

**National Oceanic and Atmospheric
Administration**

**Office of
Oceanic and Atmospheric Research**

**Pacific Marine Environmental Laboratory
Science Review**

September 9-11, 2014

Review Panel Guide

Revised August 2014

1. Introduction

Laboratory science reviews are conducted every five years to evaluate the *quality*, *relevance*, and *performance* of research conducted at National Oceanic and Atmospheric Administration (NOAA) Oceanic and Atmospheric Research (OAR) laboratories. The reviews are for internal OAR/NOAA planning, programming, and budgeting, as well as external interests. Reviews help the Laboratory in its strategic planning of future scientific research and development, and are also intended to ensure that OAR laboratory research is linked to the NOAA Strategic Plan, relevant to the NOAA Research Mission and priorities, high quality as judged by preeminence criteria, and carried out with a high level of performance.

These guidelines have been prepared using experience gained from previous laboratory reviews. The goal of the guidelines is to clarify your role and assist in the organization of the work of the review panel. The guidelines cover the process from when you receive the invitation letter to your participation on the review panel to the submission of the summary report of the review panel.

2. Research Areas in Review and Charge to the Review Panel

Each member of the review panel should have received the *Charge to Reviewers*. The Charge covers the following topics: purpose of the review, scope of the review, research areas for the review, evaluation guidelines including questions to be addressed by the review panel, proposed schedule including the dates of the review, time frame for delivery of the final review report, the time commitment for reviewers, and review panel resources. Each member is asked to complete a review report so that each research area will be reviewed by at least two panel members; members will provide their reviews to the Review Panel Chair. The Chair will summarize the recommendations and ratings of individual reports of the review panel, but will not attempt to seek a consensus of the review panel on any findings or recommendations. Each member of the review panel received a conflict of interest disclosure form; thank you for returning the completed form! A description of the Laboratory's research areas is in Appendix A.

3. Resources for the Review Panel

Steven Fine, Deputy Assistant Administrator (DAA) of OAR for Laboratories and Cooperative Institutes, will provide the resources necessary for you and the review panel to complete its work. A list of OAR contacts for the review is in Appendix D. All Laboratory review materials and presentations for the review will be posted to a website in advance of the review. The web site will contain: background documents from NOAA (e.g., NOAA Strategic Plan, NOAA Research 5-Year Plan), background data on the Laboratory including several "indicators of preeminence" (e.g. laboratory annual

operating plans, publications, awards, scientific leadership, and patents), the Laboratory Strategic Plan, and presentation files. Please let us know if you would like to receive a binder with printed copies of presentations in advance of the review. You are also provided a template *Evaluation Worksheet* with which you may complete your review observations, findings, and recommendations, and provide your overall evaluation of the research areas (Appendix C). We also request that you fill out the additional *Reviewer Feedback Worksheet* (Appendix C) with comments and suggestions on the overall Review process and supporting materials provided.

4. Logistics and Agenda for the Review

Travel arrangements for the onsite review will be made and paid for by OAR. Laboratory staff will contact you to arrange travel to the review. If you have not already done so, please provide the Laboratory Travel Coordinator (listed in Appendix D) with your intended dates of travel and other particulars by the requested due dates to ensure all arrangements are made satisfactorily. The laboratory will reserve a block of hotel rooms for the reviewers, but you will be asked to cover all your travel expenses (except air fare) upfront and will be reimbursed, usually through direct deposit to your bank, after laboratory staff complete the travel reimbursement forms with your help. Some receipts may be needed for reimbursement. If you have not been the recipient of federal travel reimbursement before, you will need to register as a U.S. government vendor to receive your travel reimbursement. The Laboratory travel staff will do that for you, but you will have to provide them with some personal identifying information, including the routing and account numbers for your bank account for direct deposit of the reimbursement. For non-U.S. reviewers, you will be sent a check for travel cost reimbursement. Travel schedules should be chosen to allow you to attend all scheduled review sessions.

Laboratory staff may also ask for information for building security in advance of the review, particularly for reviewers who are not U.S. citizens. In any case, bring photo identification.

