC	Coates & Jarratt, Inc.	Washington, DC
Colome	Steven	CASAC	Integrated Environmental Sciences	Irvine, CA
Coppock	Robert	EEC	World Resources Institute	Washington, DC
Cortese	Anthony D.	RSAC	Tufts University	Medford, MA

LAST NAME	FIRST NAME	COMMITEE	AFFILIATION	CITY, STATE
Cory-Slechta	Deborah	EPEC	University of Rochester	Rochester, NY
Costanza	Robert	EPEC	University of Maryland/Cheasapeake	Solomons Island,
Crapo	James D.	CASAC	Duke University Medical Center	Durham, NC
Cropper	Maureen L.	EEAC	The World Bank	Washington, DC
Cummins	Kenneth	EPEC	S. Fla. Water Mgmt. District	W. Palm Beach, F
Cutshall	Norman H.	EC	Martin Marietta Energy Systems, Inc.	Oak Ridge, TN
D'Elia	Christopher	EPEC	University of Maryland	College Park, MD
Dabberdt	Walter	EPEC	National Ctr for Atmospheric Research	Boulder, CO
Dagirmanjian	Rose	DWC	University of Louisville	Louisville, KY
deFur	Peter L.	EPEC	Environmental Defense Fund	Washington, DC
Denison	Richard	EEC	Environmental Defense Fund	Washington, DC
Diamond	Gary L.	EHC	Syracuse Research Corporation	Syracuse, NY
Dickinson	Robert E.	EPEC	National Center for Atmospheric Research	Boulder, CO
DiGiovanni	John	RAC	University of Texas	Smithville, TX
DiGiulio	Richard	EPEC	Duke University	Durham, NC
Dockery	Douglas W.	CASAC	Harvard School of Public Health	Boston, MA
Dorn	Philip B.	EPEC	Shell Development Company	Houston, TX
Dysart	Benjamin	EEC	Environmental Issues Management	Atlanta, GA
Eatough	Delbert	IAQC	Brigham Young University	Provo, UT
Enslein	Kurt	EHC	Health Designs, Inc.	Rochester, NY
Ensley	Burt D.	EPEC	Envirogen, Inc.	Lawrenceville, NJ
Epstein	Lois	EEC	Environmental Defense Fund	Washington, DC
Ewing	Ben B.	EEC	Consultant	Lummi Island, WA
Feero	William	RAC	Electric Research and Management, Inc.	State College, PA
Fenters	James	CASAC	ITT Research Institute	Chicago, IL
Finkel	Adam M.	EHC	Resources for the Future	Washington, DC
Fisher	Gerald	CASAC	Sandoz Research Institute	E. Hanover, NJ
Fishoff	Baruch	CASAC	Carnegie Mellon University	Pittsburgh, PA
Ford	Davis L.	EEC	Davis L. Ford & Associate	Austin, TX
Frank	Nedd R.	CASAC	Johns Hopkins University	Baltimore, MD
Gallagher	John	EPEC	University of Delaware	Lewes, DE
Gasiewicz	Thomas A.	EHC	University of Rochester, School of Medicine	Rochester, NY
Gentile	James M.	DWC	Hope College	Holland, MI
Goldstein	Bernard	EHC	UMDNJ-Robert Wood Johnson Medical School	Piscataway, NJ
Goldstein	Robert A.	CASAC	Electric Power Research Institute	Palo Alto, CA
Gordon	Gilbert	DWC	Miami University	Oxford, OH
Gordon	Theodore	EEC	Retired	Vero Beach, FL
Gosselink	James G.	EPEC	Louisiana State University	Rock Island, TN
Goyer	Robert	EHC	Consultant	Chapel Hill, NC
Grelecki	Chester	EEC	Hazards Research Corporation	Mount Arlington, N

LAST NAME	FIRST NAME	COMMITEE	AFFILIATION	CITY, STATE
Greer	Linda	NRDC	Natural Resources Defense Council	Washingtin, DC
Guilmette	Raymond	RAC	Inhalation Toxicology Research Institute	Albuquerque, NM
Hammond	Katharine S.	IAQCC	University of Massachusetts Medical Ctr	Worcester, MA
Hammond	Paul B.	CASAC	University of Cincinnati/Ketter	Cincinnati, OH
Hansen	Frederic J.	EC	Oregon Department of Environmental Quality	Portland, OR
Harbison	Raymond	EHC	Univ. of Florida	Alachua, FL
Harris	Robert L.	RAC	University of North Carolina-Chapel Hill	Chapel Hill, NC
Hartung	Rolf	EPEC	University of Michigan	Ann Arbor, MI
Hawkins	Charles	EPEC	Utah State University	Logan, UT
Heath	Clark	RAC	American Cancer Society	Atlanta, GA
Hidy	George M.	EEC	Electric Power Research Inst.	Palo Alto, CA
Hockman	Edwin L.	EEC	Amoco Corporation	Tulsa, OK
Hopke	Philip	RAC	Clarkson University	Potsdam, NY
Howard	Walter	EHC	Retired	St. Louis, MO
Inyang	Hilary	EEC	Geoenvironmental Design & Research, Inc.	Fairfax, VA
Jacobson	Jay S.	CASAC	Boyce Thompson Institute at Cornell Univ	Ithaca, NY
Jasanoff	Sheila	EC	Cornell University	Ithaca, NY
Jeffries	Harvey E.	CASAC	University of North Carolina	Chapel Hill, NC
Jenkins	Kenneth	EPEC	California State University	Long Beach, CA
Johnson	E.Marshall	EHC	Jefferson Medical College	Philadelphia, PA
Johnson	James D.	DWC	University of North Carolina	Chapel Hill, NC
Johnston	Carol A.	EPEC	Univ. of Minnesota	Duluth, MN
Kabat	Geoffrey C.	IAQC	Yeshiva University	Bronx, NY
Kalton	G. Graham	RAC	Westat	Rockville, MD
Kasperson	Roger E.	EPEC	Clark University	Worcester, MA
Kaufman	David G.	DWC	University of North Carolina	Chapel Hill, NC
Kendall	Ronald	EPEC	Clemson University	Pendleton, SC
Khalil	M. Aslam	EEC	Oregon Graduate Institute	Beaverton, OR
Kim	Nancy K.	EHC	New York Department of Health	Albany, NY
Kimberle	Richard A.	EPEC	Monsanto Company	St. Louis, MO
Koenig	Jane Q.	CASAC	University of Washington	Seattle, WA
Kreamer	David K.	RAC	University of Las Vegas	Las Vegas, NV
Kuschner	Marvin	EHC	State University of New York, Stony Brook	Stony Brook, NY
Laird	Nan M.	RAC	Harvard University	Boston, MA
Lamb	James C.	RSAC	Jellinek, Schwartz & Connolly, Inc.	Arlington, VA
Lebowitz	Michael	CASAC	University of Arizona,	Tucson, AZ
Lederman	Peter B.	EEC	Roy F. Weston, Inc.	Westchester, PA
Lee	Ramon	DWC	Illinois American Water Company	Belleville, IL
Legge	Allan	CASAC	Biosphere Solutions	Calgary, Alberta, CA
Longo	Lawrence D	CASAC	Loma Linda University	Loma Linda, CA

LAST NAME	FIRST NAME	COMMITEE	AFFILIATION	CITY, STATE
Lowndes	Herbert E.	EHC	Rutgers University	Piscataway, NJ
Lue-Hing	Cecil	EEC	Metro. Water Reclam. Dist of Gtr Chicago	Chicago, IL
Luthy	Richard G.	EEC	Carnegie-Mellon University	Pittsburgh, PA
MacKay	Donald	EPEC	University of Toronto	Toronto, Ontario
Mahoney	James	CASAC	International Technology Corporation	Torrance, CA
Mailman	Richard B.	EHC	University of North Carolina	Chapel Hill, NC
Mancini	John	EPEC	John Mancini Consultants, Inc.	Arlington, TX
Manning	William	CASAC	University of Massachusetts	Amherst, MA
Martin	James	RAC	Univ of Michigan	Ann Arbor, MI
Marty	Melanie	CASAC	CA Office of Env Health Hazard Assessment	Berkeley, CA
Massmann	Joel	EEC	University of Washington	Seattle, WA
McBee	Karen	EPEC	Oklahoma State University	Stillwater, OK
McClelland	Gary H.	EEAC	University of Colorado	Boulder, CO
McKinley	Marvin D.	EEC	University of Alabama	Tuscaloosa, AL
McMichael	Francis C.	EEC	Carnegie-Mellon University	Pittsburgh, PA
McMurry	Peter H.	CASAC	University of Minnesota	Minneapolis, MN
Menzel	Daniel B.	EHC	Duke University Medical Center	Durham, NC
Mercer	Robert R.	CASAC	Duke University Medical Center	Durham, NC
Meyer	H. Robert	RAC	Consultant	Fort Collins, CO
Michel	Jacqueline	RAC	Research Planning Inc.	Columbia, SC
Miller	Fred	EHC	Chemical Industry Institute of Toxicology	RTP, NC
Mitchell	Robert C.	EEAC	Clark University	Worcester, MA
Moomaw	William R	EPEC	Tufts University	Medford, MA
Morey	Rexford	EEC	Morey Environmental Mgmt, Inc	Hudson, NH
Morgan	M. Granger	EEC	Carnegie Mellon University	Pittsburgh, PA
Morrison	Robert D.	EC	R. Morrison & Associates	Valley Center, CA
Mueller	Peter K.	CASAC	Electric Power Research Institute	Palo Alto, CA
Mullins	Judith	EEC	General Motors	Detroit, MI
Mushak	Paul	CASAC	PB Associates	Durham, NC
Napier	Bruce A.	RAC	Battelle Pacific Northwest	Richland, WA
Nerode	Anil	RSAC	Cornell University	Ithaca, NY
Neuhauser	Edward	EPEC	Niagara Mohawk Power Corp	Syracuse, NY
Neuhold	John M.	EPEC	Utah State University	Logan, UT
Nielsen	David M.	EEC	Nielsen Ground-Water Science, Inc.	Galena, OH
Nisbet	Ian C.	EPEC	I.C. T. Nisbet & Company, Inc.	Lincoln, MA
Nixon	Scott	EPEC	University of Rhode Island	Narragansett, RI
North	D. Warner	EHC	Decision Focus, Inc.	Los Alto, CA
Nygaard	Oddvar	RAC	Case Western Reserve University	Cleveland, OH
O'Connor	Mary Ellen	RAC	University of Tulsa	Tulsa, OK
O'Melia	Charles	EEC	Johns Hopkins University	Baltimore, MD

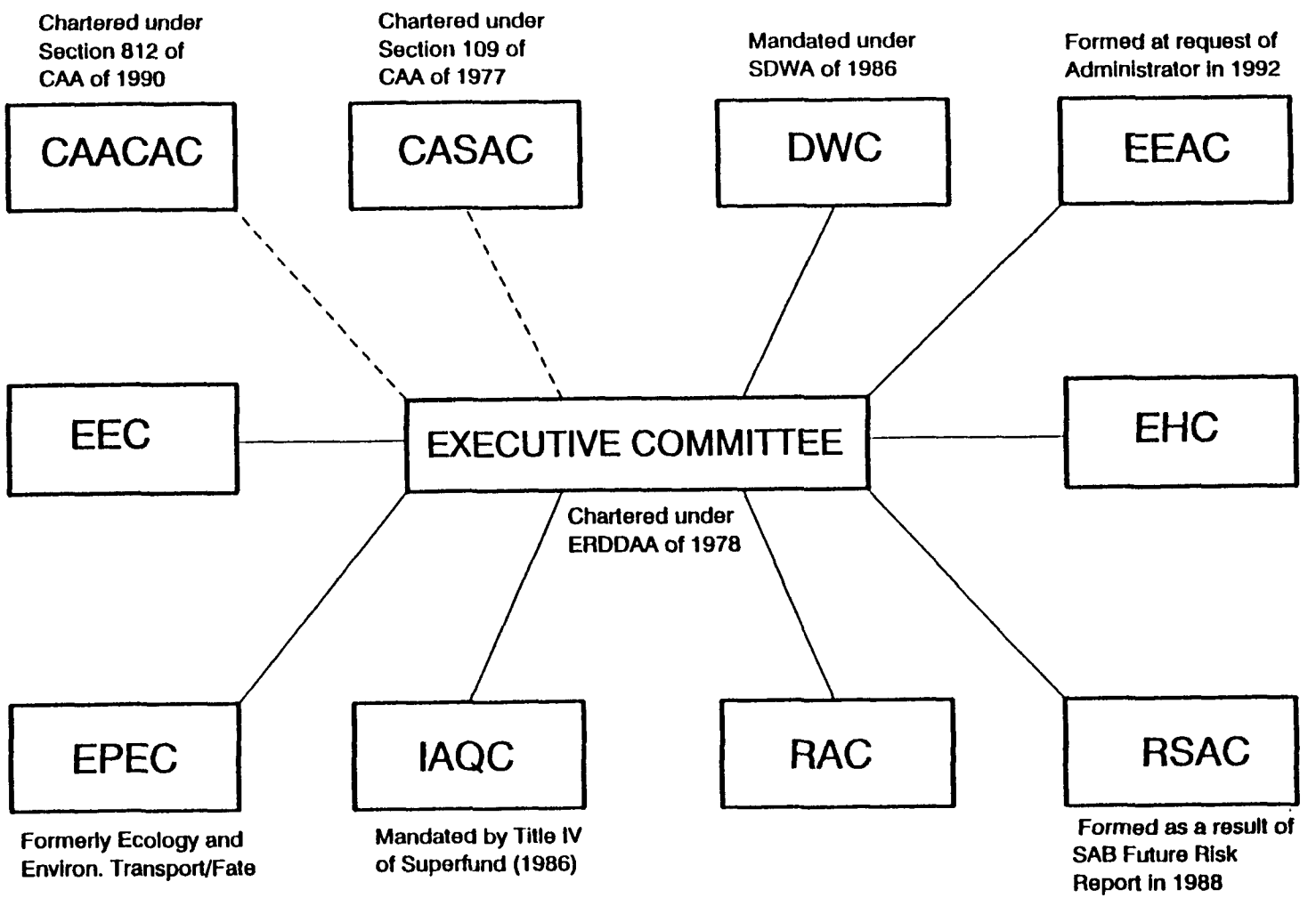
LAST NAME	FIRST NAME	COMMITEE	AFFILIATION	CITY, STATE
Oberdoerster	Gunter	EHC	University of Rochester	Rochester, NY
Olsen	Betty H.	EPEC	University of California, Irvine	Irvine, CA
Omenn	Gilbert	CASAC	University of Washington	Seattle, WA
Oppenheimer	Michael	CASAC	Environmental Defense Fund	New York, NY
Overcash	Michael R.	EEC	North Carolina State University	Raleigh, NC
Pefley	Richard	CASAC	Retired	Santa Clara, CA
Peterson	Richard	EPEC	University of Wisconsin	Madison, WI
Pierce	Donald	RAC	Oregon State University	Corvallis, OR
Poe	Gregory L.	EEAC	Cornell University	Ithaca, NY
Preslo	Lynne	EEC	ICF Kaiser Engineers	Oakland, CA
Rabinowitz	Michael B.	CASAC	Marine Biological Laboratory	Falmouth, MA
Rall	David	EHC	Consultant	Washington, DC
Regal	Philip	EPEC	University of Minnesota	Minneapolis, MN
Reuhl	Kenneth R.	EHC	Rutgers University	Piscataway, NJ
Riley	Jesse	RAC	Consultant	Charlotte, NC
Ringen	Knut	EHC	Center to Protect Workers Rights	Washington, DC
Ringer	Robert K.	EPEC	Consultant	Traverse City, MI
Risser	Paul G .	EPEC	University of New Mexico	Albuquerque, NM
Roberts	Donald W.	EPEC	University of Arizona	Tucson, AZ
Roberts	Paul	EEC	Stanford University	Palo Alto, CA
Rockette	Howard	IAQC	University of Pittsburgh	Pittsburgh, PA
Rodier	Patricia	DWC	University of Rochester	Rochester, NY
Rodricks	Joseph V.	RAC	Environ Corporation	Arlington, VA
Rose	Joan B.	EHC	University of South Florida	St. Petersburg, FL
Ross	Benjamin	RAC	Disposal Safety, Inc.	Washington, DC
Ross	Stephen T.	EPEC	University of Southern Mississippi	Hattiesburg, MS
Roth	Philip	CASAC	Envair	San Anselmo, CA
Rowe	Robert D.	CASAC	RCG/Hagler, Bailly, Inc.	Boulder, CO
Rozman	Karl K.	EHC	University of Kansas Medical Center	Kansas City, KS
Rundberg	Robert S.	RAC	Los Alamos National Laboratory	Los Alamos, NM
Russell	Clifford S.	EEAC	Vanderbilt University	Nashville, TN
Ryckman	Devere	EEC	REACT	St. Louis, MO
Safe	Stephen H.	EHC	Texas A&M University	College Station, TX
Saum	David	EEC	Infiltec, Saum Enterprises, Inc.	Falls Church, VA
Schachter	Edwin Neil	CASAC	Mt. Sinai Medical Center	New York, NY
Schnoor	Jerald	EPEC	University of Iowa	Iowa City, IA
Schreck	Richard	CASAC	General Motors Research Laboratory	Warren, MI
Schull	William	RAC	University of Texas	Houston, TX
Scialli	Anthony	EHC	Georgetown University Medical School	Washington, DC
Segerson	Kathleen	CASAC	Department of Economics	Storrs, CT

