BOARD OF SCIENTIFIC COUNSELORS (BOSC)
OFFICE OF RESEARCH AND DEVELOPMENT (ORD)
UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY (EPA)

PROGRAM REVIEW OF THE
NATIONAL EXPOSURE RESEARCH
LABORATORY (NERL)

Final Report of the Ad Hoc Subcommittee
on the Review of NERL

April 30, 1998

NOTICE

This report has been written as part of the activities of the Board of Scientific Counselors (BOSC), a public advisory group that provides objective and independent counsel to the Assistant Administrator for the Office of Research and Development (ORD) of the Environmental Protection Agency (EPA). The Board is structured to provide a balanced expert assessment of the management and operation of ORD's research programs and its utilization of peer review. This report has not been reviewed for approval by the Agency; and hence, the contents of this report do not necessarily represent the views and policies of the EPA or other agencies in the federal government. Mention of trade names or commercial products does not constitute a recommendation for use.

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PREFACE

The Board of Scientific Counselors (BOSC) provides objective and independent counsel to the Assistant Administrator of the Office of Research and Development (AA/ORD) on the management and operation of ORD's research programs. The primary functions of BOSC are to: (1) evaluate science and engineering research programs, laboratories, and research-management practices of ORD and recommend actions to improve their quality and/or strengthen their relevance to the mission of the EPA; and (2) evaluate and provide advice concerning the use of peer review within ORD to sustain and enhance the quality of science in EPA.

In fall 1996, Dr. Robert J. Huggett, AA/ORD, requested that BOSC conduct peer reviews of the ORD Laboratories and Centers. Accordingly, BOSC undertook the task of conducting programmatic, as opposed to scientific or technology, reviews of the Laboratories and Centers and proceeded to establish policies and procedures for conducting such reviews. The scheduled reviews occurred as follows:

- National Exposure Research Laboratory, July 21-22, 1997, at Research Triangle Park, NC
- National Health and Environmental Effects Research Laboratory, August 4-5, 1997, at Research Triangle Park, NC
- National Risk Management Research Laboratory, August 18-19, 1997, at Cincinnati, OH
- National Center for Environmental Assessment, September 8-9, 1997, at Washington, DC
- National Center for Environmental Research and Quality Assurance, October 20-21, 1997, at Washington, DC

As constructed, the Laboratory and Center reviews are expected to lead to a better understanding of the strategies employed by the respective Directors in accomplishing their missions, and to a better understanding as to how these strategies are implemented. BOSC also expects to develop a clearer perspective on how effective these strategies are in causing the operation of the Laboratories and Centers to come into alignment with the strategic plan of the ORD.

Each Laboratory and Center review consisted of two parts. The first part was a written self-study submitted to the review committee in advance of the date of its review, and the second part was a 2-day site visit conducted by the review committee. In the self-study, Directors were asked to prepare responses to eight questions aimed at a programmatic assessment of the organization. During the first day of the site visit, the Director made a brief presentation about the organization and was then asked to respond to questions from the review committee about the self-study document. Later, case studies were presented that reflected how the organization successfully addressed a specific issue faced by the Agency. The first day concluded with breakout sessions attended by staff scientists and other professionals. On the second day, the committee drafted a report that contained its findings and recommendations. At the end of the day, an exit interview was conducted with the Director.

All review teams were organized as *Ad Hoc* Subcommittees of the Board of Scientific Counselors and were headed by a chair and vice chair, both members of BOSC. Additional members of the Subcommittee were selected on the basis of an appropriate technical discipline as well as having broad experience in science and research management, planning, and communication. The Chair of BOSC attended all reviews as an ex-officio member.

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Washington, DC

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Director
National Exposure Research Laboratory
U.S. EPA/ORD
Research Triangle Park, NC

Logistical DFO:	Terry Grady National Exposure Research Laboratory U.S. EPA/ORD Research Triangle Park, NC
Technical Liaison:	Martha Moore National Health and Environmental Effects Research Laboratory U.S. EPA/ORD Research Triangle Park, NC

1.0 EXECUTIVE SUMMARY

Overall, the review was very positive and received excellent input from the participants. The discussions were candid and open, and all questions were answered. The Self-Study Report and the interviews with employees were productive and provided valuable information.