5. Teleconferences Prior to the Review

Two teleconferences will be scheduled to discuss the review process and answer any questions you may have. The first of these teleconferences will occur approximately two months prior to the review, and the second will occur approximately two weeks prior to the review. In addition to the review panel members, attendees will include the OAR Deputy Assistant Administrator (DAA), the OAR Headquarters Coordinators, and management from the Laboratory. On the first call, the *Charge to Reviewers* and the *Draft Review Agenda* will be discussed, as well as any other questions reviewers may have on the process or on the preliminary materials provided on the Laboratory's Review website. The second teleconference will cover information provided on the website, presentation materials, the *Final Review Agenda*, the review reports, and resolution of last-minute details. During this call, we ask that you identify any additional information

needs from the Laboratory or OAR for the successful determination of your Review Ratings. All relevant information requested by the review panel will be provided on the review website at least two weeks before the review and prior to the second teleconference with the review panel.

6. During the Review

Reviews are held over a three-day period. On the morning of the first day, you will meet at breakfast with the OAR DAA to discuss any final issues before the review. Generally, the first morning will include an overview presented by the Laboratory Director and other senior management staff. The review agenda includes presentations and discussions that will provide information on the research areas to be reviewed and the questions to be addressed by the review panel. These presentations may include PowerPoint presentations, poster sessions, demonstrations, and/or facility tours. Time will be built into the review schedule for questions and discussion following presentations. Interactive dialogue and discussion during all of the sessions is strongly encouraged.

As time permits, reviewers will meet in closed sessions with laboratory management, as well as with laboratory scientists, visiting scientists, and/or Post Docs, without management present. A separate session has been arranged for teleconference discussions with the Laboratory's key stakeholders. Stakeholders are asked to fill out a Stakeholder Questionnaire before the review. While you will receive the answers to the Stakeholder Questionnaires in advance of the Review, the Stakeholder Session is an opportunity to get input about the Laboratory's science, products and services from key customers. Please use these closed sessions to probe more deeply into the science and operations of the Laboratory.

Time will also be set aside for reviewers-only, closed sessions. The goals of the reviewers-only sessions are to provide time for the review panel to discuss any presentations or information provided and to identify additional information needed or issues that need to be clarified. The closed sessions also provide an opportunity to work on the individual evaluations and to prepare for the preliminary report to laboratory management at the end of the third day. At any time during the review, you should feel free to request additional information or clarifications from Laboratory staff.

7. Preparation and Submission of the Review Report

We ask that each reviewer submit an individual report providing an overall rating for each Research Area you review and, if possible, for each Research Area, also ratings for the subcategories of Quality, Relevance, and Performance. Ratings are: "Highest Performance," "Exceeds Expectations," "Satisfactory," or "Needs Improvement." The Evaluation Guidelines (Appendix B) provide a description of what defines these ratings and evaluation questions to consider in providing a rating. For the convenience of the panel, Evaluation Worksheets for each review area are provided in Appendix C for entry

of findings and recommendations as well as the ratings discussed above. We ask that, based on your findings, you provide recommendations that are specific and actionable by the laboratory. The Review Panel Chair will compile a final summary report from the individual reports. In order to be compliant with the Federal Advisory Committee Act, the Chair is asked not to seek consensus, but to summarize or otherwise combine the individual evaluations.

We suggest that the final summary report include the following elements:

✓ **Cover Page**

Please include a title page with the title, *Summary Report of the Review of the NOAA Pacific Marine Environmental Laboratory*, the date of the review, and the names of the reviewers and their organizational affiliations.

✓ **Overview Section**

Please include details of the location and date of review and the research areas covered in the report. Please include a statement that the report is not a consensus, but a summary of individual reviewer reports.

✓ **Summary of Laboratory-Wide Findings and Recommendations**

Include in this section an overall rating for the entire Laboratory, and findings and recommendations relevant to the entire Laboratory. These could include points that arose in multiple Research Areas, during the presentations, discussions, lab tours, or other aspects of the review agenda, or in discussions during the work sessions of the review panel.

Also include a listing/table that summarizes each reviewer's overall evaluation rating (Highest Performance, Exceeds Expectations, Satisfactory, Needs improvement) for each research area he/she reviewed, and, if possible, also ratings for the subcategories of Quality, Relevance, and Performance. It is helpful for the Laboratory to understand the findings and recommendations, and that the recommendations are worded so they are actionable.

✓ **Findings and Recommendations by Research Area**

Include findings and recommendations for each research area, and include the overall rating for each research area (Highest Performance, Exceeds Expectations, Satisfactory, Needs improvement). For ratings of "needs improvements" please suggest specific actions the Laboratory could take to make improvements.

✓ **Summary of Recommendations**

Please include a numbered list of all recommendations in your report.