LAST NAME	FIRST NAME	COMMITEE	AFFILIATION	CITY, STATE
Shapiro	Joseph	EPEC	University of Minnesota	St. Paul, MN
Shugart	Herman H.	EPEC	University of Virginia	Charlottesville, VA
Shugart	Lee R.	EPEC	Oak Ridge National Laboratory	Oak Ridge, TN
Sinclair	Warren	RAC	National Council on Radiation Protection	Bethesda, MD
Small	Mitchell	EEC	Carnegie Mellon University	Pittsburgh, PA
Smith	Clifford V	RAC	GE Fund	Fairfield, CT
Sobsey	Mark D.	DWC	University of North Carolina	Chapel Hill, NC
Spacie	Anne	EPEC	Purdue University	West Lafayette, IN
Speizer	Frank	CASAC	Harvard School of Public Health	Boston, MA
Spengler	John D.	CASAC	Harvard University	Boston, MA
Stein	Michael	EC	University of Chicago	Chicago, IL
Stetter	Joseph R.	IAQCC	Transducer Research, Inc.	Naperville, IL
Stolwijk	Jan	IAQCC	Yale University	New Haven, CT
Stout	Judy	EPEC	Dauphin Island Sea Lab	Dauphin Island, AL
Sunderman	Frederick	EHC	University of Connecticut School of Medicine	Farmington, CT
Susskind	Charles	RAC	University of California	Berkeley, CA
Suter	Glenn	CASAC	Oak Ridge National Laboratory	Oak Ridge, TN
Swenberg	James A.	EHC	University of North Carolina	Chapel Hill, NC
Taub	Frieda B.	EPEC	University of Washington	Seattle, WA
Taylor	George E.	CASAC	University of Nevada-Reno	Reno, NV
Templeton	William L.	RAC	Battelle Pacific Northwest	Richland, WA
Tephly	Thomas R.	DWC	University of Iowa	Iowa City, IA
Thein	Myint	EC	Oak Ridge National Laboratory	Oak Ridge, TN
Tiedje	James M.	EPEC	Michigan State University	East Lansing, MI
Tikuisis	Peter	CASAC	Defense Civil Inst of Env. Medicine	North York, ONT
Till	John E.	RAC	Radiological Assessments Corp.	Neeses, SC
Travis	Cheryl	RSAC	University of Tennessee	Knoxville, TN
Trehy	Michael	RSAC	Monsanto Corporation	St. Louis, MO
Trussell	R. Rhodes	DWC	Montgomery Watson Consulting Engineers	Pasadena, CA
Utell	Mark	CASAC	Univ of Rochester Medical Center	Rochester, NY
Valentine	Jane	EHC	University of California at Los Angeles	Los Angeles, CA
Van Konynenburg	Richard A.	RAC	Lawrence Livermore National Laboratory	Livermore, CA
Vlachos	Evan	EEC	Colorado State University	Fort Collins, CO
Voilleque	Paul	RAC	MJP Risk Assessment, Inc.	Idaho Falls, ID
von Lindern	Ian	CASAC	TerraGraphics Environmental Engineering	Moscow, ID
Wallsten	Thomas	EHC	University of North Carolina	Chapel Hill, NC
Walton	Barbara	EPEC	Oak Ridge National Laboratories	Oak Ridge, TN
Ward	C. Herb	EEC	Rice University	Houston, TX
Ware	James H.	CASAC	Harvard University	Boston, MA

LAST NAME	FIRST NAME	COMMITEE	AFFILIATION	CITY, STATE
Weiss	Bernard	EHC	University of Rochester	Rochester, NY
Weis	Judith S.	EPEC	Rutgers University	Newark, NJ
Weiss	Scott T.	IAQC	Harvard University	Boston, MA
Whicker	Floyd W.	RAC	Colorado State Universtiy	Fort Collins, CO
Whipple	Christopher	RAC	Clement International	Oakland, CA
White	Warren H.	CASAC	Washington University	St. Louis, MO
Wiersma	G. Bruce	EPEC	University of Maine	Orono, ME
Williams	Philip B.	EHC	Philip Williams & Associates, Ltd.	San Francisco, CA
Wilson	John	EEC	New Mexico Institute of Mining and Technology	Socorro, NM
Wilson	Richard	RAC	Harvard University	Cambridge, MA
Winner	William	EPEC	Oregon State University	Corvallis, OR
Witschi	Hanspeter	RSAC	University of California-Davis	Davis, CA
Wood	Ronald W.	CASAC	New York University Medical Center	New York, NY
Woods	James E.	IAQC	Virginia Polytechnic Institute	Blacksburg, VA
Wyzga	Ronald	EHC	Electric Power Research Institute	Palo Alto, CA
Yosie	Terry F.	EC	E. Bruce Harrison Company	Washington, DC
Zeise	Lauren	EHC	California Environmental Protection Agency	Berkeley, CA

APPENDIX C SCIENCE ADVISORY BOARD ORGANIZATIONAL CHART

U.S. Environmental Protection Agency
Science Advisory Board



All Committees (Except CAACAC and CASAC which report directly) report to the Administrator through the Executive Committee

APPENDIX D
STAFF SUPPORT AND COMMITTEE LEADERSHIP IN FY94

Many of the following positions were filled by two (or more) people during the year as changes in personnel or staff alignments were made. Where two persons occupied a position during the year, both are listed. The latter name is the incumbent at the close of FY94.

I - SUPPORT STAFF ALIGNMENT

STAFF DIRECTOR'S OFFICE

Staff Director:	Dr. Donald G. Barnes
Secretary to the Staff Director:	Mrs. Priscilla Tillery
Stay-in-School	Ms. Monique Ford
AARP Assistant	Ms. Betty Fortune

ASSISTANT STAFF DIRECTOR

Assistant Staff Director:	Mr. Robert Flaak

Committee Evaluation and Support Staff

Chief:	Mr. Randall Bond
Program Analyst:	Ms. Janice Cuevas
Project Coordinator:	Ms. Joanna Foellmer
Program Assistant:	Ms. Carolyn Osborne
Management Analyst:	Ms. Patricia Thomas
Secretary:	Ms. Lori Gross
Administrative Tech.:	Ms Vicki Richardson
Stay-in-School:	Mr. Rasheed Tahir

Committee Operations Staff

Designated Federal Officers:	Dr. Jack Kooyoomjian
	Mr. Samuel Rondberg
	Dr. Edward Bender
	Mrs. Kathleen Conway
	Mr. Manuel Gomez
	Ms. Stephanie Sanzone
Staff Secretaries/ Meeting Planners:	Mrs. Dorothy Clark
	Mrs. Diana Pozun
	Mrs. Mary Winston

II - COMMITTEE LEADERSHIP

Executive Committee

Chair:	Dr. Genevieve Matanoski
Designated Federal Official:	Dr. Donald G. Barnes
Staff Secretary:	Mrs. Pricilla Tillery

Clean Air Act Compliance Advisory Council

Chair:	Dr. Richard Schmalensee
Designated Federal Official:	Dr. Jack Kooyoomjian
Staff Secretary	Mrs. Diana Pozun

Clean Air Scientific Advisory Committee

Chair:	Dr. George Wolff
Designated Federal Official:	Mr. Randall Bond
Staff Secretary:	Ms. Lori Gross

Drinking Water Committee

Chair:	Dr. Verne Ray
Designated Federal Official:	Mr. Manuel Gomez
Staff Secretary:	Mrs. Dorothy Clark

Ecological Processes and Effects Committee

Chair:	Dr. Kenneth Dickson
Designated Federal Official:	Ms. Stephanie Sanzone
Staff Secretary:	Ms. Mary Winston

Environmental Economics Advisory Committee

Co-Chair:	Dr. A. Myrick Freeman
Co-Chair:	Dr. Paul Portney
Designated Federal Official:	Mr. Samuel Rondberg
Staff Secretary:	Mrs. Diana Pozun

Environmental Engineering Committee

Chair:	Dr. Ishwar Muraka
Designated Federal Official:	Mrs. Kathleen Conway
Staff Secretary:	Mrs. Dorothy Clark

Environmental Health Committee

Chair:	Dr. Frederica Perera
Designated Federal Official:	Mr. Samuel Rondberg
Staff Secretary:	Mrs. Mary Winston

Indoor Air Quality/Total Human Exposure Committee

Chair:	Dr. Joan Daisey
Designated Federal Official:	Mr. Manuel Gomez
Staff Secretary:	Mrs. Mary Winston

Radiation Advisory Committee

Chair:	Dr. James Watson
Designated Federal Official:	Dr. Jack Kooyoomjian
Staff Secretary:	Ms. Diana Pozun

Research Strategies Advisory Committee

Chair:	Dr. Roger McClellan
Designated Federal Official:	Dr. Ed Bender
Staff Secretary:	Ms. Lori Gross

ad hoc Environmental Futures Committee

Chair:	Dr. Raymond Loehr
Designated Federal Official:	Dr. Edward Bender
	Mr. Robert Flaak
Staff Secretary:	Ms. Lori Gross

ad hoc Industrial Excess Landfill Panel

Chair:	Dr. Robert Huggett
	Dr. Jan Stolwijk
Designated Federal Official:	Mr. Robert Flaak
Staff Secretary:	Ms. Janice Cuevas
	Ms. Lori Gross

ad hoc SAB Reinvention Committee

Chair:	Dr. Geneive Matanoski
Designated Federal Official:	Dr. Donald Barnes
Staff Secretary:	Ms. Janice Cuevas

APPENDIX E - SAB MEETINGS FOR FY94

Key to Committees of the Science Advisory Board

CAACAC	Clean Air Act Compliance Advisory Council
CASAC	Clean Air Scientific Advisory Committee
DWC	Drinking Water Committee
EC	Executive Committee
EEAC	Environmental Economics Advisory Committee
EEC	Environmental Engineering Committee
EFC	ad hoc Environmental Futures Committee
EHC	Environmental Health Committee
EPEC	Ecological Processes and Effects Committee
IAQC	Indoor Air Quality and Total Human Exposure Committee
IEL	*ad hoc Industrial Excess Landfill Panel*
RAC	Radiation Advisory Committee
RC	ad hoc Reinvention Committee
RSAC	Research Strategies Advisory Committee
SAP	Scientific Advisory Panel (for FIFRA, not an SAB Committee)

Note: Meetings listed in **bold *italics*** are public conference calls

Dates	**Issues/Projects**	**Committee**
Oct 1	***CAA Study AQ Models***	***CASAC***
Oct 21	***Radon Science Initiative***	***RAC***
Oct 21	***CAA Study AQ Models***	***CASAC***
Oct 26-27	Quarterly Meeting	EC
Oct 27	SAB Annual Meeting/Environmental Futures	EC
Oct 28	Futures Brief: Indirect Exposure Methodology Discuss: IAQ Research Draft	IAQC
Oct 28	Planning for FY94 Futures	DWC

Dates	Issues/Projects	Committee
Oct 28-29	Planning/Coordination for FY94 Futures	EEC
Oct 28-29	Review/Planning for FY94 NORM RA Radon Science Initiative Radon Measurement Protocol ORIA Clean-up Stds Futures	RAC
Oct 28-29	Planning for FY94 Review: MASTER Consult: Aquatic Life Criteria Brief: Eco/Econ Sustainability Modeling Futures	EPEC
**********		
Nov 10	Futures	EFC
Nov 18	Ozone NAAQS Exposure	CASAC
**********		
Dec 1	***Futures***	***EEC***
Dec 2	***CAA Study AQ Models***	***CASAC***
Dec 2-3	Indirect Exposure Methodology IAQ Research Draft - Revisions Futures	IAQC
Dec 3-4	Futures	RAC
Dec 8	Futures	EFC
Dec 14	IEL (Uniontown, OH)	EC/IEL Panel
Dec 16	Futures	DWC
Dec 16	Ozone NAAQS Exposure Futures	CASAC
Dec 17	***NORM RA***	***RAC***
Dec 17	***EPA Lab Study***	***RSAC***
**********		
Jan 5	***Futures***	***EEC***
Jan 10-11	Futures	EPEC
Jan 19	***EPA Lab Study***	***RSAC***
Jan 20	Futures	EFC
Jan 21	***Futures***	***RAC***
Jan 27-28	Quarterly Meeting	EC