NERL needs to develop a strategic plan that reflects the recent reorganization of the Office of Research and Development (ORD) Research Laboratories. New research positions should become available from restructuring the administration and from correcting the fact that NERL did not benefit from past contractor conversions that were carried out by EPA. Now is an excellent time to hire highly qualified, new Ph.D., research scientists to reinvigorate the Laboratory.

Exposure research is absolutely central and essential to the needs of the ORD and to the risk assessment paradigm. The National Exposure Research Laboratory (NERL) is not self sufficient in personnel and/or funding to carry out many of the large-scale research programs that fall under its mandate. NERL must continue to partner with extramural research organizations. The U.S. Environmental Protection Agency (EPA) should constantly strive to remove existing barriers to true intellectual partnerships.

ORD's reorganization and Strategic Plan have not infused themselves into the scientific culture at NERL. A continued effort must be spent to obtain an understanding and acceptance of these developments at the level of the bench scientist.

2.0 LABORATORY REVIEW

The NERL structure is presented in Figure 1 (see Section 4.0, Appendix D). Its mission is to perform research and development to characterize, predict, and diagnose exposures to humans and ecosystems, giving priority to the research that most significantly reduces the uncertainty in risk assessment and most improves the tools to assess and manage risk and to characterize compliance with regulations.

The NERL research functions are as follows:

- Environmental Characterizations
- Compartment and Pathway Understanding
- Modeling
- Exposure Data, Methods, Applications, and Assessments
- Mitigation Evaluation and Design Assistance from Transport and Fate and Exposure Point-of-View
- Methods and QA Development/Evaluation
- Data Management and Computation Methods
- Technical Assistance/Transfer
- Operational Monitoring QA

General Observations

1. NERL Self Sufficiency

The reorganization of the research and development activities within the EPA has resulted in a reduction in research and technical personnel in NERL. There has been a substantial reduction in force at NERL as a result of the reorganization. For example, according to the budget figures provided by NERL, there has been about a 28 percent decrease in NERL personnel, a 45 percent reduction in contractor awards, and a 56 percent decrease in budget since Fiscal Year (FY) 1993. Reestablishment of Full-Time Equivalents (FTEs) after the divestiture in the onsite contractors never reached NERL. Furthermore, with the establishment of the peer-reviewed grants program many of the onsite discretionary monies for contract and cooperative agreements are no longer available. The best case study ($PM_{2.5}$) presented to the Review Committee illustrates the new integrated research effort involving 40 percent intramural activity and 60 percent extramural. NERL cannot carry out its mission without major support from extramural research organizations.

2. NERL Research Focus

The programmatic goals for the ORD are the following:

- Create a strong, well-managed, effective, and empowered national environmental science and technical organization to provide the scientific and technical basis for Agency decisions.

- Create well-managed, effective, and empowered national institutions in national laboratories or centers to develop and implement programs to produce high-quality and timely scientific and technical information to support the Agency's decision process.

- ❖ Develop a high-quality, problem-focused, peer-reviewed in-house research and development program and ensure that ORD is viewed as a preferred employer of scientists and engineers.

- ❖ Develop and implement a high-quality, peer-reviewed extramural assistance program to engage the best scientific minds in academic and scientific organizations.

The NERL has reorganized and realigned its resources to address research within these new ORD goals. The structure is in place, but it is too early to evaluate how well the transition is working. There appears to be a strong commitment from most administrators to make the new structure work well. The new research focus does involve a reduction in some technical support for the Program Offices. NERL is leaner and more focused on its primary mission: research. It is conducting some high-quality, peer-reviewed science in high-priority areas for EPA.

3. NERL Balance

The new EPA focus mandates a balance between human health and ecological issues. The NERL is attempting to develop a priority for new hirings and reprogramming of intramural activities. Much of the reprogramming will entail enhancing the skills of research faculty and returning some administrators back to research activities. Currently, 103 out of 407 total staff positions at NERL (25 percent of total) are in administrative jobs (see Figure 2 in Section 4.0, Appendix E). About 45 out of the 103 administrative positions are strictly management (44 percent of administrators or 11 percent of total staff, (see Figure 3 in Section 4.0, Appendix F). There is a redundant administrative infrastructure at each of the four locations (Research Triangle Park [RTP], Las Vegas, Cincinnati, and Athens, shown in Figure 2). Of the remaining FTEs, roughly 168 (106 Ph.D. and 62 M.S.) are research scientists, and the remainder are technical support staff. NERL should increase the number of research and technical support personnel and decrease the number of administrators. Administrators who are purely in management roles should not comprise 11 percent of total staff. The Subcommittee believes that one-half of the personnel in a research laboratory should be research scientists, but NERL has only 168 FTEs (35 percent of total personnel) with research degrees of M.S. or Ph.D. level. Now is an excellent time to hire highly qualified, new Ph.D., research scientists to reinvigorate the Laboratory. NERL is in the best position to determine if all Assistant, Associate, and Division Director positions are essential to its mission. NERL needs a strategic plan that includes personnel and resource reallocation goals.