The final report is requested within **45 days** of the review and should be submitted by the Review Panel Chair to the DAA and the Laboratories and Cooperative Institutes (LCI) Coordinator. Once the report is received, OAR staff will have **30 days** to review the report, identify any factual errors or necessary clarifications, and send the technical

corrections to the review panel. The review panel will consider the suggested technical corrections and deliver the final report and individual evaluations (separate files) within **30 days** to the OAR Assistant Administrator with a copy to the LCI.

8. Uses for and Distribution of the Review Report

As outlined in the *Purpose of the Review* section of the *Charge to Reviewers*, Laboratory scientific reviews are conducted to help the Laboratory in its strategic planning of its future science, and to ensure that Laboratory research is linked to the NOAA Strategic Plan, relevant to OAR mission and priorities, high quality as judged by preeminence criteria, and carried out with a high level of performance. After submission of the final report by the review panel, the Laboratory will be asked to review the report and prepare a plan to incorporate recommendations into Laboratory research and operations (to be discussed with OAR management).

The final report will be a standalone, public document and may be distributed to internal NOAA and external audiences. Your individual reports will not be made public, and will only be used by OAR as background for the final report. Internal distribution of the individual reports will be limited.

9. Schedule and Time Commitment for Reviewers

The on-site review will be conducted over a three-day period, September 9-11, in Seattle, Washington. Two teleconferences are planned with the Deputy Assistant Administrator for OAR in advance of the review (August 1, 3:00 – 4:00 PM EDT and August 27, 2:30 – 3:30 PM EDT).

Each reviewer is asked to independently prepare his or her written evaluation on each of research areas assigned to them and provide these to the Chair as soon as possible after the completion of the review. The Chair will draft the final report summarizing the individual evaluations and transmit it to the Deputy Assistant Administrator and the OAR HQ LCI Coordinator (see Appendix D) within 45 days of completion of the review. Once the report is received, OAR staff will have 30 days to review the report, identify any factual errors or necessary clarifications, and send the technical corrections to the review panel. The review panel will consider the suggested technical corrections and deliver the final report and individual evaluations within 30 days to the OAR Assistant Administrator with a copy to the LCI Coordinator.

Appendix A: Research Areas for Review

PMEL's Mission: Observe, Innovate, Understand, and Inform

- Observe, analyze, and predict oceanic and atmospheric phenomena;
- Lead the development and deployment of innovative technologies;
- Identify and understand ocean-related issues of major consequence; and
- Inform society with well-documented, high-quality science.

Core Competencies

Research capabilities in oceanography, atmospheric sciences, chemistry, geology, geophysics, acoustics, engineering, modeling, and data management.

Key Products

- Applied research to improve NOAA products and services;
- Peer-reviewed research papers;
- High-quality oceanic and atmospheric observations; and
- Innovative technology development to support new observational capabilities, software development, and data management and availability.

Connection to the NOAA Mission

PMEL's efforts to understand changes in our oceanic and atmospheric systems on local, regional, and global scales support NOAA's commitment to providing effective services and stewardship to the Nation. PMEL is a global leader in ocean observing systems, providing an observational backbone that supports a wide array of research and operational activities within NOAA, in other federal agencies, in academia, and in the international community. PMEL has developed and executed capabilities to support NOAA's goals through decades of world-class research, recognizing that the ability to monitor, understand, and predict key aspects of the environment is essential for protecting our oceans, advancing our economy, and preserving life and property.

Descriptions of PMEL Research Areas

1. Climate Research

Climate research at PMEL is undertaken to support NOAA's mission to understand and predict changes in climate, weather, and the oceans and directly supports NOAA's Climate Adaptation and Mitigation goal. Our society is affected by recurring patterns of climate variability, by more secular global trends in ocean temperature and carbon, by as-yet poorly understood aspects of the global ocean circulation, and by the connections between the open ocean and our coastal oceans. PMEL's climate efforts focus on observing and interpreting the physical and chemical variability of the ocean and marine atmosphere. Many different in situ observing technologies are used, and new techniques

are always under development to improve the observing network and increase its efficiency. PMEL collaborates with scientists and institutions around the world in many international programs and partnerships, and training of the next generation of scientists takes place both formally through relationships with students and postdocs and through collegial interactions with the Laboratory's partners.