Dates	Issues/Projects	Committee
Feb 7	***Futures***	***EEC***
Feb 10-11	Futures	EEC/Subc
Feb 15-16	Futures	EPEC/Subc
Feb 22	Futures	RAC/Subc
Feb 23-24	Planning/Review NORM RA Radon Science Initiative Futures	RAC
Feb 23-24	Futures	EFC
Feb 24	Planning CEEPES Brief: Ecol/Econ Sustainability Modeling	EEAC
**********		
Mar 2-3	STAA (CLOSED TO PUBLIC)	RSAC/Subc
Mar 2-3	Futures Cons: Superfund Soils Screening Levels	EEC
Mar 4	Futures	EEC/Subc
Mar 24	Ozone Exposure 2	CASAC
Mar 28	***NORM RA***	***RAC***
Mar 31- Apr 1	Futures	EFC
**********		
Apr 6	Cancer Guidelines Repro. Tox. Guidelines Environmental Hormones Futures Pollution Prevention	EHC
Apr 7-8	Futures Briefings: Monte Carlo Activities Indoor Air Program Exposure Factors Handbook	IAQC
Apr 8	ORD Budget	RSAC/Subc
Apr 12	SO_2 Reproposal (RTP, NC)	CASAC
Apr 21-22	Quarterly Meeting	EC

Dates	Issues/Projects	Committee
Apr 27-28	Information Collection Rule	DWC
	Futures	
Apr 27-28	Wildlife Criteria (GLWQI)	EPEC
Apr 28-29	Bioaccumulation Methodology	EPEC/DWC
**********		
May 4-5	Planning/Coordination/Review	RAC
	EMF Carcinogenicity	
	Futures	
May 12-13	EPA Lab Study	RSAC
May 18-19	Futures	EFC
May 31	Futures	EEAC
	Planning	
	Briefings on Econ. Activities	
**********		
Jun 1	Ecol/Econ Sustainability Modeling	EPEC
Jun 14	Reinvention	RC
Jun 15-16	Futures	EFC
Jun 20	***Futures***	***RAC***
Jun 22-23	Planning-Futures	EPEC
	Consult: Saltwater DO Criteria	
Jun 28-30	Cons: Combustion (various topics)	EEC
	Futures	
	Environmental Tech.Init. Strategy	
**********		
Jul 11	Futures	RAC/Subc
Jul 12-13	Planning/Coordination/Review	RAC
Jul 13	Futures	EFC
Jul 14-15	Quarterly Meeting	EC
Jul 19-20	Review: Integrated Ecosystems Issue Plan	EPEC
	Review: EMAP Landscape Charac.	
Jul 21	Marsh Management Review - I	EPEC/Sub
Jul 20-21	Ozone Criteria Document	CASAC
Jul 19	Repro. Tox. Guidelines	EHC
**********		
Aug 2-3	Futures	EFC

Dates	Issues/Projects	Committee
Aug 18-19	Review of As Issues Multiple Briefings	DWC
Aug 29	***Futures***	***RAC***
**********		
Sep 7-8	Marsh Management - II	EPEC/Sub
Sep 8	Reinvention .	RC
Sep 13-14	Futures	EFC
Sep 26	***Futures***	***EFC***

Total: **58 Open Meetings**
1 Closed Meeting
15 Open Conference Call Meetings

APPENDIX F
SCIENCE ADVISORY BOARD FY94 REPORT ABSTRACTS

F1 LIST OF SAB REPORTS, LETTERS, COMMENTARIES, ADVISORIES, AND CONSULTATIONS FOR FY94

REPORTS

EPA-SAB-EEAC-94-001 Contingent Valuation Methodology (CV 1)-Review of the Contingent Valuation Method for the Proposed RIA for RCRA Corrective Action Rule

EPA-SAB-EEC-94-002 Review of MMSOILS Component of Proposed Regulatory Impact Analysis (RIA) for the RCRA Corrective Action Rule

EPA-SAB-EPEC-94-003 Evaluation of Draft Technical Guidance for Biological Criteria for Streams and Small Rivers

EPA-SAB-DWC-94-004 Review of the Draft Drinking Water Criteria Document on Inorganic Arsenic

EPA-SAB-EHC-94-005 Assessment of Potential 2,4-D Carcinogenicity

EPA-SAB-DWC-94-006 Review of the Research Program on Disinfectants and Disinfectant By-Products in the Risk Reduction Research Laboratory

EPA-SAB-EPEC-94-007 Evaluation of a Testing Manual for Dredged Material Proposed for Discharge in Inland and Near Coastal Waters

EPA-SAB-DWC-94-008 Review of Indoor Air Issue Plan

EPA-SAB-IAQC-94-009a Review of Draft of Addendum to the Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions--Interim Report

EPA-SAB-IAQC-94-009b Review of Draft Addendum to the Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions

EPA-SAB-EC-94-010 Review of EPA's Approach to Screening for Radioactive Waste Materials at A Superefund Site in Uniontown, Ohio

EPA-SAB-RSAC-94-011 Recommendations on the 1993 Scientific and Technological Achievement Awards Nominations

EPA-SAB-EPEC-94-012 Review of the Midwest Agrichemical Surface/Subsurface Transport and Effects Research (MASTER) Program

EPA-SAB-RAC-94-013 Review of Diffuse NORM Draft Scoping Document

EPA-SAB-EPEC-94-014 Review of the Strategic Plan for the Terrestrial Elements of EPA's Global Change Research Program

EPA-SAB-RSAC-94-015 Review of Mitre Corp. Draft Report on the EPA Laboratory Study

LETTER REPORTS

EPA-SAB-EEAC-LTR-94-001 Review of Economic Aspects of the Proposed RIA for the RCRA Corrective Action Rule (also referred to as CV-2)

EPA-SAB-EC-LTR-94-002 Overview of SAB Comments and Recommendations on the Proposed RIA for the RCRA Corrective Action Rule

EPA-SAB-EHC-LTR-94-003 Review of Health Benefits for the Proposed RIA for the RCRA Corrective Action Rule

EPA-SAB-EPEC-LTR-94-004 Review of the Environmental Monitoring and Assessment Program's Draft Assessment Framework

EPA-SAB-EEC-LTR-94-005 Ground Water Monitoring Network Research

EPA-SAB-RAC-LTR-94-006 RIA's Radon Measurement Protocol Evaluation Study

EPA-SAB-CASAC-LTR-94-007 CASAC Closure on the Supplements to Criteria Document and Staff Position Papers for SO2

EPA-SAB-RSAC-LTR-94-008 Review of the FY1995 Presidential Budget Request for the Office of Research and Development

EPA-SAB -CASAC-LTR-94-009 CASAC Comments on Air Quality Modeling for the Section 812 Retrospective Study

EPA-SAB-DWC-LTR-94-010 Review of Information Collection Rule (Monitoring Requirements for Public Drinking Water Supplies)

COMMENTARIES

EPA-SAB-EPEC-COM-94-001 Commentary on Ecological Risk Assessment for the Proposed RIA for RCRA Corrective Action Rule

EPA-SAB-DWC-COM-94-002 Drinking Water Committee Commentary on Negotiated Regulations for Disinfectants and By-Products

EPA-SAB-EEAC-COM-94-003 Commentary on Peer Review of Research Used in Support of Environmental Policy

EPA-SAB-EEC-COM-004 Commentary on Strategic Research Planning

EPA-SAB-CASAC-COM-94-005 Commentary on Data Sets for PM10

ADVISORIES

EPA-SAB-EPEC-ADV-94-001 Advisory Evaluation on A National Methodology for Wildlife Criteria.

CONSULTATIONS

EPA-SAB-RAC-CON-94-001 Notification of Consultation on Cleanup Standards

EPA-SAB-EEC-CON-94-002 Notification of a Consultation on Soil Screening Levels

EPA-SAB-EEAC-CON-94-003 Notification of a Consultation on the Comprehensive Environmental Economic Policy Evaluation System (CEEPES)

EPA-SAB-EPEC-CON-94-004 Notification of a Consultation on National Saltwater Dissolved Oxygen Criteria

EPA-SAB-EPEC/DWC-CON-94 -005 Notification of a Consultation on Bioaccumulation Issues

EPA-SAB-EPEC-CON-94-006 Notification of a Consultation on A Conceptual Plan for an Integrated Ecosystem Protection Research Program

EPA-SAB-RAC-CON-94-007 Notification of Consultation on Low Level Waste Standards

EPA-SAB-EEC-CON-94-008 Notification of Consultation on Waste Minimization and Combustion

F2 Abstracts of SAB Reports, Advisories, and Commentaries for FY 1994
REPORTS

EPA-SAB-EEAC-94-001 Contingent Valuation Methodology (CV 1)-Review of the Contingent Valuation Method for the Proposed RIA for RCRA Corrective Action Rule

The EEAC addressed the design, conduct, and results of the contingent valuation study (undertaken for the EPA Office of Solid Waste by Drs. McClelland, Schulze, *et al.*), focusing on a Charge organized around five major questions: a) the survey respondents' understanding of groundwater resources; b) selection of the best method for estimating non-use values from the survey responses; c) use of the Box-Cox econometric procedure to address large bids; d) the problems of embedding, non-bids, and scenario rejection; and e) the applicability of the valuations obtained in this study as a basis for EPA to determine the non-use values of groundwater. The Committee commends EPA staff for supporting exploratory research of this nature. There is little doubt that this study represents a substantive contribution, extending our understanding of the issues associated with contingent valuation estimation of non-market values. Addressing the last, but most encompassing element of the Charge first, the Committee can not endorse the McClelland *et al.* study as a means of generating valid and reliable estimates of the nonuse values associated with cleaning up contaminated groundwater. Specifically, the Committee has no confidence that the respondents were clear about what it is they were being asked to value. Although the study was innovative in a number of respects, this most basic failing gives the Committee no choice but to question the validity of the findings. Addressing other aspects of the Charge: a) The Committee does not believe that the pre-testing and survey design techniques offer convincing evidence that a well-defined groundwater commodity was understood properly by all the respondents; b) The Committee does not believe that any of the three possible methods for separating the non-use or passive use values from total values can be established as preferred at this time; c) the Committee deems it impossible to judge whether the Box-Cox econometric estimates alone provide an acceptable and defensible method for dealing with the scenarios and the large bids associated with them; and d) the Committee does not believe that the approaches for treating embedding, scenario rejection, and the potential effects of non-bidding responses can be assessed for their reliability on the basis of the information provided in the report. The EEAC feels that the problems in using the study results to meet the needs of the RIA effort arise from requirements imposed on the research by the EPA, including the need for separate estimate of nonuse value and for a method that abstracted from the specific features of the local conditions associated with each specific case of groundwater contamination. The approaches taken to deal with these requirements have no basis in the theory of non-market valuation, nor precedent in practice, and were never subjected to peer review. The Committee's report offers specific suggestions for further

research to help resolve the questions raised by this study, including the criteria for deciding which households would be among the groups demanding increases in the amount available of specific commodities or values and study of the sensitivity of CV outcomes to the survey methods used.

EPA-SAB-EEC-94-002 Review of MMSOILS Component of Proposed Regulatory Impact Analysis (RIA) for RCRA Corrective Action Rule

The MMSOILS Model Review Subcommittee (MMRS) of the Environmental Engineering Committee (EEC) of the EPA Science Advisory Board (SAB) has prepared a report on the Agency's Office of Solid Waste (OSW) MMSOILS Multimedia Contaminant Fate, Transport, and Exposure Model. This model and guidance document was developed as a technical resource for estimating potential health risks at sites contaminated by toxic wastes or spills of toxic chemicals.

The review by the SAB's MMRS dealt with the adequacy of methods for using a screening level model where there is substantial subsurface heterogeneity or where non-aqueous phase contaminants are present, the appropriateness of the Agency's approach for aggregating releases from solid waste management units (SWMUs) to estimate concentration at exposure points over time, and the adequacy of the Agency's approach for developing long-term effectiveness and failure scenarios for site remedies.

The general consensus of the MMRS was that the use of a multimedia pathway model for screening purposes could be an appropriate approach for developing risk and cost estimates for a national-level Regulatory Impact Analysis (RIA), as long as the input parameters are accurate and the model is not applied outside its range of validity. Furthermore, the Agency's use of a single model, to the extent defensible for each facility considered, was viewed by the MMRS as necessary in order to ensure consistency among model results. The major overriding concerns of the MMRS were: a) application of MMSOILS outside its range of validity; b) large uncertainties in input parameters; c) consequent large uncertainties in MMSOILS results; d) clear communication of this uncertainty to decision-makers; and e) presentation of the results in the draft RIA document in a scientifically defensible manner that communicates the uncertainties of the calculations and their implications for the cost/benefit analysis.

The MMRS recommended that the Agency augment the MMSOILS results with cost/benefit estimates derived by alternative approaches, such as utilizing assessment data generated for Superfund sites, using more sophisticated models with better-defined data to develop estimates for representative sets of waste sites, applying site-specific models to analyze that relatively small number of facilities which MMSOILS

results indicate dominate the total costs or risks, and submission of selected case studies to expert panel review.

EPA-SAB-EPEC-94-003 Evaluation of Draft Technical Guidance for Biological Criteriafor Streams and Small Rivers

On May 13-14, 1993, the Biological Criteria Subcommittee of the Ecological Processes and Effects Committee reviewed the draft document, "Biological Criteria: Technical Guidance for Streams and Small Rivers." Biological criteria (biocriteria) are numeric or narrative expressions that describe the biotic integrity (health) of aquatic communities in minimally impaired reference areas. The Subcommittee concluded that the options presented for selecting reference conditions (i.e., use of reference sites in concert with historical data, empirical models, and expert opinion/consensus) were appropriate. The Subcommittee also supported the use of multiple metrics to evaluate the integrity of aquatic communities, but felt that seasonal variability requires that sampling be conducted at various times of the year. The report stresses the importance of consistent taxonomic identification of biological specimens, use of established museum repositories for curation of voucher specimens, and the importance of developing diagnostic tools to differentiate probable causes of impairment. The Subcommittee also highlights the important linkages between the biocriteria program and other Agency efforts, including the Environmental Monitoring and Assessment Program (EMAP), the Framework for Ecological Risk Assessment, and the Ecoregion Research Program.