4. NERL Research Partnerships

NERL has developed integrated research plans with academia and industry that must involve intellectual interactions with extramural research programs. Furthermore, these research plans require a temporal continuity that far exceeds annual budget adjustments. The extramural grants program can commit to a 5-year research activity. NERL scientists believe they cannot actively participate in these research programs. This policy has recently been relaxed. This should be challenged. No organization has a sufficient array of talent and resources to address these complex environmental problems. The EPA should constantly strive to remove these barriers to intellectual partnerships.

NERL needs to derive greater benefits from the Science to Achieve Results (STAR) Program, which is a large resource for the Agency ($100 million). STAR scientists could be invited to NERL Laboratories for seminars, and EPA databases could be loaned to STAR researchers.

5. NERL Influence

The Subcommittee would like to emphasize the importance of maintaining, if not expanding, the liaison function that currently is one of the responsibilities of the Assistant Laboratory Directors. The Program Offices have their own specialized exposure research needs that often may be completely compatible with current NERL capabilities and expertise. Regular communication by NERL to EPA Program Offices, and other governmental agencies, would provide new opportunities for NERL to positively impact the science of risk assessment and risk management. One specific example cited by the Subcommittee as a need was NERL's support in the many current chemical scoring and ranking activities that are under way in several EPA offices (e.g., TRI Indicators, Wastes, Toxic Substances Control Act (TSCA), Water, Sediments, Clusters Scoring). There is a perception by the Subcommittee that the science of chemical scoring for exposure estimates needs NERL's expert input to make these EPA efforts scientifically defensible.

6. NERL Communication and Strategic Plan

Workers at all levels seem to be trying to understand just what the new *modus operandi* means to them personally. They are concerned both from the standpoint of their own activities and from the broader program changes that are likely to result from future severe elimination in support.

Management solicits input from Laboratory workers, but there seems to be little feedback to these people concerning policy and strategic plans that result from such information solicited from lower-level staff. For example, the NERL Self-Study Report was not shown to investigators whose opinions were solicited.

There may be overlap between ecological-related research projects within NERL. Perhaps, this can be justified as a consequence of the emerging "team" approach to problem solving.

Moreover, there is an urgent need for a strategic plan to add direction and begin to set longer range goals for staff and scientists. Although it is understandable that much, if not most, of the NERL activities must be devoted towards problems that come up in the short term, horizon scanning for future problems using the judgment of NERL scientists also should be encouraged and fostered.

7. Perceptions of NERL

NERL has gone through a reorganization; however, this reorganization has not created any cultural change. The change has not created any scientific excitement among the employees or change in the way they are doing their research. One must have a change in culture as well as organization.

Better definition of NERL's real clients is needed. Too much change is being driven by Congress, which creates havoc with appropriate scientifically driven priority setting.

2.1 Alignment of Priorities and Directions With the ORD Strategic Plan

NERL needs a strategic plan that spells out its priorities. Overall, the members of the BOSC Review Committee found good alignment of NERL's programs designated as high priority with those presented in the ORD Strategic Plan. Furthermore, the management style and overall program

direction also were quite consistent with the ORD Strategic Plan. All of NERL's exposure programs fit obviously into ORD's risk assessment paradigm, where exposure and effects data are evaluated in risk characterization, risk assessment, and risk management.

NERL has a clear Mission Statement to: "Perform research and development to characterize, predict, and diagnose exposures to humans and ecosystems, giving priority to that research that most significantly reduces the uncertainty in risk assessment and most improves the tools to assess and manage risk and to characterize compliance with regulations." A commitment exists on the part of NERL's management "team" to: (1) be involved in and support high-priority exposure issues; (2) reorganize, streamline, and increase the effectiveness of its staff; (3) participate in the extramural grants and fellowship programs; (4) use peer review in science programs; and (5) involve personnel in "team" approaches in planning and implementing research programs. In addition, management is focusing on: (1) reducing the uncertainty in exposure issues; (2) supporting exposure research for human health as well as ecological risk assessments; (3) providing personnel with the infrastructure and management style to support strong core technical competencies; (4) beginning to recruit new professionals; (5) taking new initiatives to enhance its in-house research program focused on needed key technical capabilities; and (6) reducing broad-based, routine modeling, monitoring, and site characterization programs.