Description and motivation

Humankind is increasingly aware of its vulnerability to extremes of weather and climate. Storms and droughts have both short- and long-term consequences. Rising sea level and temperatures also pose rising risks to our coastal communities, national transportation infrastructure (e.g., ports), and ecosystems worldwide. We continue to learn more about the extent to which ocean-atmosphere-cryosphere interactions affect our ability to forecast such conditions. PMEL's climate research and observations contribute centrally to national and international efforts to improve climate science and deliver climate services to the Nation. PMEL is well-positioned to help address the societal need for understanding the climate system and the efficacy and consequences of possible mitigation strategies. The Laboratory has the expertise, partnerships, and infrastructure to design and build instruments, make sustained observations, analyze resulting data, and carry out the necessary theory and modeling to understand why the climate system works as it does. PMEL works closely with the operational components of NOAA and transitions technologies and observational systems from research to operations as appropriate.

There are eight activities within PMEL focusing on Climate Research:

- Tropical Moored Buoy Array
- Ocean Climate Stations
- Large-Scale Ocean Physics
- Thermal Modeling and Analysis (TMAP)
- Arctic Climate Dynamics
- Ocean Carbon
- Pacific Western Boundary Currents
- Atmospheric Chemistry

2. Marine Ecosystem Research

Marine ecosystem research at PMEL is focused on measuring, understanding, and predicting impacts of natural physical, chemical, biological, geological, and anthropogenic processes on the oceanic web of life. Research associated with this area supports NOAA's Healthy Oceans and the Resilient Coastal Communities and Economies goals. Since ecosystem research involves capabilities beyond those which PMEL can provide, the laboratory partners extensively with the NOAA Fisheries Science Centers, academic colleagues, and other federal, state, and tribal entities. PMEL's primary contribution is to put the biological research into the context of the physical and geochemical settings. PMEL marine ecosystem research is focused primarily along the U.S. Pacific and Arctic ocean coastal zones, but efforts are global with respect to explorative research and fundamental processes. Researchers strive to meet NOAA's vision, as stated in the Next Generation Strategic Plan, of "healthy ecosystems,

communities, and economies that are resilient in the face of change,” using diverse skills to acquire, process, analyze, predict, disseminate, and archive data for the long-term benefit of the Nation.

Description and motivation

Marine ecosystem research at PMEL is based on the study of anthropogenic and natural processes that affect the composition of marine communities. This research clarifies relationships between living systems and the environment through a multidisciplinary approach. Examples include the impacts of climate change, fishing, ocean acidification, and tectonic and volcanic processes on the biological, physical, and chemical structure of ecosystems. Changes in one part of an ecosystem will feed back to influence other parts. PMEL is well-positioned to contribute to NOAA’s objective of achieving a holistic understanding of ecosystems through research and resource management. The Laboratory’s personnel, partnerships, infrastructure, and culture form an effective matrix suited to untangling linkages within ecosystems. Scientific teams that are experts on ocean physics, ocean carbon, atmospheric chemistry, climate, marine nutrients, and hydrothermal vents partner to create results that are internationally recognized.

Within PMEL, four research groups are focused on Marine Ecosystems:

Ecosystems & Fisheries-Oceanography Coordinated Investigations (EcoFOCI)

Earth–Ocean Interactions

Acoustics

Ocean Acidification

Ecosystem research is conducted with the primary objective of providing the information needed to make scientifically informed decisions in support of a prosperous future that is both economically and environmentally sound. Given a changing climate and ever escalating anthropogenic pressures, marine ecosystem research is increasingly important in ensuring healthy oceans.

3. Oceans and Coastal Processes Research

Oceans and Coastal Processes Research captures those elements of PMEL’s integrated research agenda that do not easily fall into the broad categories of climate or ecosystems, but still comprise important contributions to NOAA’s mission. Elements captured in this goal include an understanding of ocean physics and interactions between the ocean and both the seafloor and atmosphere.

There are three areas of Ocean and Coastal Process Research within PMEL:

NOAA Center for Tsunami Research (NCTR)

Ocean Tracer

Earth–Ocean Interactions

Research in this area is responsive to all four of NOAA’s NGSP goals: Weather-Ready Nation, Healthy Oceans, Climate Adaptation and Mitigation, and Resilient Coastal Communities and Economies.

Description and motivation

Tsunamis have been recognized as potential hazards to U.S. coastal communities since the mid-twentieth century, when multiple destructive tsunamis caused damage to the states of Hawaii, Alaska, California, Oregon, and Washington. In response to the scale of destruction and unprecedented loss of life following the December 2004 Sumatra tsunami, the U.S. refocused efforts to reduce the tsunami vulnerability of coastal communities. PMEL is at the forefront of NOAA's tsunami research program and contributes to the national and international effort by conducting research in support of tsunami measurement technologies. PMEL also develops improved models and methods to both increase the timeliness and accuracy of operational forecasts and warnings and predict tsunami impacts on the population and infrastructure of coastal communities. The improved tsunami hazard assessment tools and warning products developed at PMEL are transitioned to the two operational NOAA Tsunami Warning Centers.