EPA-SAB-DWC-004 Review of the Draft Drinking Water Criteria Document on Inorganic Arsenic

On April 19-20, 1993, the Drinking Water Committee of the Science Advisory Board (SAB) reviewed the Agency's draft *Drinking Water Criteria Document on Inorganic Arsenic.*

The Committee found that the document generally addresses the important aspects of arsenic toxicology, but that it does not adequately integrate the available scientific information. They agreed that the methylated forms of arsenic are less toxic than the parent compound. They found that appropriate data were used to derive the Reference Dose (RfD) for arsenic, but recommended against the use of an additional uncertainty factor (UF) of three.

The Committee agreed that there is an association between excess risks of certain internal organ cancers and exposure to high levels of arsenic. They recommended, however, that EPA develop a better understanding of the relationship between arsenic exposure and cancer risk before completing an in-house quantitative risk assessment. In particular, they found a need to take into account possible differences

between Taiwanese and U.S. populations, such as diet and background arsenic levels, before using the results of Taiwanese studies to assess risks for U.S. populations.

The Committee agreed that arsenic has not been shown conclusively to be an essential element. They recommended clarification of the use of the concepts of prevalence, exposure and use in the document, that the uncertainty surrounding arsenic exposures be estimated and reported, that issues of variability of dietary arsenic intake be addressed, and that the Agency also address potential ingestion of arsenic-laden dust by infants and toddlers.

EPA-SAB-EHC-94-005 Assessment of Potential 2,4-D Carcinogenicity

In August 1980, the EPA required oncogenicity testing of 2,4-D (2,4-dichlorophenoxyacetic acid. EPA reviewed the results of those studies completed to date (some of which reported an association of phenoxy herbicides, including 2,4-D, and non-Hodgkin's lymphoma (NHL)) and requested that a joint Committee of the Science Advisory Board and the Scientific Advisory Panel review the epidemiologic studies and other available relevant data. A joint Committee was formed, and met in Arlington, Virginia on April 1-2, 1993 to review human/canine epidemiological studies and animal toxicology studies *re* possible human carcinogenicity and mutagenicity.

Epidemiologic cohort studies have generally shown no increased risk of cancer, albeit that all of the populations for which specific exposure to 2,4-D have been identified were small, and the follow-up period usually short. Some case-control studies have shown a risk of Non-Hodgkin's Lymphoma (NHL) in association with farming but many of these studies did not control for exposure to other agents in addition to 2,4,D. The Committee concluded that current studies cannot distinguish whether observed risks reported are due to the use of 2,4,D. The single canine epidemiologic study suggested that pet dogs may be at risk from exposure to 2,4,D or to areas treated by a lawn care service. Although this study is supportive of a finding of carcinogenicity, there are questions about its applicability to human carcinogenicity because of poor information on exposure and possible non-comparability between canine and human lymphomas. Toxicology studies show that rats (but not other animal species tested) may develop astrocytomas from exposure to 2,4,D, but this outcome has not been reported in the human studies. An ongoing rat study at higher doses will clarify whether this finding is treatment-related or not. Tests of 2,4-D have not shown any mutagenic changes under experimental situations.

The Committee concludes that the data are not sufficient to find that there is a cause and effect relationship between the exposure to 2,4,D and NHL. Because there is some evidence that NHL occurs in excess in populations that are likely to have been

exposed to 2,4,D, there should be continued examination of the issue through further studies. Other data gaps exist, and decision-making on 2,4-D would benefit from completion of rodent studies previously requested by EPA, particularly further animal carcinogenicity studies that test 2,4-D jointly with other substances that might reflect the human exposure situation; a replication of the dog epidemiology study; additional case/control studies, with careful attention to exposures; additional human cohort studies designed to assess both relative risk of NHL and the comparative risk of all mortality; and additional follow up and analysis of worker cohorts involved in the production of 2,4-D.

EPA-SAB-DWC-006 Review of the Research Program on Disinfectants and Disinfectant By-Products in the Risk Reduction Research Laboratory

On December 2-3, 1992, the Drinking Water Committee of the Science Advisory Board (SAB) met to review, at the request of the Committee, the Agency's research program on disinfectants and disinfection by-products. The Committee concluded that the Agency is doing an excellent job in the performance of research activities in this area, but that reductions in funding levels are seriously delaying the acquisition of critical data in the microbial, disinfectant and disinfection by-products areas. The Committee strongly recommended the addition of additional resources.

The Committee recommended additional research efforts regarding: (a) by-products associated with alternative (non-chlorine) disinfectants, especially ozone; (b) brominated compounds arising from chlorination; (c) the use of granular activated carbon and membranes for control of by-product precursors; (d) new technologies with promise for small systems.

The Committee also found the Ground Water Survey of Viruses to be a valuable undertaking, but recommended that the Agency undertake a representative survey of human enteric viruses in ground waters. Finally, the Committee recommended that the Agency undertake efforts to establish criteria for the interpretation of biotechnological methods currently used for detection of viruses.

EPA-SAB-EPEC-94-007 Evaluation of a Testing Manual for Dredged Material Proposed for Discharge in Inland and Near Coastal Waters

On July 7-8, 1993, the Sediment Quality Subcommittee of the Ecological Processes and Effects Committee met to review the draft document, *Evaluation of Dredged Material Proposed for Discharge in Inland and Near Coastal Waters: Testing*

Manual, to determine whether it provides an appropriate testing framework to evaluate potential ecological and human health impacts of proposed discharges of dredged material under section 404 of the Clean Water Act. Overall, the Subcommittee concluded that the tests were validated and appropriate for use at this time. However, the Subcommittee questioned the premise of comparing contaminant-related risks from dredged material to those from reference material which might itself be causing adverse biological effects. Rather, the Subcommittee recommended that the toxicity of dredged material be determined relative to known clean sediments. The Subcommittee felt that the assessment of risks from discharge of dredged material in inland and near coastal waters should be conducted in accordance with the Agency's *Framework for Ecological Risk Assessment*, considering the full range of risks (including those from resuspension of pathogenic microorganisms in dredged material) and risks associated with alternative disposal options. In assessing risks to human health from bioaccumulating substances, the Subcommittee agreed that FDA action levels are the appropriate benchmarks for comparison, as long as the tests are made on edible portions of food organisms; bioaccumulation factors (BAFs) determined in amphipods or aquatic insects are not appropriate for such a comparison. The panel also recommended that plant bioassays be conducted in conjunction with animal tests in cases where the dredged material discharge site will be vegetated (e.g., beneficial uses of dredged material for creation of wetlands, submerged aquatic vegetation beds, and beach nourishment).

EPA-SAB-IAQC-94-008 Review of Indoor Air Issue Plan

On September 8-9, 1993, the Indoor Air Quality/Total Human Exposure Committee (IAQC) of the Science Advisory Board (SAB) reviewed the Agency's *Indoor Air Issue Plan*, a research plan prepared by the Office of Research and Development (ORD).

The Committee found that the Research Plan document, together with the oral presentations and supporting documents, provided a clear description of a coherent indoor air research strategy and program. They found that the program was clearly-focused, as were its inter-relationships with related activity elsewhere in ORD and the rest of the Agency, other federal agencies and the private sector. Although there are insufficient funds to adequately pursue all of the important indoor air issues, they concluded that EPA staff has adequately identified key areas for focus and developed a generally sound research program around these areas.

The Committee was concerned, however, that these evident strengths of the planning process and the research program were not adequately captured by the Issue Plan document. They recommended that the document be revised to more accurately represent the content of the presentations and the supporting materials, particularly a more complete discussion of the approach to be used to integrate the various program elements, as well as a "Rationale" section.

The Committee also commented on numerous scientific issues raised or addressed by the goals of the Research Plan. They recommended increased emphasis on a more explicit and clear-cut linkage of the research to health effects of potential concern, airborne particulate matter, and complex mixtures. In addition they addressed questions regarding the quantification of health effects that are associated with indoor environments, the identification of sensitive sub-populations, the definition of a "complex mixture" and protocols to study such mixtures, airborne particulate matter, biocontaminants, monitoring methods, and others.

EPA-SAB-IAQC-94-009a and EPA-SAB-IAQC-94-009b	Review of Draft Addendum to theMethodology forAssessing Health Risks Associated with Indirect Exposure to Combustor Emissions

On December 3, 1993, the Indoor Air Quality/Total Human Exposure Committee (the Committee) of the Science Advisory Board reviewed the draft document "Addendum to the Methodology for Assessing Health Risks Associated with Indirect Exposure to Combustor Emissions" (the Addendum).

Although the multi-media model of the Addendum is not yet fully developed, the Committee found merit in the model and recommended its use as an *analytical tool* to identify the chemicals most likely to accumulate in the environment, the environmental compartments most at risk of unacceptable accumulations, and the exposure pathways and chemicals most likely to result in aggregate health risks that reach levels of concern. Such analyses will provide strategic guidance for environmental sampling to obtain data on indirect exposure to humans and to ecosystems. However, they did not recommend the release of the Addendum as an "EPA Methodology" for routine, quantitative, site-specific risk assessments for incinerators because of substantial scientific uncertainties in the model and the absence of many important model parameters.

In addition to their general findings regarding the use and possible misuse of the methodology in the Addendum, the Committee addressed numerous specific issues concerning: 1) air emissions and modeling; 2) soil impacts and the food chain; 3) water impacts and modeling; and 4) exposure. Finally, the Committee stressed the need to establish a framework to ensure that the entire range of potential risks from stationary combustors are addressed holistically, including both direct and indirect risks, as well as local, regional, national and international concerns.

EPA-SAB-EC-94-010

Review of EPA's Approach to Screening for Radioactive Waste Materials at A Superefund Site in Uniontown, Ohio

The *ad hoc* Industrial Excess Landfill Panel of the Science Advisory Board reviewed issues related to the USEPA's screening criteria and procedures for radioactive waste materials, using the Industrial Excess Landfill Superfund site in Uniontown, Ohio as a test case. The Panel was asked: a) For screening purposes, what types of temporal and spatial sampling and analyses are sufficient to test a hypothesis that radioactive contamination is present? b) What radiological parameters are sufficient to determine the possible existence/extent of potential sub-surface radiological contamination? Are the methods employed by EPA for analysis of radioactive contamination adequate and appropriate for analyses of samples from hazardous waste sites? c) What modifications to generic guidelines for sampling and analytic methods and chain of custody protocols are scientifically justified while still assuring accurate, precise and valid data? d) What factors need to be considered in the development and application of data validation criteria for evaluation of radioactive contaminants at hazardous waste sites? e) What practices and organizational changes could lead to improved credibility for the U.S. EPA and constructive public participation at hazardous waste sites with potential radioactive contamination? The Panel responded to these and other questions in their report. Many of the Panel's conclusions and recommendations concerning issues such as sampling protocols, laboratory selection, data validation and verification, chain of custody, and risk communication should be taken broadly to apply to EPA's actions concerning Superfund sites in general, and not just the Industrial Excess Landfill which is featured in this report.

EPA-SAB-RSAC-94-011

Recommendations on the 1993 Scientific and Technological Achievement Awards Nominations

This report represents the conclusions and recommendations of the U.S. Environmental Protection Agency's Science Advisory Board regarding the 1992 EPA Scientific and Technological Achievement Awards (STAA) program. The STAA Subcommittee of the Science Advisory Board reviewed and evaluated the 131 papers nominated in eight scientific and technical categories for the 1992 STAA awards. The Subcommittee recommended 41 papers (32 percent of the nominations) for awards at three levels and also recommended to the Office of Research and Development (ORD) that additional papers be recognized with honorable mention. The Subcommittee recommended awards for papers from eleven EPA research laboratories, the Office of the Administrator, and two Environmental Services Divisions (Region VII and Region VIII). The Subcommittee encouraged the Agency to continue support for the STAA

program as a mechanism for recognizing and promoting high quality research in support of the Agency's mission.

EPA-SAB-EPEC-94-012 — Review of the Midwest Agrichemical Surface/Subsurface Transport and Effects Research (MASTER) Program

The Ecological Processes and Effects Committee met on October 28-29, 1993, to review the Midwest Agrichemical Surface/Subsurface Transport and Effects Research (MASTER) Program. The MASTER Program is an inter-agency effort between EPA, the U.S. Department of Agriculture, and the U.S. Geological Survey, designed to assess the impacts of agricultural practices on the watershed scale. EPA's participation in MASTER has focused on the ecological effects of agricultural best management practices (BMPs). The Committee strongly supports EPA's involvement in research such as MASTER to assess the impacts of nonpoint source (NPS) pollution in agroecosystems and in seeking ways to attain sustainability and ecological quality in agriculture. The MASTER Program provides the opportunity to consider not only the ecological effects of toxic chemicals, but to include a broader consideration of stressors such as habitat alterations associated with various agricultural BMPs which may have ecological consequences equal to or greater than those from agrichemicals. The Committee urges the Agency to continue support for the MASTER Program beyond the development of models and baseline data in the pilot watershed so that the predicted effects of management changes in the watershed can be compared to results from field tests.

EPA-SAB-RAC-94-013 — Review of Diffuse NORM Draft Scoping Document

The Radiation Advisory Committee (RAC) of the Science Advisory Board (SAB) has reviewed the Agency's Office of Radiation and Indoor Air (ORIA) study entitled "Diffuse NORM - Waste Characterization and Preliminary Risk Assessment," dated May, 1993. The RAC responded to the six specific questions asked by ORIA and also provided more general comments and suggestions.

The RAC believes that, despite its shortcomings, the NORM document nonetheless provides indications that some categories of NORM may produce risks that exceed those of concern from other sources of radiation. Consequently, the RAC is of the opinion that the issue of NORM deserves substantial attention within EPA, and is concerned that resolution of this issue will require an increased commitment of resources. If the EPA addressed the deficiencies identified by the RAC in its response to the charge, then the revised NORM scoping document could serve as a useful and

much-needed compilation of information for the public on NORM source terms and potential exposure pathways.

However, to go beyond this limited use and to meet the goal of serving as a screening tool for identifying those categories that may require possible regulatory attention, it would be necessary for the Agency to conduct its risk assessment analysis using a consistent approach for addressing uncertainties, such as the methodology suggested by the RAC in its report. Care should be taken to recognize the differences between those categories of NORM that may be rated high with respect to individual risk and those that may be rated high with respect to population risk.

EPA-SAB-EPEC-94-014 Review of the Strategic Plan for the Terrestrial Elements of EPA's Global Climate Change Research Program

This review by the Global Climate Change Research Subcommittee of the Ecological Processes and Effects Committee of the Science Advisory Board focused exclusively on the terrestrial elements of the Global Change Research Program under the direction of the Office of Research and Development (ORD) in EPA. Three questions were specifically addressed: (1) scientific merit of the current research plan, (2) effectiveness of Agency management and program coordination (internally and nationally), and (3) recommendations for future directions.