2.2 Laboratory Strategic Initiative

The BOSC Subcommittee believes that NERL's strategic initiatives in the Self-Study Report were consistent with their mission and with EPA objectives. NERL's initiatives appropriately emphasize exposure research, particularly the modeling, measurement, and monitoring of human and ecological exposures. It was not clear to the Subcommittee how the capabilities of NERL's scientific personnel match with the needs of their strategic initiatives, but it is clear that significant scientific contributions have been made in the following areas:

- Source Exposure Research
- Chemical, Physical, and Biological Process Modeling
- Environmental Characterization Research
- Exposure Analysis and Assessment Research
- Exposure/Dose Research.

NERL has some unique exposure facilities and has made scientific contributions in several areas, including analytical measurements, environmental process research, and animal exposure. The models of NERL in the areas of urban and regional air pollution and aquatic contaminant fate and transport are state-of-the-art. In some cases, the contributions of NERL scientists have led the field both nationally and internationally. NERL should examine these notable successes and seek to understand what factors are needed to ensure scientific success in the future. NERL should consider carefully the scientific strengths and weaknesses of the Laboratory and what capabilities will be needed in the future to meet Agency needs.

As a result of the reorganization of ORD 3 years ago, NERL has appropriately decreased the emphasis on contractors and increased (slightly) the number of bench scientists and their contribution to the Agency's mission. It was the conclusion of the Subcommittee that there is better coordination and communication within NERL's Divisions as a result of the reorganization, but considerable room for improvement still exists. It seems that the effort at team building (modelers and measurers together) has only just begun. We understand that it is a difficult task, considering the disparate locations and multiple layers of bureaucracy that are inherent to EPA's ORD. The Subcommittee saw clear evidence that NERL is more focused on multimedia problems and that there is a better balance between ecological research and human health research than prior to the reorganization. Staff scientists are insulated from the day-to-day needs of EPA Program Offices, but NERL must not ignore their "clients" in Washington, DC. Also, NERL must continue to address problems that are relevant to the mission of the Agency.

The greatest good that NERL could achieve from the standpoint of improving scientific productivity would be to hire postdoctorate researchers at all levels. Postdoctorate researchers bring with them the latest skills in the field, they can rejuvenate a laboratory, and they want to be productive. Their enthusiasm is contagious. We applaud the efforts of NERL and EPA to add postdoctorate positions to their Laboratory staff. Due to the 28 percent decrease in staff within NERL since FY 1993 and the modest increases in budgets recently, there is ample space, equipment, and opportunity to add new, young researchers to the staff. Furthermore, some of the best postdoctorate researchers can be groomed for future permanent staff positions. The timing of this initiative is good because there is a talented pool of Ph.D. scientists/engineers currently available in all fields.

For scientists to be productive, they need technical support and they need to be spared from the bureaucratic red tape. The lack of technicians and travel money was reported to the Subcommittee from several sources. ORD should undertake a benchmarking initiative (relative to other federal research laboratories, academic, and industry) to determine how deficient they are in these areas and make all efforts to rearrange existing budgets to provide more technical support for scientists.

NERL's Human Exposure Research program consists of the following areas:

- Reducing Uncertainties in Exposure Measurements
- Variability in Exposure and Susceptibility to Disease
- Drinking Water Exposures
- Particulate Matter Exposures
- Pesticide Exposures.

These are important programs that support NERL's and EPA's mission. Population-based surveys of exposure and occurrence are identified appropriately as meeting the needs of the Agency. The difficulty in determining cause and effect for the correlation between particulate matter exposure and mortality statistics points out the need for epidemiologists and toxicologists to work together on complex environmental problems that affect the public.

The Subcommittee believes that one of the best ways to reduce risk is by decreasing exposure through concepts such as pollution prevention, industrial ecology, and green chemistry. We note that NERL does not show any activity in these important research areas of sustainable development, and we recommend that they consider how to become a part of these high-priority areas of EPA research.