Knowledge of the mixing and circulation patterns of the world ocean is crucial for understanding how CO₂ and other pollutants will be mixed into and distributed throughout the ocean basins. Studies of chlorofluorocarbon (CFC) transfers from the atmosphere into the surface ocean, and the subsequent transport of these compounds into the ocean interior, provide a unique description of time-integrated circulation of the ocean on decadal time scales. These tracer data can be used to estimate the rates and pathways of ocean circulation and mixing processes, and as a means of testing and evaluating numerical models of ocean circulation. The development and testing of such models is critical to understand the present state of the ocean-atmosphere system, and to quantify the role of the oceans in the uptake of climatically important trace gases such as CO₂.

In the deep ocean, the conservative tracer helium-3 (³He) has been extremely useful for delineating the patterns of mixing and circulation. ³He is enriched in the Earth's mantle, and is therefore also enriched in volcanic gases and in submarine hydrothermal fluids, which are derived from the Earth's interior. Hydrothermal venting on the seafloor thus produces ³He-rich plumes that can be traced for thousands of kilometers away from the source of injection. Since the source of these ³He plumes is well constrained, the resulting plume distribution is useful for defining the deep ocean flow.

Humankind's accelerating desire for new resources is leading to commercial plans for harvesting mineral resources from hydrothermal deposits in the deep sea. The environmental consequences, both local and regional, are unknown. PMEL houses the sole NOAA expertise for discovering, characterizing, and studying the processes of chemical and physical interactions between the seafloor and deep sea. NOAA's ocean stewardship implicitly includes consideration of sustainable usage of resources available within the deep ocean. This stewardship is embodied in the Healthy Oceans goal of the NOAA Next Generation Strategic Plan.

4. Research Innovation

NOAA's success is predicated upon cutting-edge research, as well as the development and the delivery of products, tools, and information services to meet the needs of the

nation. The first three PMEL research areas are focused on developing a research agenda for the oceans. However, accomplishments across NOAA's mission goals are also dependent upon the continued innovative development and use of observing platforms, systems, and information technology to improve data quality and delivery, and lower operating costs. Ongoing investments are necessary to ensure continuity and timeliness of long-term data collection from key regions across the world. Such data are critical to improve understanding and prediction of complex phenomena. Innovative solutions provide modern tools that make valuable information accessible to the science community and the public at large. Further development of software tools and emerging technologies will greatly enhance the public understanding of the Earth system.

One of PMEL's strengths lies in the laboratory's focus on innovation. Beyond PMEL's research groups, there are three groups that focus on innovative development:

Engineering Development Division

Research IT

Integrated Science Data Management

These groups work closely with all of the research groups and other NOAA partners to implement new and improved ways of conducting and communicating our science. PMEL's Research Innovation theme supports all of PMEL's programs; in doing so, it supports all goals of NOAA's NGSP.

Description and motivation

Today, the need to collect more data at a lower cost and to share that scientific information has become the norm across many scientific disciplines. Even "one-off" observations may provide baseline understanding that proves essential for future observing system elements. High-quality observations are irreplaceable for the simple reason that they are unique in time and space and, therefore, can never be measured again. As a mission-driven agency, NOAA is well situated to make sustained large-scale observations. PMEL's ocean observation programs have three goals: 1) to support the publication of new scientific results in peer-reviewed journals, 2) to contribute high-quality data to the emerging global ocean/climate observing system, and 3) to transition mature observing systems to operations. PMEL's Engineering Development Division is the cornerstone to the successful attainment of these goals.

Engineering innovations at PMEL are multidisciplinary in nature and are driven by the formation of teams that integrate research and engineering to solve difficult ocean and atmospheric observing challenges. PMEL Engineering's objective is twofold: 1) to support PMEL field systems with engineering services, and 2) to foster technological innovation by pushing the limits of ocean and atmospheric observing platforms and sensors that advance NOAA research and operations.

Innovative technologies provide essential support for the science process, from collection of data in the field to analysis, computer modeling, and graphical visualization that leads to scientific understanding, results, and publications.