In general, the specific research projects appeared to be of high quality and adequately reviewed. Scientific accomplishments appeared consistent with the funds invested. Deficiencies, however, were revealed in program management. These deficiencies include absence of a clear vision of ORD's role in the National Program, lack of a strategic plan for implementing research, and inadequate linkage and integration with other Agency and Federal programs. The Subcommittee strongly recommends that EPA take an active role in: (1) defining and justifying the ecological effects and risk assessment needs for the National Program; (2) specifying the methodological development, data acquisition, and assessment research tasks necessary to meet those needs; and (3) implementing a national integrated research program focused on a clearly defined EPA role and national policy needs. There is a clear need to fund new policy-relevant research on ecological effects, assessments at different spatial and temporal scales, and responses strategies. Therefore, research should be concluded on methane budgets, carbon storage and dynamics, and *UV*-B impacts on rice. Also, a primary earth systems model should be selected.

EPA-SAB-RSAC-94-015 Review of Mitre's Draft Report on the EPA Laboratory Study

The Research Strategies Advisory Committee of the Science Advisory Board reviewed the Mitre Corporation report on the "EPA Laboratory Study", a compilation of data and analysis. This report was prepared for senior EPA managers and evaluated the facilities, equipment, and staffing of three types of laboratories (ORD, program office, and regional). The SAB was asked to review the report and offer its recommendations for laboratory realignment and management.

The Committee found that the research management was dysfunctional, research funding and capacity had declined significantly over the past 15 years, and that long-term strategic research lacked a customer/advocate. The Committee recommended the Agency correct its management problems before it begin any reorganization of the laboratories. They recommended that ORD headquarters resources also be considered as part of a comprehensive reorganization of the laboratories within ORD. They recommended that the Administrator become the advocate and primary client for centralized, long-term strategic research. The management plan should also include a consideration of the human resources and activities to develop and maintain the pool of scientific talent; options for coordinated budgets and evaluations with the client program office; a commitment to increase extramural research; and plans to convert contractor laboratory research personnel to federal employees. The Agency was advised by the Committee to resist pressure to make decisions on laboratory realignment in the near term.

LETTER REPORTS

EPA-SAB-EEAC-LTR-94-001 Review of Economic Aspects of the Proposed RIA for the RCRA Corrective Action Rule (also referred to as CV-2)

The EEAC completed its review of the analytical methodology for the draft RIA at its meeting of September 23, 1993. The Committee evaluated four aspects of the proposed economic methodologies, including a)the desirability of disaggregate information as part of the development and presentation of benefit-cost information in the RIA for a large, complex national rule; b) the exploration and presentation of "human health benefits," including both the cancer and non-cancer health effects associated with the proposed rule; c) the possibility of using the McClelland *et al.* (1992) CV analysis as the basis for estimating the non-use values for groundwater cleanup on a national scale; and d) the application of hedonic methods to evaluate the effects of contaminated sites on residential property values.

Overall, EPA staff are to be commended for a number of innovations in the methodologies outlined for use in the full RIA and illustrated with the examples in the draft report. The Committee also had a number of recommendations for improvement. For example, it should be possible to classify Solid Waste Management Units (SWMU) by size, location, and other characteristics and to develop the estimates according to these categories. This practice would facilitate evaluation of the methods used and improve the transferability of disaggregate results to the aggregate level. The second major element of the review addressed the RIA's evaluation of the benefits from avoiding adverse human health effects. While there are notable features in this component of the RIA, the Committee believes that there are also important limitations. Finally, the cost effectiveness analysis and presentation of overall impacts aggregates effects over a 128 year time horizon. The Committee recommends that alternative strategies be investigated for dealing with the effects of this long time horizon, including: discounting the measures of physical effects before gauging cost effectiveness; calculating cost effectiveness based on a year-by-year cost effectiveness and these ratios then discounted to a base period or an annualization of all factors relevant to a comparison.

Based on the earlier review of the McClelland *et al.* study itself, and two further issues raised by the methodology proposed for adopting the McClelland *et al.* results for use in the RIA, the Committee believes that the McClelland *et al.* estimates cannot be used for the intended purposes. Last, a key element in the development of aggregate estimates is the determination of the number of households which would be willing to pay (a non-use value) for cleanup of the groundwater. No specific evidence has been developed on how to determine the number of these households. The original McClelland *et al.* study focused on per-household values. Subsequent work appears very preliminary based on the information made available to the Committee. Overall, the Committee recommends against using the specific approach proposed in the draft RIA for developing the aggregate estimates of non-use values. The Committee found the hedonic analysis to be a careful and systematic evaluation of the effect of proximity of a contaminated site on the prices of nearby residential properties.

EPA-SAB-EC-LTR-94-002 — Overview of SAB Comments and Recommendations on the Proposed RIA for the RCRA Corrective Action Rule

This report presents a summary of the findings and recommendations of the SAB compiled by the RCRA RIA Steering Committee (RRSC). This report is one of a series of six reports. The RRSC was charged by the Executive Committee of the SAB to organize the reviews of standing committees, to ensure coordination and provide its own comments and overview and clarify the nature of the SAB review. The steering committee noted concerns with the Agency's use of contingent valuation (the study

design and its probity as used), the representativeness of the selected samples, the lack of validation for the assumptions of the MMSOILS model, and a general failure to characterize the uncertainties associated with non-cancer risks. The reader is directed to individual reports for full and detailed descriptions of the findings.

EPA-SAB-EHC-LTR-94-003 Review of Health Benefits for the Proposed RIA for the RCRA Corrective Action Rule

This report was prepared by the SAB's Environmental Health Committee following the circulation (by mail) of initial comments prepared by a Committee Member, and a public teleconference held on September 24, 1993. The report focuses on the risk assessment methodology used to generate the estimated impacts on human health resulting from proposed corrective action at RCRA facilities. In general, the methods used are well known and correspond to "much-used" guidelines, methods and practices (GMP).

There are some areas where we suggest possible improvements. i It would be very useful to include a way to estimate, even crudely, the fraction of the population presumably exposed to significant levels of contaminants (HI > 1) who actually manifest adverse, non-cancer effects. Without some attempt at providing such estimates for the most important cases, the cost/benefit calculation remains seriously incomplete. By including such estimates, the monetization of both cancer and non-cancer effects avoidance benefits can be done in a formal sense, and that portion of the cost/benefit calculation would at least be present in the overall screening analysis.

Addressing other areas, we note that the term "population risk" (and related terms in connection with both cancer and non-cancer adverse effects) is employed correctly *vis-a-vis* cancer, but not with non-cancer effects. The Agency should be more explicit in distinguishing cancer and other disease conditions with respect to risk and "population at risk." The benefits of abating disease are not monetized in the RIA document. At some point, the decrease in cancer cases and the decrease in numbers exposed to possible risks of non-cancer adverse effects may need to be balanced, along with other benefits (either monetized or not) against the dollar costs of corrective action. This is a difficult if not impossible aim to achieve in any objective way. It would be useful to estimate for cancer, the number of individuals "at risk" (already done for non-cancer effects) so as to have comparable numbers of people at risk for cancer and non-cancer effects. An estimate of the population exposed at levels of exposure of concern for cancer (i.e., levels leading to a lifetime individual risk of 10^{-6} or greater) would yield such estimates recognizing the fact that what is of concern is not identically defined in the two cases. Lastly, we urge increased emphasis on the collection and

management of good exposure data as a foundation for this, and other efforts by the Agency. The importance of good exposure data can not be underestimated that it is such a basic and important consideration that it needs to be highlighted in our comments especially since some problematic chemicals have not been included in the assessment.

EPA-SAB-EPEC-94-004 — Review of the Environmental Monitoring and Assessment Programs Draft Assessment Framework

In June 1993, the Ecological Processes and Effects Committee met to review the Assessment Framework for the Environmental Monitoring and Assessment Program (EMAP). The Committee felt that the Assessment Framework is a critical component of the program since it provides the framework for interpreting and evaluating EMAP data to answer policy-relevant questions about ecological resources. For this reason, the Committee recommended that assessment activities be given a greater priority within EMAP to ensure that the monitoring data being collected will be integrated into a form which is useful to Agency managers. They also felt that collection and analysis of monitoring data using existing ecological indicators should proceed in parallel with research and development of new indicators and they reaffirmed their belief that the primary focus of EMAP's monitoring effort should be on effects rather than stressors. Overall, the Committee found the Assessment Framework to be an appropriate guide for EMAP assessments, although they recommended that the document be revised to stress that EMAP assessments are consistent with the Agency's Framework for Ecological Risk Assessment and to include discussion of the sources and nature of uncertainties inherent in EMAP assessments. They also cautioned against inferring causal relationships based only on temporal and spatial associations. The Committee recommended that EMAP establish a centralized group, with representatives from each ecological resource group, to focus specifically on the integration and assessment across resource groups and regions.

EPA-SAB-EEC-LTR-94-005 — Ground-Water Monitoring Network Research

The Office of Solid Waste (OSW) requested that the Science Advisory Board's Environmental Engineering Committee (EEC) review the Ground-Water Monitoring Network Design Research Program of the Environmental Monitoring Systems Laboratory is Las Vegas (EMSL-LV). The EEC's Ground-Water Monitoring and Network Design Review Subcommittee (GWMNDRS) conducted its review of a June 1993 draft of the subject research plan at a site visit at EMSL-LV on July 29-30, 1993.

OSW would like to use the results of this research to develop quantitative standards for the design of ground-water monitoring well networks. The Subcommittee found that the goal of developing tools for implementing quantitative data quality objectives (QDQOs) for RCRA ground-water monitoring network system design and performance is achievable and has practical merit for RCRA as well as for the Superfund monitoring programs. Although the scientific quality of the work reviewed is very high, the projects as structured appear to fall short for meeting the stated specific needs for delivering readily useable methods in the near future. Additional planning is needed to improve guidance for new network design and to provide tools for evaluating existing networks and modifying them as needed.

The Subcommittee's chief recommendations are: (1) that the Agency sponsor a comprehensive literature review on the research topic, (2) undertake a "fourth project" that attempts to implement the methods and tools developed in the first three projects at actual RCRA sites, and (3) critically review the problems associated with current approaches to network design.

EPA-SAB-RAC-LTR-94-006 ORIA's Radon Measurement Protocol Evaluation Study

The Radiation Advisory Committee (RAC, also "the Committee") of the Science Advisory Board (SAB) reviewed, at its meeting in July 1993, the Agency's Office of Radiation and Indoor Air (ORIA) study design for the Radon Measurement Evaluation Protocol Study. Overall, the Committee is pleased that many of the concerns and questions raised in an earlier November 1992 discussion have been addressed and that the resulting study design appears to be robust and seems reasonable to achieve the stated Data Quality Objectives (DQOs).

This letter report addresses the specific elements in the charge from the Agency to the Committee, and provides recommendations for improvements to and additional comments on the proposed study. These recommendations include 1) exclusion from the study those houses which have had radon mitigation systems installed; 2) contingency plans for the study design cell with the smallest sample size; 3) formulation and discussion of the specific study hypotheses to be analyzed statistically; 4) presentation of results as direct comparisons of concentration measurements, including measurement/analysis uncertainties; and 5) not to use the present study design to evaluate the effect of climate.

In addition, the report offers comments on 1) whether to use basement or first-floor radon concentration measurements of 4 pCi/L for disaggregating the selected study houses; 2) the desirability of using other short-term measurement devices in place

of the planned use of 2-day open-face charcoal canisters; and 3) the use of continuous radon measurements in some of the study homes.

EPA-SAB-CASAC-LTR-94-007

CASAC Closure on the Supplements to Criteria Document and Staff Position Papers for SO2

On April 12, 1994, the CASAC completed its review of the criteia document and staff paper for sulfur oxides. The Committee felt that the documents were consistent with available scientific evidence for sulfur oxides and should provide an adequate basis for a regulatory decision. The Committee also highlighted 4 major points concerning the issue.

1) A wide spectrum of views exist among asthma specialists regarding clinical and public health significance of the effects of 5 to 10 minute concentrations of sulfur dioxide on asthmatics engaged in excercise.

2) It was the consensus of the group that the exposure scenario of concern is a rare event.

3) It was the consensus of CASAC that any regulatory strategy to ameliorate such exposures shouyld be risk-based -- targeted on the most likelysources of shot-term sulfur dioxide spikes rather than imposing short-term standards on all sources.

4) CASAC questioned the enforceability of of a 5 minute NAAQS or "target level". Current instrumentation used to routinely monitor sulfur disxide does not respond quickly enogh to accurately characterize 5 minute peaks.

EPA-SAB-RSAC-LTR-94-008

Review of the FY 1995 Presidential Budget Request for the Office of Research and Development

The Budget Review Subcommittee of the SAB conducted a broad review of the total research and development program and related budget and a more detailed review of four specific activities: the Ecosystem Protection Initiative, the Environmental Technology Initiative, and the Human Health Risk Assessment Methods and Criteria Air Pollutant Issues. The Subcommittee found that although the ORD budget represented an increase over last year, there has been a long-term erosion in the level of ORD funding, in spite of a substantial increase in FTEs and resources for the Agency and a substantial increase in the mission of the Agency. The Subcommittee also found that the Agency lacks a functioning, integrated management system with provision for planning, budgeting, implementing, reporting, and oversight of its research and development activities. It was noted that the lack of a management system has wasted resources and contributed to communications problems within the organization and with its client offices. The Subcommittee supported new investments in ecosystem protection, criteria air pollutants, and human exposure, but challenged the Agency to tie its

research to a strategic vision for its future application. Detailed comments were appended to the letter report.

EPA-SAB-CASAC-LTR-94-009 — CASAC Comments on Air Quality Modeling for the Section 812 Retrospective Study

At their December 22, 1992 meeting the SAB's Clean Air Act Compliance Analysis Council decided to refer review of the air quality modeling methodology part of the "Retrospective Study" of the impacts of the Clean Air Act to CASAC.

Three public confernce calls on October 1, 21, and December 2, 1993 served to brief the Panel members on their charge and for Panel members to provide comments on the methodoogy proposed by the Agency. The comments of the panel focused on ways to reuce the uncertainties in estimating what hisorical pollutant concentrations would have been in the presence and absence of the Clean Air Act and subsequent Amendments.

EPA-SAB-DWC-LTR-94-010 — Review of Information Collection Rule (Monitoring Requirements for Public Drinking Water Supplies)

On April 27, 1994, the Drinking Water Committee of the Science Advisory Board reviewed the Agency's proposed "Monitoring Requirements for Public Drinking Water Supplies" ("Information Collection Rule or ICR)."

The Committee supported the development and implementation of this rule but recommended that the Agency articulated an overall research plan to guide the collection and analysis of the data in a meaningful way. The plan should define clearly defined scientific objectives and methodology.