NERL's Ecological Exposure Research program entails the following areas:

- Measurement Technologies
- Biological Indicators
- Landscape Sciences
- Integrated Multimedia Processes and Modeling.

The Subcommittee considers NERL's efforts in these areas to be important for science and for the Agency. There was some feeling on the part of the Subcommittee that there may be an overemphasis on streams as compared with terrestrial exposures and effects.

2.3 Integration Across and Within Divisions and Within ORD

NERL has aggressively pursued the formation of research teams to address these interdisciplinary research tasks. Team efforts that are most effective involve an intellectual maturation of team members so that the value added exceeds the individual efforts. The Self-Study Report envisions committees, work groups, and teams organized and supported by mid-level managers. An alternative model is to let the research scientists manage themselves and hold them accountable for the products produced. This also might help free up the 45 scientists from planning and management to return to a research career (see Figure 3 in Section 4.0, Appendix F).

The research coordination teams (RCTs) play a very important role in integration both within ORD and between ORD and the Program Offices. It seems to be a redundant function to that of the other Laboratory and Center Directors. The RCTs, however, appear to be performing a very important function and doing it well.

2.4 Measures of Performance and Awards

Performance Awards—In discussions with a small number of employees, it was concluded that there is an attempt being made to provide a clear and consistent performance award program.

If NERL is to have a successful program, it must have a performance award program that truly pays for performance. The discrepancies between the "outstanding" and "exceeds" must be made to demonstrate a true justification for "outstanding" with little overlap.

The number of employees receiving the awards in 1996 seems adequate. However, the committee observed that a number of the performance awards were quite small on a percentage basis. Also, it was difficult to interpret whether or not a special emphasis is placed on the new employees (less than 5 years).

The performance award program is the major incentive program for the employees, thus demanding time and effort to make it a positive standard for the employees. It should have enough dollars to make it significant, and be transparent such that the employees can see it is a clear and consistent program that is paying for performance. It should be a program that rewards pre-agreed goals and performance standards. Thought should be put into how the dollars will be allocated to make the program fair and acceptable to the employees.

Special Act Awards—It is difficult to understand the value of this award. The award pool seems to be quite small. A survey of employees could be used to determine if these awards are of value.

EPA Bronze, Silver, and Gold Medals—There was mixed feedback from employees regarding these medals. Again, management should attempt to determine their value and properly communicate why these awards are being presented.

It was interesting that no gold medals were presented in 1996. We would think there would be at least one Gold Medal in 400 plus employees. Again, management must determine if these medals are viewed as a positive motivator, or do they produce a negative attitude for employees.

Science Achievement Awards—We believe this is a good concept to award outstanding research articles. It is a program that should be maintained and expanded if possible. The Subcommittee would hope that these awards are transparent to the employees and will help to stimulate research excellence as opposed to only research quantity.

Promotion—Promotion is still a major motivator for the success of employees and programs. We get the sense that due to the complexity of the federal program, it is a challenge for management to use promotion as a motivator. Even though it is a complex program, it should be of primary concern for management to ensure that there is an active participatory and transparent promotion program. Nominations should be dealt with in an expedient manner to demonstrate the importance of the program.

Promotion program elements should be communicated clearly to all employees such that the employees can help plan a career path.

2.5 Organizational Performance Compared With Others

Benchmarking can be a very valuable and successful exercise if done appropriately. A major problem with benchmarking is comparing apples and oranges. You must identify appropriate organizations with similar missions, processes, tasks, types of personnel, and size to benchmark against.

You must understand your own organization and be able to develop a set of benchmark questions that will be specific enough to not only provide you qualitative data, but also quantitative data. You must design the questionnaire such that it produces valuable interpretable results. Quantitative type questions usually help bring reality to a benchmarking process. The questionnaire should cover all aspects of NERL. It is advisable to go to an outside consulting firm to get help with questionnaire preparation.

Upon completing the questionnaire, it is advisable to use a pilot in-house group to determine the value of the questions. This helps to give the benchmarking exercise credibility in-house.

It is advisable to have meetings with the organizations you are benchmarking before the questionnaire is sent out. This helps to clarify any questions or problems and helps produce a quality product. Some organizations have used teams to visit the benchmarking locations rather than send out the questionnaire. A caution here is to make sure that you have the appropriate makeup of teams.