The Committee supported the archiving of virus samples but cautioned that without a research plan for their use and adequate commitment of resources, it is unlikely that archived samples would be put to a profitable use. They did not see merit in archiving parasite samples.

The Committee does not recommend the use of particle size count data in lieu of monitoring for *Giardia* and/or *Cryptosporidium* in finished water. They encouraged the Agency, however, to obtain as much data as possible concerning the relationship between particle counts and concentrations of protozoan parasites in order to better establish if relationships between them exist.

The Committee agrees with the Agency's proposal to require monitoring for coliphages and *C. perfringens*.

With regard to the Agency proposal to develop a database that includes the relevant characteristics of the water treatment plants covered by the ICR, the Committee recommended that the Agency carefully define the scientific objectives for its

modeling effort, its planned approach for use of the database, and standardization and verification procedures for data collection, prior to the start of the monitoring.

COMMENTARIES

EPA-SAB-EPEC-COM-94-001

Commentary on Ecological Risk Assessment for the Proposed RIA for RCRA Corrective Action Rule

As part of the Science Advisory Board's overall review of the draft Regulatory Impact Analysis (RIA) for the RCRA Corrective Action Rule, the Ecological Processes and Effects Committee met in June 1993 to review the ecological risk analysis in the RIA. The Committee congratulated the Agency for beginning to incorporate ecological risk assessment into management and regulatory decisions and acknowledged the difficulty of assessing ecological risks at a large number of RCRA sites with varying contaminants and ecological conditions. However, the Committee concluded that the consideration of ecological risks in the RIA was incomplete and not fully consistent with the Agency's Framework for Ecological Risk Assessment. Specifically, the Committee recommended that 1) the analysis consider the benefits (or risks) which would result from remediation (rather than looking only at the "no action" scenario), 2) the Agency follow the ecological risk framework for problem formulation, selection of ecological endpoints, and risk characterization; and 3) the results of the case studies be used to evaluate and refine the conceptual model used for the risk assessment. In addition, the Committee expressed concern that the stratification of the sample frame does not consider the distribution of ecologically-relevant site characteristics. In summary, the Committee recommended that the RIA be modified to consider the full range of ecological endpoints, or to state clearly that only a subset of endpoints have been evaluated and why these were selected.

EPA-SAB-DWC-COM-94-002

Drinking Water Committee Commentary on Negotiated Regulations for Disinfectants and By-Products

On August 17, 1993 the Drinking Water Committee of EPA's Science Advisory Board (SAB) was briefed by the Office of Ground Water and Drinking Water on the outcome of the negotiations regarding the rules for Disinfectants and Disinfection By-products (D/DBPs), Enhanced Surface Water Treatment (ESWTR) and Information Collection (ICR). The Committee had requested this briefing. The Committee concluded that a comprehensive, carefully targeted, and adequately funded research program is indispensable to clarify risks associated with drinking water disinfection.

Specifically, they recommended that the Agency's research in this area address: 1) the identification of toxic by-products of chlorination; 2) the identification and characterization of toxic by-products of alternative treatment processes; 3) the collection of risk and occurrence data for microbiologic hazards; 4) the choice, collection and analysis of data under the information collection rule to address clearly identified research needs. The Committee also recommended a special effort to develop a *comparative* quantitative risk assessment of the multiple chemical and microbial risks associated with disinfection of drinking water.

EPA-SAB-EEAC-COM-94-003 — Commentary on Peer Review of Research Used in Support of Environmental Policy

The Environmental Economics Advisory Committee (EEAC), based on its Members' experience both prior to joining this Committee and in the tasks undertaken as part of its activities developed some general recommendations regarding the role of peer review of scientific research conducted in support of environmental policy-making. The Agency's staff is attempting to develop and use research methods and findings at the frontiers of their disciplines in the areas relevant to EPA's regulatory mission. These efforts are to be commended and encouraged.

Because the research is often directed at the frontiers of each discipline's scientific understanding, it is particularly important to incorporate **external** peer review as an integral part of the development of the research design. Clearly, the need for such comprehensive involvement of peer review at all stages in research design and execution will depend upon the scale of the research undertaken. As the size and complexity of the effort (as well as its importance for policy) increases, so also should the resources devoted to peer review. The Committee's experience with the economics components of the research efforts we have reviewed has found only limited evidence of systematic **external** peer review conducted prior to the time when documents were presented to the Committee for evaluation (This is apparently not a recent problem -- the Environmental Engineering Committee commented on the need to organize peer review efforts in a 1989 report on mathematical models [EPA-SAB-EEC-89-012]).

We believe that this lack of peer review is a mistake, and understand that it is not consistent with Agency policy on peer review which calls for such review as an integral part of the research activities associated with EPA's regulatory policy. The resulting *de facto* assignment of the **primary** peer review to the SAB's Committees typically imposes that review at the wrong time in the process -- when the research is largely done. Ideally, **external** peer reviews (other than those performed by the SAB) would be conducted on an ongoing basis as research for large projects is underway, and the results of all such reviews made available to the relevant SAB Committee at the time a more comprehen-

sive review of a research program or policy evaluation was undertaken. EPA staff should develop a network of external peer reviewers in topic areas where there will be continuing research interests. This could enable these reviews to be conducted prior to submitting materials to SAB Committees. In cases where SAB involvement at other than the final stage is desirable, Agency program officials should seek Consultations, through which the SAB can provide discussion and advice from various individual Members directly to the appropriate staff, outside the formal framework of a full review. The use of a Consultation in no way precludes a full review and a formal SAB report at a later stage of the effort.

EPA-SAB-EEC-COM-94-004 Strategic Research Planning Commentary

Strategic Research and Development Planning is the subject of a commentary by the Environmental Engineering Committee of the EPA Science Advisory Board. The Committee (1) recommends that EPA adopt and implement a consistent, reliable and comprehensive approach to strategic planning for EPA research and development, (2) recommends that EPA consider the several models presented earlier in this letter as it develops this comprehensive approach, and (3) suggests that there be a particular locus for such strategic planning within EPA for successful ongoing implementation. We would be pleased to suggest ways that this could be accomplished or to review the Agencywide strategic planning process in the future.

Strategic planning is an integral part of an overall management system with provision for budgeting, prioritizing, planning, implementation and oversight of the research program. It is especially important because strategic planning provides the overall guidance for the other activities.
The SAB has often been critical of the plans due to a number of deficiencies including lack of a vision statement, lack of definition of measures of success, not taking into account critical factors essential to developing the strategic plans, and lack of priority setting mechanisms. In addition, the strategic research plans have been varied in format, content and approach. EPA should adopt and implement a consistent, reliable and comprehensive approach to strategic research planning to develop research and development strategic plans that provide both continuity with long-range research while being responsive to changing environmental issues.

The Environmental Engineering Committee of the SAB recommends that EPA adopt a defined approach for strategic R&D planning for the Agency that builds upon concepts now being used by industry and other government institutions. EPA's approach will need to be adaptable to changing needs of the Agency. The Committee notes successful industrial and EPA regional use of methodologies involving the development of a vision statement, a definition of a mission, conducting an assessment of the region's strengths, weaknesses,

external opportunities, and threats, defining strategic initiatives, and defining metrics of success. While we do not endorse this specific approach used by Region I as the only approach, it is one example of how to successfully conduct strategic planning. Whatever the approach selected, it must be adapted to the special needs of environmental research and development.

EPA-SAB-CASAC-COM-94-005 Commentary on Data Sets for PM10

On May 16, 1994, the present and former chairs (Drs. Wolff and McClellan) of the Clean Air Scientific Advisory Committee sent a letter to EPA Administrator Carol Browner requesting that the Agency take steps to assure that crucial data sets linking exposure to partculate matter and health responses are available for analysis by multiple analytical teams. This would help to assure the validity of the results before they are used in making regulatory decisions on the National Ambient Air Quality Standards for Particulate Material.

The authors feel that EPA should take the lead in requesting that investigators make available the primary data sets being analyzed so that others can validate the analyses. Further, the Agency should actively facilitate the conduct of such validating analyses.

ADVISORIES

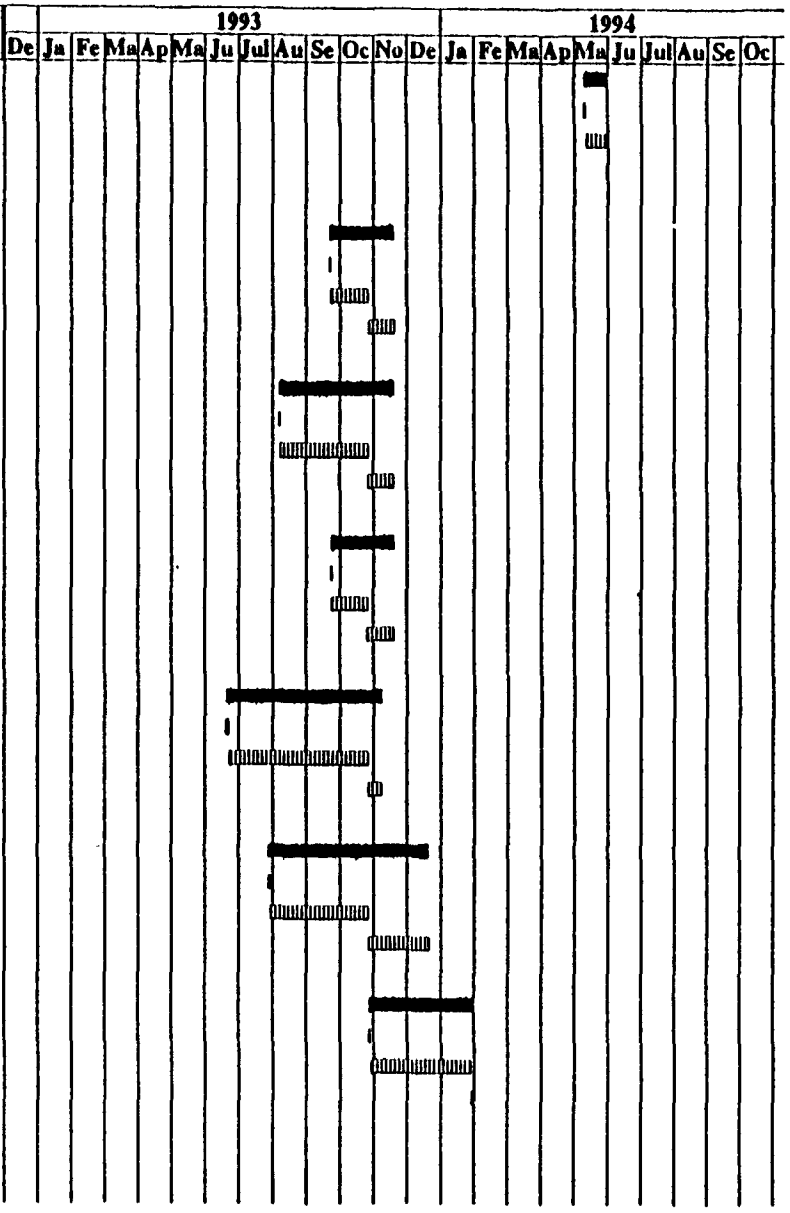
EPA-SAB-EPEC-ADV-94-001 Advisory Evaluation on A National Methodology for Wildlife Criteria.

On April 27-28, 1994, the Wildlife Criteria Subcommittee of the Ecological Processes and Effects Committee of the Science Advisory Board (SAB) met to hear briefings and consider 34 questions prepared by Agency staff about the development of a national methodology for deriving wildlife criteria. The issues considered were similar in many instances to those raised during SAB review of the Great Lakes Water Quality Initiative. The Subcommittee then prepared this advisory with their assessment of the overall program and the approaches being considered by the Agency for developing wildlife criteria.

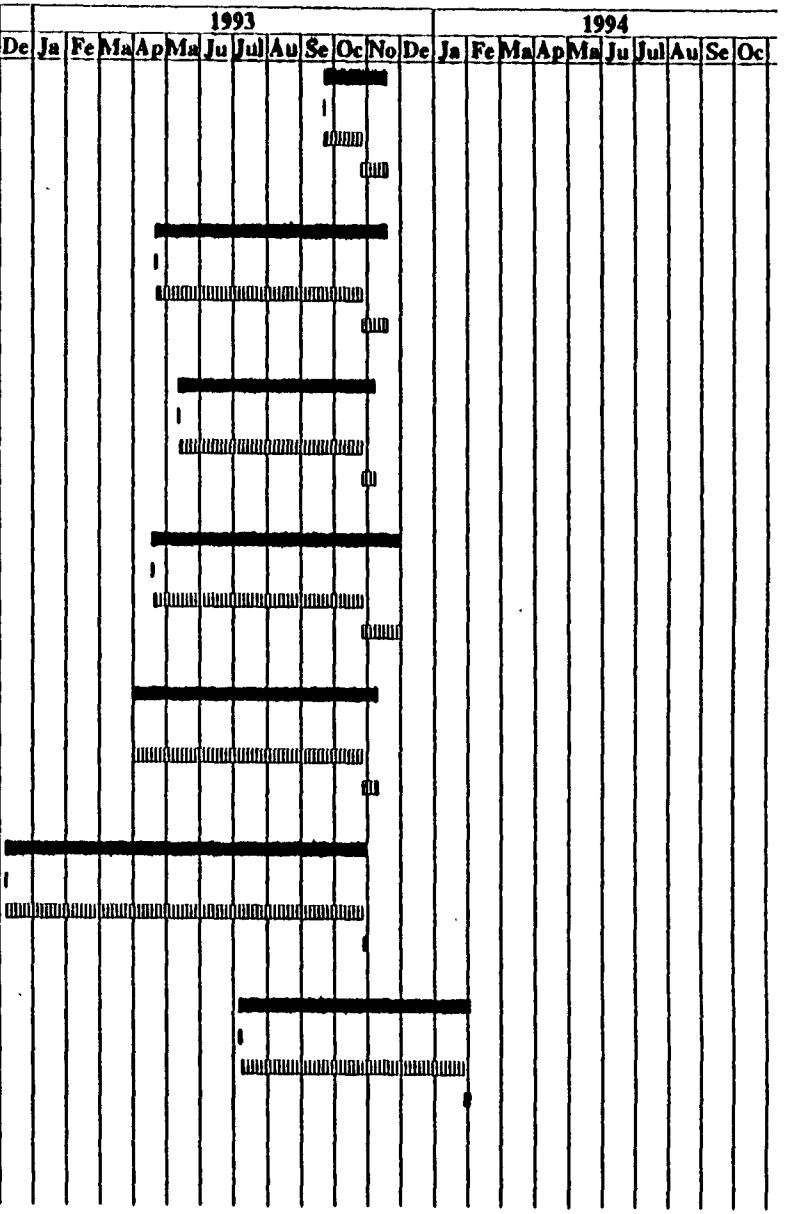
The Subcommittee recommended that the wildlife criteria program be guided by the ecological risk assessment framework, that several approaches for deriving wildlife criteria be further developed, and that the objective of the program should be the development of a national methodology which would be used to derive regional or site-specific wildlife criteria. In addition, the Subcommittee felt that models under development should be validated with existing data for well-studied chemicals and that wildlife criteria should be designed to protect wildlife populations rather than individuals. The Subcommittee endorsed the Agency's proposed research agenda supporting the development of wildlife criteria but urged the Agency to test wildlife criteria methodologies with a wider array of chemical groups, ecosystems and regions, and wildlife species.

APPENDIX G
DETAILED TIME TO COMPLETION GRAPHICAL ANALYSIS FOR FULL AND LETTER REPORTS

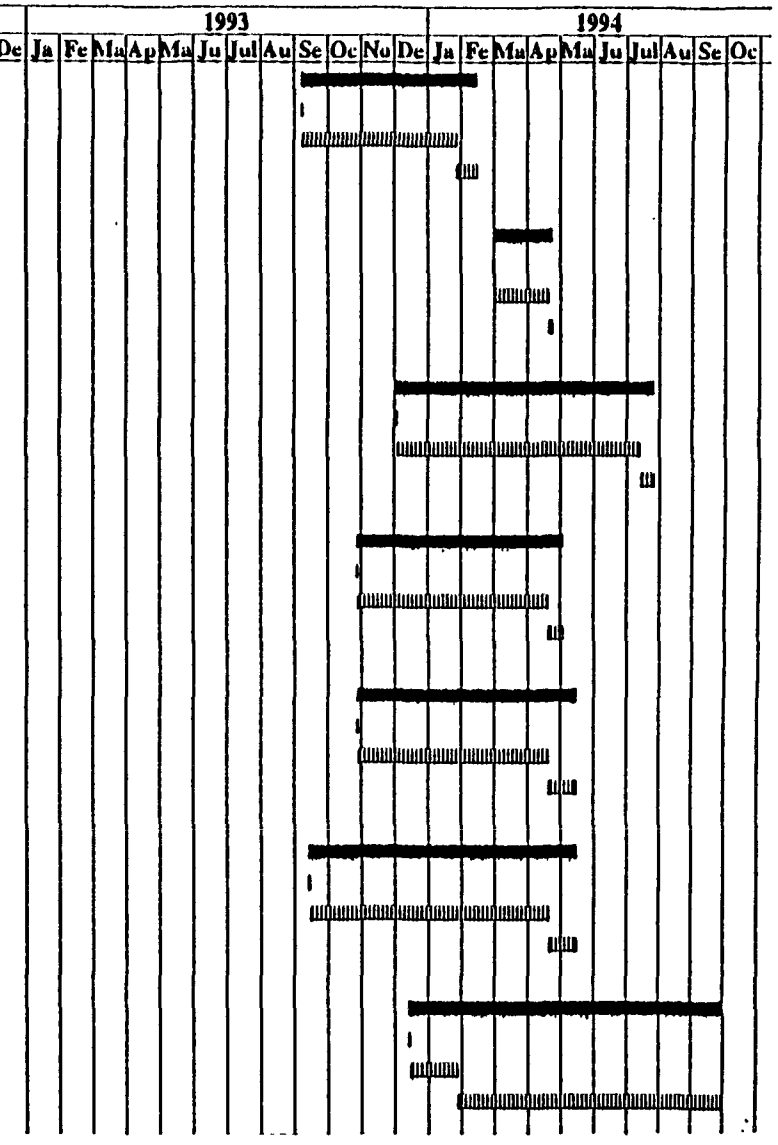
REPORT	DAYS	DATE
RSAC-Lab Study	22.0 d	02/Jun/94
Meeting	2.0 d	13/May/94
Exec. Comm. Approval	18.0 d	31/May/94
To Administrator	2.0 d	02/Jun/94
	1.0 d	14/Dec/90
EEAC-RCRA-RIA CV2*	58.0 d	19/Nov/93
Meeting	1.0 d	23/Sep/93
Exec. Comm. Approval	34.0 d	27/Oct/93
To Administrator	23.0 d	19/Nov/93
EC-RCRA-RIA Overview*	104.0 d	19/Nov/93
Meeting	1.0 d	06/Aug/93
Exec. Comm. Approval	80.0 d	27/Oct/93
To Administrator	23.0 d	19/Nov/93
EHC-RCRA-RIA Health Benefits*	57.0 d	19/Nov/93
Meeting	1.0 d	24/Sep/93
Exec. Comm. Approval	33.0 d	27/Oct/93
To Administrator	24.0 d	19/Nov/93
EPEC-EMAP Assess. Frmwrk*	141.0 d	08/Nov/93
Meeting	3.0 d	23/Jun/93
Exec. Comm. Approval	126.0 d	27/Oct/93
To Administrator	12.0 d	08/Nov/93
EEC-WQ Monitoring Netwrk*	146.0 d	21/Dec/93
Meeting	2.0 d	30/Jul/93
Exec. Comm. Approval	89.0 d	27/Oct/93
To Administrator	55.0 d	21/Dec/93
RAC-Radon Meas. Protocol*	96.0 d	31/Jan/94
Meeting	2.0 d	29/Oct/93
Exec. Comm. Approval	91.0 d	28/Jan/94
To Administrator	3.0 d	31/Jan/94



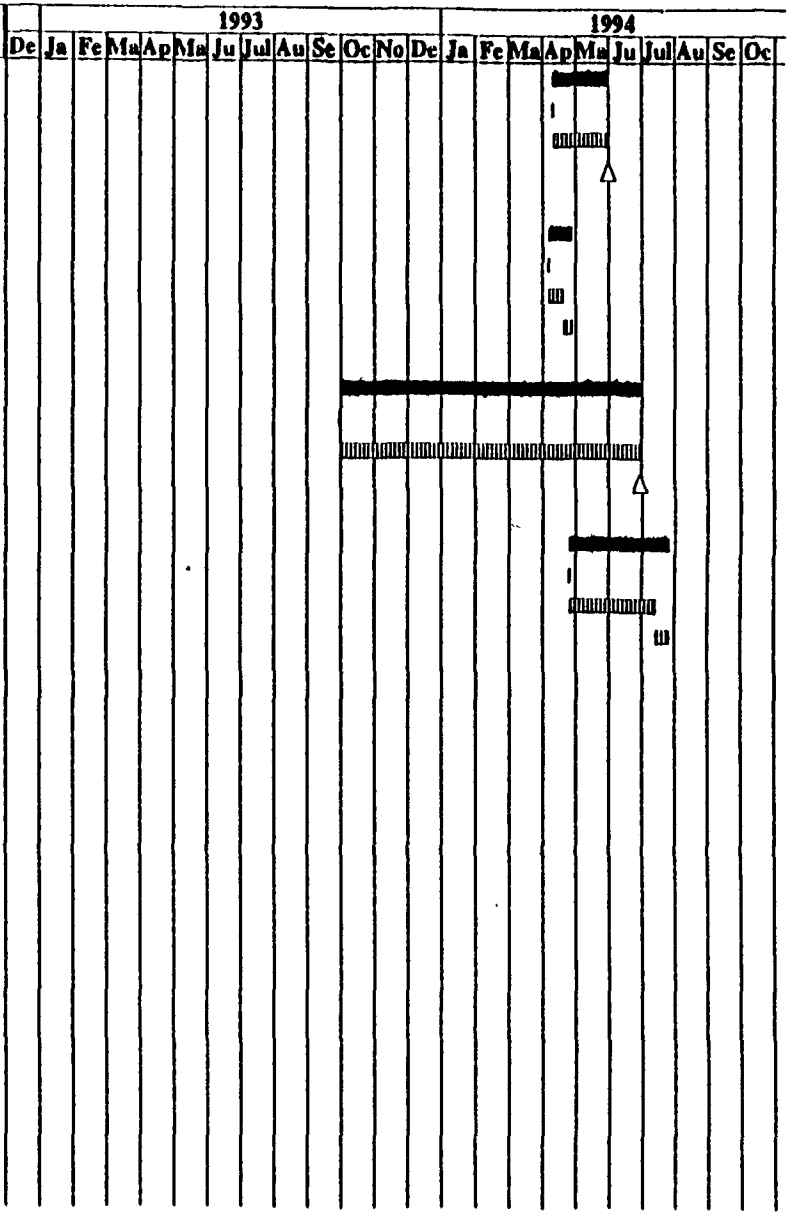
REPORT	DAYS	DATE
EEAC-RCRA-RIA CV 1	58.0 d	19/Nov/93
Meeting	1.0 d	23/Sep/93
Exec. Comm. Approval	35.0 d	27/Oct/93
To Administrator	24.0 d	19/Nov/93
EEC-RCRA-RIA MMSoils	212.0 d	19/Nov/93
Meeting	2.0 d	23/Apr/93
Exec. Comm. Approval	187.0 d	27/Oct/93
To Administrator	23.0 d	19/Nov/93
EPEC-Biocriteria of Streams	180.0 d	08/Nov/93
Meeting	2.0 d	14/May/93
Exec. Comm. Approval	166.0 d	27/Oct/93
To Administrator	12.0 d	08/Nov/93
DWC-Arsenic Crit. Doc.	228.0 d	02/Dec/93
Meeting	2.0 d	20/Apr/93
Exec. Comm. Approval	190.0 d	27/Oct/93
To Administrator	36.0 d	02/Dec/93
EHC/SAP-2,4-D Carcinogenicity	224.0 d	11/Nov/93
Meeting	2.0 d	02/Apr/93
Exec. Comm. Approved	208.0 d	27/Oct/93
To Administrator	14.0 d	11/Nov/93
DWC-D/DDP Review	330.0 d	01/Nov/93
Meeting	2.0 d	08/Dec/92
Exec. Comm Approved	324.0 d	27/Oct/93
To Administrator	5.0 d	01/Nov/93
EPEC-Inland Testing Manual	211.0 d	02/Feb/94
Meeting	3.0 d	09/Jul/93
Exec. Comm. Approval	202.0 d	27/Jan/94
To Administrator	6.0 d	02/Feb/94



REPORT	DAYS	DATE
IAQC-IAQ Research Prog.	161.0 d	15/Feb/94
Meeting	1.0 d	09/Sep/93
Exec. Comm. Approval	141.0 d	27/Jan/94
To Administrator	19.0 d	15/Feb/94
RSAC-STAA	55.0 d	25/Apr/94
Meeting	2.0 d	03/Mar/94
Exec. Comm. Approval	49.0 d	21/Apr/94
To Administrator	4.0 d	25/Apr/94
IAQC-Indirect Combustion (WTI)	237.0 d	27/Jul/94
Meeting	2.0 d	04/Dec/93
Exec. Comm. Approval	223.0 d	15/Jul/94
To Administrator	12.0 d	27/Jul/94
EPEC-Master	190.0 d	05/May/94
Meeting	1.0 d	29/Oct/93
Exec. Comm. Approval	175.0 d	21/Apr/94
To Administrator	14.0 d	05/May/94
RAC-NORM Risk Assess.	202.0 d	17/May/94
Meeting	2.0 d	29/Oct/93
Exec. Comm. Approval	174.0 d	21/Apr/94
To Administrator	26.0 d	17/May/94
EPEC-Global Climate	246.0 d	17/May/94
Meeting	2.0 d	15/Sep/93
Exec. Comm. Approval	218.0 d	21/Apr/94
To Administrator	26.0 d	17/May/94
EC-IFL	291.0 d	30/Sep/94
Meeting	2.0 d	15/Dec/93
Exec. Comm. Approval	43.0 d	27/Jan/94
To Administrator	246.0 d	30/Sep/94



REPORT	DAYS	DATE
CASAC-SO2 Closure*	51.0 d	01/Jun/94
Meeting	1.0 d	12/Apr/94
Exec. Comm. Approval	50.0 d	01/Jun/94
To Administrator	0.0 d	01/Jun/94
CASAC-ORD Budget Review*	22.0 d	29/Apr/94
Meeting	1.0 d	08/Apr/94
Exec. Comm. Approval	13.0 d	21/Apr/94
To Administrator	8.0 d	29/Apr/94
CASAC-Air Qual. Models*	273.0 d	30/Jun/94
Meeting	1.0 d	01/Oct/93
Exec. Comm. Approval	272.0 d	30/Jun/94
To Administrator	0.0 d	30/Jun/94
NWC-Information Coll. Rule*	92.0 d	27/Jul/94
Meeting	1.0 d	27/Apr/94
Exec. Comm. Approval	79.0 d	15/Jul/94
To Administrator	12.0 d	27/Jul/94



APPENDIX H
BIOGRAPHICAL SKETCHES OF THE SENIOR STAFF MEMBERS

Staff Director:	Dr. Donald G. Barnes
Assistant Staff Director:	Mr. A. Robert Flaak
Designated Federal Officials:	Dr. Ed Bender Mr. Randall Bond Mrs. Kathleen Conway Mr. Manuel Gomez Dr. K. Jack Kooyoomjian Mr. Samuel Rondberg Ms. Stephanie Sanzone

DR. DONALD G. BARNES
Staff Director and Designated Federal Official for the Executive Committee

DR. DONALD G. BARNES assumed his position as Staff Director in 1988. Since arriving, he has overseen a 25% growth in the Committees of the Board and a 50% increase in the membership of the Board. During his tenure the Board has completed two major de novo reports (Future Risk (1988) and Reducing Risk (1990) and two self-studies (1989 and 1994), in addition to more than 200 reports to the Administrator.

Dr. Barnes is active in Agencywide issues associated with science and risk assessment. For example, he serves on the Administrator's Science Policy Council, the Risk Assessment Forum, and the Council of Science Advisors. He continues to publish a variety of risk assessment topics, such as benchmark dose and toxicity equivalency factors, recently receiving special Agency recognition for a paper on PCBs.

Dr. Barnes came to the SAB following ten years' service as Senior Science Advisor to the Assistant Administrator for Pesticides and Toxic Substances. In that role he became involved with a number of controversial issues; e.g., pesticide re-registrations, the implementation of Section 5 of TSCA, and "dioxin", for which he received two EPA Gold Medals for Superior Service.

He has been active in the area of risk assessment for more than a decade as practitioner, reviewer and instructor. For example, he participated in the White House's Office of Science and Technology Policy-led effort to produce a consensus view of cancer in the Federal government; i.e., Cancer Principles. He has been was active in the writing of a number of the Agency's risk assessment guidelines; e.g., for cancer and for mixtures. In a tangential activity he has worked with the government of Bulgaria to inculcate risk-based decision making in their emerging environmental protection program, both at the ministry and regional levels.