For NERL, we would caution that benchmarking will only be of value after NERL understands itself. NERL can accomplish a lot by exploring itself from within.

2.6 Interactions With the Outside Scientific Community

The BOSC Subcommittee was presented with an impressive list of outside activities and organizations with which NERL scientists and engineers interact on a regular basis. Activities of involvement include: professional societies and organizations, advisory panels, university faculties and professional educational groups, joint authorship and publication by NERL scientists and engineers with professionals outside of NERL, sponsorship and participation in symposia and workshops at national and international levels, and involvement in some intergovernmental organizations. These extensive involvements are characteristic of an organization that takes seriously the need for its personnel to grow in their profession and have the professional respect of the scientific and regulatory communities at the state, national, and international levels.

It was noted by the Subcommittee that the effectiveness of the overall NERL program could be enhanced if greater use was made of the Committee on Environmental Natural Resources (CENR). Use of the CENR could help reduce redundancy of effort by allowing other government agencies to be knowledgeable of NERL capabilities. Also, it can foster better understanding by NERL concerning the exposure research needs of other government agencies.

The Subcommittee also would like to encourage NERL staff to look upon private industry as an important outside resource. Industry has exposure programs that would support and complement NERL programs. Plus, cooperative research is a way for NERL to leverage its limited resources. All parties would likely benefit from new relationships with industry.

2.7 Unique Capabilities and Their Use

Conversations with individual scientists support the notion that significant interaction both among NERL scientists and between NERL and outside groups occur. It seems that this results primarily from personal one-on-one interactions and infrequently as part of a more formal structured arrangement. This appears to support the notion that there are unique attributes demonstrated by individual NERL scientists. This expertise is important to the advisory role that NERL is required to play in support of EPA decisionmaking.

The collective memory of NERL scientists is unique because it represents a focus on environmental problem solving not duplicated elsewhere among the scientific community. In particular, problems associated with air quality are being addressed by a number of scientists, each capable of making important contributions towards understanding cause-and-effect relationships. These skills cover a broad range of topics from the development of predictive models to the design

of remote sensing strategies. Although much of this work may be in the formative stages of development, it has demonstrated the potential to address a broad range of air-related problems from ozone to particulate emissions. EPA scientists operating out of the National Oceanic and Atmospheric Administration (NOAA) Laboratory in Princeton, New Jersey, provide a unique opportunity for interagency and intra-agency collaboration on multidisciplinary problems.

There is the possibility that unique technical capabilities mentioned above (and others) are underutilized as a consequence of the overall reorganization plan. This has resulted in little money available to broker interagency collaboration or to fully utilize the unique capabilities of NERL scientists on environmental problems of general concern. This situation results in a limitation of professional growth and breadth by NERL staff, and moreover, it retards the development of solutions to important environmental problems.

In summary, when one looks at the list of skills and past activities of NERL scientists it is clear that indeed, as claimed, they can model the movement of pollutants from source to receptor. It is not clear, however, whether this combination of skills can now be effectively dedicated towards its mission in view of the limited technical support currently available in NERL Laboratories.

2.8 Appropriate Mix of Workforce, Facilities, and Infrastructure

The NERL Self-Study Report correctly identifies its major problem as the number and academic distribution of its personnel. Many of the issues of balance among research, administrative, and technical support and the issue of parity between human health and ecology are addressed in the General Observations section.

In the aftermath of the report of EPA's Inspector General and the subsequent termination of many onsite contractors by ORD, NERL was not able to participate equally in the subsequent contractor conversion. For example, the National Health and Environmental Effects Research Laboratory (NHEERL), with 705 current FTEs, benefitted from 250 conversions. NERL, with a current staff of 425 FTEs, only received 4 conversions. A more equitable balance in EPA FTEs should be established over time with a redistribution of new positions.

An inventory of research capabilities (individuals and productivity) should be completed, and then compared to the demands generated from the integrated research plans. New positions should be located organizationally and spatially based on priority needs across all of ORD.

There is an assumption that in today's climate of personnel downsizing and reduced budgets that if an organization is going to be highly productive per unit of total effort, more teamwork is essential. The Subcommittee supports NERL's management in implementing functional operating teams across research projects and down through the organization. To date, this change in management style by NERL's management is perceived by employees as just beginning. To better ensure the ultimate success of the team building and teamwork effort, there is a need to provide some training for all personnel.