Prior to coming to EPA, Dr. Barnes was Associate Professor and Science Division Chair at St. Andrews Presbyterian College in North Carolina. His formal education includes a BA (chemistry) from the College of Wooster, a PhD (physical chemistry, with a minor in physics) from the Institute of Molecular Biophysics at Florida State University, and subsequent graduate courses in several health-related areas; i.e., pharmacology, toxicology, immunology and epidemiology.

His real world education continues to be provided by Dr. Karen K. Barnes and their two sons.

MR. A. ROBERT FLAAK
Assistant Staff Director
Designated Federal Official for the Environmental Futures Committee

MR. A. ROBERT FLAAK has served as the Assistant Staff Director since January 1991, overseeing the committee operations of the Board. He has been a Designated Federal Official (DFO) at the SAB for over ten years, serving as DFO for the following: Clean Air Scientific Advisory Committee (CASAC) (1978-1979; 1984-1991); Indoor Air Quality/Total Human Exposure Committee (IAQC) 1986-1993; Drinking Water Committee (DWC) (1991-1993); ad hoc IEL Panel (1992-1994); Environmental Futures Committee (1993-present); and a host of SAB subcommittees and working groups involved with issues such as global climate and biotechnology.

Mr. Flaak serves as an Instructor for the General Services Administration Course on Federal Advisory Committee Management. Since 1990, he has helped design, organize and teach the course. Along the way, he has taught several hundred Federal workers how to run Federal Advisory Committees. Mr. Flaak's academic background and training is in the field of biological oceanography. He graduated from Stuyvesant High School in New York City, the City College of New York (BS in zoology), the University of Delaware (MA in marine studies), and Central Michigan University (MA in public administration). He has taken other graduate level environmental and management courses and has over 20 years of experience as a trainer.

Mr. Flaak served (as a civilian) for five years with the U.S. Coast Guard Headquarters Office of Marine Environment and Systems as Senior Environmental Specialist developing and implementing environmental policy and guidance for the preparation of environmental impact statements for bridge construction throughout the United States and its territories. His non-government professional positions include service as Staff Marine Biologist with an engineering consulting company where he designed and coordinated sampling and data analysis for oceanographic surveys. He has also been a consulting marine taxonomist for the National Oceanic Atmospheric Administration, the du Pont Co., Roy F. Weston Inc., and the University of Delaware's College of Marine Studies. These activities reflect his research interests in estuarine and coastal ecology, phytoplankton dynamics, bivalve nutrition, and invertebrate mariculture.

His 28 years of military service (US Army) includes over three years of active duty with a tour in South Vietnam in 1968-69, and service during 1991 in Saudi Arabia, Kuwait and Iraq during Operation Desert Storm. He is currently the Acting Deputy Chief of Staff for Logistics with the 352d Civil Affairs Command in Maryland, an Army Reserve Component of the 1st Special Operations Command stationed at Ft. Bragg, NC. He lives with his wife, Dottie, and their nine-year old son, Chris in Clifton, Virginia.

DR. EDWARD BENDER
Designated Federal Official for the Research Strategies Advisory Committee
Designated Federal Official for the Environmental Futures Committee

DR. EDWARD S. BENDER is the Designated Federal Official for the Research Strategies Advisory Committee, having previously served as the DFO for the Ecologial Processes and Effects Committee. He is also serving as the principal DFO for the Steering Committee of the Environmental Futures Project.

Prior to joining the SAB, Dr. Bender spent ten years working in EPA's National Pollutant Discharge Elimination System enforcement program as an expert in biological monitoring of effluents. In this position, he helped develop and/or revise the program policies and guidance for self-monitoring by permit holders, compliance inspections and reporting, and civil and administrative penalties. He reviewed over 100 litigation reports that alleged violations of permit conditions and he also provided technical support, including expert testimony in two trials. In one case, the US vs Olin Corp, he helped negotiate the clean-up and restoration of a National Wildlife Refuge that was contaminated with DDT. Prior to his work with EPA, he conducted ecological assessments and research for the Army at ammunition plants, arsenals, and depots throughout the United States. He recently completed a Department of Commerce Science and Technology Fellowship in which he worked for the Department of Energy developing programs in Advanced Materials authorized under the National Energy Policy Act.

Dr. Bender received a B.S. from Westminster College, New Wilmington, PA, an M.S. (Zoology) from the University of Florida, Gainesville, FL, and a PhD. from Virginia Polytechnic Institute and State University, Blacksburg, VA. His dissertation research focused on the process of recovery of a stream macroinvertebrate community from chronic DDT contamination. This past year, he chaired a session on the "Role of Science Policy Advice at EPA" at the Annual meeting of the Society of Environmental Toxicology and Chemistry which included several SAB members.

Dr. Bender and his wife, June, share their interests and labors in horticulture and home improvement projects and in raising their three daughters.

MR. RANDALL BOND
Chief, Committee Evaluation Staff
Designated Federal Official for the Clean Air Scientific Advisory Committee

MR. RANDALL BOND joined the Science Advisory Board staff in December 1990. Randy started with EPA as a student assistant to the Medical Science Advisor in 1976 while working on his undergraduate degrees in chemistry and biology. After finishing his undergraduate work at George Washington University, he accepted a position with ORD's Office of Research Program Management where he served as Executive Secretary to the newly formed Pesticides Research Committee and the Chemical Testing and Assessment Research Committee. Randy has also served as a participant in the LEGIS (Congressional Fellowship) program, and served as EPA coordinator for animal welfare issues. He has also chaired a number of international committees related to biological environmental specimen banking. His most recent position was in ORD's Office of Health Research where he coordinated pesticides and toxic substances health research issues and served as the Chairman for the committee responsible for planning all TSCA related research and development activities.

MRS. KATHLEEN CONWAY
Designated Federal Official for the Environmental Engineering Committee

MRS. KATHLEEN CONWAY received her BS and MS from Tufts University where she studied biology, public health, and sanitary engineering. Between degrees she wrote for the Hartford Courant. Mrs. Conway was a sanitary engineer for the Massachusetts Department of Public Health and later for the U. S. Environmental Protection Agency's Region I where she worked in the wastewater treatment plant operations and maintenance program. During this time she chaired the Boston Section of the Society of Women Engineers.

In 1977 she joined EPA's Office of Research and Development. Her subsequent service as acting Director for two divisions in the Office of Health Research lead to her selection, in 1982, as a participant in the President's Executive Exchange Program. During her exchange year she worked with an occupational health and safety unit at IBM. She served the Science Advisory Board as Deputy Director from 1984 to 1989 when she resigned the position to work part-time.

MR. MANUEL GOMEZ
Designated Federal Official for the Drinking Water Committee
Designated Federal Official for the Indoor Air Quality Committee

MR. MANUEL GOMEZ joined the Science Advisory Board (SAB) in late 1992 as the Designated Federal Officer of the Drinking Water Committee and the Indoor Air Quality/Total Human Exposure Committee. He brought to the SAB a very diverse previous experience in the environmental and occupational health arenas, most recently with the National Cancer Institute (NCI), where he was active in exposure assessment research activities as part of an occupational epidemiology research group.

Prior to the NCI, Mr. Gomez served as Assistant Professor in the School of Health Sciences of Hunter College of the City University of New York, as an industrial hygienist with both state and federal agencies, as well as a consulting firm, and as a research leader with a public interest organization in New York. He is the author of a study of health and safety issues in the copper smelting industries, along with other publications in the scientific literature. In the mid-1980's, Mr. Gomez also served as the Executive Director of a civic organization engaged in a variety of public education and policy analysis activities on Capitol Hill.

Mr. Gomez has an undergraduate degree in Biochemistry from Harvard, a master's degree in Environmental Health Sciences from Hunter College of the City University of New York, and is now completing his dissertation for a Doctor of Public Health degree from the Johns Hopkins University School of Hygiene and Public Health. In the recent year, Mr. Gomez has been very active in the conduct of activities concerning the improvement of occupational exposure databases, under the auspices of two industrial hygiene professional organizations in which he is active.

DR. JACK KOOYOOMJIAN
Designated Federal Official for the Radiation Advisory Committee
Designated Federal Official for the Clean Air Act Compliance Analysis Council

DR. JACK KOOYOOMJIAN joined the Science Advisory Board (SAB) in July, 1988 as Designated Federal Official (DFO) of the Environmental Engineering Committee (EEC). In 1993, he transitioned into becoming the DFO of the Radiation Advisory Committee (RAC), handing off the EEC activities to Ms. Kathleen Conway. In January of 1994, he was asked to concurrently serve as DFO of the Clean Air Act Compliance Analysis Council (CAACAC), as well as the RAC. While this combined workload has kept him extremely busy, he brings to his work at the SAB over 25 years of engineering and professional experience with environmental issues, including over 20 years of diverse experience within EPA Headquarters.

In the mid-1970's he worked in the Office of Solid Waste, documenting cases involving the improper disposal of hazardous wastes which contributed to the passage of the landmark legislation known as the Resource Conservation and Recovery Act (RCRA) in 1976. He also gained experience with saturated and unsaturated zone modeling and ground-water model assessment during this time. He has over four years experience in the Office of Water developing guidelines and regulations for industrial wastewater sources. From 1979 through 1988, Jack was very involved with the Superfund's Emergency Response program. He developed the multi-media hazardous substance reportable quantity regulations, and was also responsible for oil and hazardous substance pollution prevention regulations, oil spill reporting, the emergency response data base known as OHMTADS (Oil and Hazardous Materials Technical Assistance Data System), as well as the oil and dispersant testing and registration program (old Subpart H, now Subpart J) of the National Contingency Plan.

Dr. Kooyoomjian received a BS (Mechanical Engineering) from the University of Massachusetts, and a MS (Management Science) and a Ph.D. (Environmental Engineering, with a minor in Economics) from Rensselaer Polytechnic Institute. His academic career included his induction into a number of honorary societies: e.g., Sigma Xi (research), Chi-Epsilon (civil engineering), Omicron Delta Epsilon (economics). His professional activities continue apace. He served as a member of the Board of Control of the Water Pollution Control Federation (WPCF) [now known as the Water Environment Federation (WEF)] from 1986 to 1989, and was a member of its Policy Advisory Committee in 1988/1989. In 1988 he received the Arthur Sidney Bedell Award from WEF for extraordinary personal service in the water pollution control field. He served as Local Arrangements Co-Chair of WEF's 63rd Conference and Exposition, which was held October 1990 in Washington, D.C. and hosted nearly 13,000 registrants. He is also very active in the Federal Water Quality Association (FWQA), the local member association of WEF, where he has served in numerous capacities, including President,

and "Ambassador-at-Large." He is currently Chairman of the Government Affairs Committee of the FWQA. He is listed in "Who's Who in Science and Engineering," and "Who's Who in the Eastern United States."

In April 26, 1992, he received an honorary professorship for his work as part of a five-person team from the United States to develop an environmental engineering bachelors program and to outline a master's curricula for the State Engineering University of Armenia (SEUA), which has over 23,000 students, as well as to assist in addressing the newly-independent republic of Armenia's environmental problems.

Closer to home, which he shares with his wife Gerry, and their three daughters, Jennifer (20), Melissa (15) and Jessica (13), Dr. Kooyoomjian is involved in numerous civic activities which focus on development, land-use and environmental issues in his area. He was a candidate for the Governor's Award for volunteerism for the state of Virginia in 1991. He also has received the EPA Public Service Recognition Award in 1988 and 1992 and several County Recognition Awards for his civic involvement.

MR. SAMUEL RONDBERG
Designated Federal Official for the Environmental Health Committee
Designated Federal Official for the Environmental Economics Advisory Committee

MR. SAMUEL RONDBERG retired from the Senior Executive Service (SES) in August, 1988. He re-entered federal service and later joined the SAB staff in November 1988. During his previous full and fruitful career at EPA, he served as an Office Director and Associate Office Director in EPA's Office of Research Development (ORD) and the Office of Information Resources Management (OIRM).

Before joining EPA in 1974, Mr. Rondberg held research management, analytical, and policy formulation positions with the Department of Transportation and the Veterans Administration's Department of Medicine Surgery. He also served in the US Army for two years, with the rank of Captain. Most of his federal career has been devoted to advancing the use of analytic methodologies to address public policy issues, and to improving the management of federal research activities. At EPA, he has directed particular efforts to the complex problems and issues engendered by operating a research program within the context of a regulatory agency--coordination between legal and scientific "cultures"; maintaining a stable long-term program in the face of urgent and frequently changing needs for short-term support; and maintaining an adequate resource base in the face of competition from regulatory programs struggling to meet court or Congressionally mandated deadlines.

Mr. Rondberg pursued undergraduate and graduate studies at Washington University, where he also served as a Teaching Assistant in the Graduate School of Arts and Sciences and as a Public Health Service Fellow and Research Associate in the Medical School. In 1967, he was awarded a National Institute of Public Administration Fellowship in Systematic Analysis at Stanford university and completed a special interdisciplinary curriculum in the Schools of Engineering, Graduate Business, and the Departments of Economics and Computer Science.

Mr. Rondberg has authored publications in clinical psychology, research management, and the applications of electronic systems and telemetry to urban transportation.

Sam is married, the father of one daughter (who recently received an MSW degree), and attempts to find time to pursue interests in modern history, the impacts of technology on society and culture, amateur radio, and antique art (posters and advertising graphics) as a reflection of our social history.

MS. STEPHANIE SANZONE
Designated Federal Official for the Ecological Processes and Effects Committee

MS. STEPHANIE SANZONE has served as the Designated Federal Official for the Ecological Processes and Effects Committee since December 1992. Prior to joining the SAB staff, Ms. Sanzone spent 4 years with EPA's coastal programs in the Office of Wetlands, Oceans and Watersheds. In her role as coordinator for coastal programs in the Southeast, she provided oversight and assistance to National Estuary Program sites in the development of management plans for estuarine watersheds. Ms. Sanzone has also served as a legislative aide for environment issues in the U.S. Senate and South Carolina House of Representatives, and as a coastal resource specialist with the Coastal States Organization in Washington, D.C.

Ms. Sanzone received a B.A. in Biology, with a minor in chemistry, from the University of Virginia, and a M.S. in Marine Science from the University of South Carolina. Her thesis research examined the role of amino acids and hemolymph proteins in a crustacean's response to changing environmental salinity

SINGLE COPIES OF THIS REPORT MAY BE OBTAINED FREE OF CHARGE BY WRITING TO:

SCIENCE ADVISORY BOARD (1400)
COMMITTEE EVALUATION STAFF
ATTN: PUBLICATIONS DEPARTMENT
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
401 M STREET SW, WASHINGTON DC 20460

PLEASE REQUEST THE *FY94 ANNUAL REPORT OF THE SCIENCE ADVISORY BOARD STAFF*, AND INCLUDE YOUR NAME AND COMPLETE MAILING ADDRESS