For a team effort to be truly successful, there needs to be additional consideration to renovating the recognition and rewards system to accommodate team awards. Concepts like 360 degree peer review (employees evaluating supervisors) at annual performance is an additional characteristic of true teamwork.

3.0 RECOMMENDATIONS

3.1 Strategic Plan

NERL needs a strategic plan. It should be consistent with the Agency's mission and reorganization.

3.2 Personnel

NERL personnel need to fully understand and maintain a high level of commitment to ORD's reorganization and Strategic Plan for several years if it is to be ultimately successful. In addition to the obvious programmatic and organizational changes that are taking place, there will need to be cultural changes during this transition.

3.3 Training and Professional Development

Management will need to plan for personnel to enhance skills and to learn new skills, which temporarily reduces productivity.

3.4 Communication

Management will need to communicate with all personnel much more frequently and effectively, focusing on progress toward the new vision and mission. There needs to be improved communications within NERL, from the bottom-up and especially from the top-down. Bench scientists need to understand where their research fits into the overall mission of ORD and the Agency.

3.5 Contributions

Training in all aspects of becoming a "team-based organization" should take place.

3.6 Resources

Travel funds available to researchers should be sufficient to: support the ORD scientific mission, attend national meetings, interact with other scientists, and provide for training and professional development.

3.7 New Development

NERL should consider how the Laboratory can contribute to the National Risk Management Research Laboratory (NRMRL) and new and developing concepts of sustainable development, industrial ecology, pollution prevention, and green chemistry. NERL would not be the lead Laboratory in this regard, but exposure research can lead to new insights and better ways to reduce risks.

3.8 Partnerships

In this era of shrinking budgets and increased accountability, NERL's efforts to establish partnerships with academia and industry should be applauded. More partnering will be needed to stretch precious resources. NERL must try to benefit more from the STAR grants program ($100 million per year) and to establish closer ties with academia through seminars, developmental assignments, postdoctoral positions, and collaboration on research articles in peer-reviewed journals.

3.9 NERL'S Mission

NERL's mission is central to ORD's high-priority areas, and it needs more bench research scientist positions to perform its mission in the future. There needs to be a reevaluation of the FTE distribution devoted to administration, research, and technical support. To ensure that ORD and NERL meet their missions, NERL should consider an increase in the number of research and technical personnel and a decrease in the number of administrators.

4.0 APPENDICES

A. Letters From Board of Scientific Counselors Chair

B. Self-Study Report

Foley, Gary J., National Exposure Research Laboratory
July 21-22, 1997

C. Meeting Agenda

U.S. Environmental Protection Agency
Office of Research and Development
Board of Scientific Counselors (BOSC)

REVIEW OF THE
NATIONAL EXPOSURE RESEARCH LABORATORY (NERL)
Room 321, Catawba Building
3210 Highway 54
Research Triangle Park, North Carolina 27709

July 21-22, 1997

Ph: 919-541-1555
Fax: 919-541-0602

PROPOSED SITE VISIT AGENDA

Monday, July 21, 1997

8:00 a.m. - 8:15 a.m.	Welcome and Introductions	Laboratory Director
8:15 a.m. - 9:45 a.m.	Overview of NERL	Laboratory Director
9:45 a.m. - 10:00 a.m.	**BREAK**	
10:00 a.m. - 10:15 a.m.	Discussion of NERL Case Study	Review Team/ Laboratory Director
12:00 noon - 1:00 p.m.	**LUNCH**	
1:00 p.m. - 2:45 p.m.	Presentation of a Case Study: Particulate Matter	Director, Human Exposure and Atmospheric Sciences Division
2:45 p.m. - 3:00 p.m.	Public Comment	
3:00 p.m. - 3:15 p.m.	**BREAK**	
3:15 p.m. - 5:00 p.m.	Breakout Sessions	Review Team Laboratory Management Support Staff
5:00 p.m.	Adjourn	

Tuesday, July 22, 1997

8:00 a.m. - 12:00 noon	Writing Session	Review Team
12:00 noon - 1:00 p.m.	**LUNCH**	
1:00 p.m. - 5:00 p.m.	Writing Session/Closing Session	Review Team/ Laboratory Management

D. Figure 1: National Exposure Research Laboratory Organizational Structure

E. Figure 2: NERL Personnel Distribution

F. Figure 3: NERL Scientists Not Performing Active Science

G. NERL Organization Chart