PMEL also foresees the trend of data sharing continuing and growing in the coming decade. Ever-increasing requirements are being placed upon NOAA observation programs to manage and share data more systematically. NOAA leadership is mandating data management plans to ensure the scientific value of data will be preserved over time and made available to users through community agreed-upon standards.

PMEL's plan for the evolution of its data collection and management as a strategic goal will gain significant advantages. Implemented properly, such changes will: 1) enhance scientific productivity by freeing scientists and staff to focus on science challenges, 2) increase the level of professional recognition that scientists receive, 3) secure the scientific value of the data over the long term, and 4) assure scientific results are readily accessible to all stakeholders. Implementing these changes through strategic, evolutionary planning will minimize costs and inconvenience to research projects.

Appendix B: Evaluation Guidelines

OAR Laboratory Reviews Evaluation Guidelines

Purpose of the Review: Laboratory science reviews are conducted every five years to evaluate the **quality, relevance, and performance** of research conducted in the National Oceanic and Atmospheric Administration (NOAA) Office of Oceanic and Atmospheric Research (OAR) laboratories. This review is for both internal OAR/NOAA use for planning, programming, and budgeting, and external interests. It helps the Laboratory in its strategic planning of its future science. These reviews are also intended to ensure that OAR laboratory research is linked to the NOAA Strategic Plan, is relevant to NOAA Research mission and priorities, is of high quality as judged by preeminence criteria, and is carried out with a high level of performance. Each reviewer will independently prepare his or her written evaluations of at least one research area. The Chair, a Federal employee, will create a report summarizing the individual evaluations. The Chair will not analyze individual comments or seek a consensus of the reviewers.

Scope of the Review: This review will cover the research of the Pacific Marine Environmental Laboratory (PMEL) over the last five years. The research areas and related topics for the review are: 1) Climate Research; 2) Marine Ecosystem Research; 3) Ocean and Coastal Processes Research; and 4) Research Innovation.

Evaluation Guidelines

For each research area reviewed, each reviewer will provide one of the following overall ratings:

- *Highest Performance*--Laboratory greatly exceeds the Satisfactory level and is outstanding in almost all areas.
- *Exceeds Expectations*--Laboratory goes well beyond the Satisfactory level and is outstanding in many areas.
- *Satisfactory*--Laboratory meets expectations and the criteria for a Satisfactory rating.
- *Needs Improvement*--Laboratory does not reach expectations and does not meet the criteria for a Satisfactory rating. The reviewer will identify specific problem areas that need to be addressed.

Reviewers are to consider the Quality, Relevance, and Performance of the laboratory, and to provide one of the overall ratings above for each research area reviewed. We also ask that, in addition to the overall ratings for each research area, if possible also assign one of these ratings for the subcategories of Quality, Relevance, and Performance within the research area reviewed. Ratings are relative to the Satisfactory definitions shown below.

1. **Quality:** Evaluate the quality of the Laboratory's research and development. Assess whether appropriate approaches are in place to ensure that high quality work will be performed in the future. Assess progress toward meeting OAR's goal to conduct preeminent research as listed in the "Indicators of Preeminence."

➤ **Quality Rating Criteria:**

- *Satisfactory* rating -- Laboratory scientists and leadership are often recognized for excellence through collaborations, research accomplishments, and national and international leadership positions. While good work is done, Laboratory scientists are not usually recognized for leadership in their fields.

➤ **Evaluation Questions to consider:**

- Does the Laboratory conduct preeminent research? Are the scientific products and/or technological advancements meritorious and significant contributions to the scientific community?
- How does the quality of the Laboratory's research and development rank among Research and Development (R&D) programs in other U.S. federal agencies? Other science agencies/institutions?
- Are appropriate approaches in place to ensure that high quality work will be done in the future?
- Do Laboratory researchers demonstrate scientific leadership and excellence in their respective fields (e.g., through collaborations, research accomplishments, externally funded grants, awards, membership and fellowship in societies)?

➤ **Indicators of Quality:** Indicators can include, but not be limited to the following (note: not all may be relevant to each Laboratory)

- A Laboratory's total number of refereed publications per unit time and/or per scientific Full Time Equivalent scientific staff (FTE).
- A list of technologies (e.g. observing systems, information technology, numerical modeling algorithms) transferred to operations/application and an assessment of their significance/impact on operations.
- The number of citations for a lab's scientific staff by individual or some aggregate.
- A list of awards won by groups and individuals for research, development, and/or application.
- Elected positions on boards or executive level offices in prestigious organizations (e.g., the National Academy of Sciences, National Academy of Engineering, or fellowship in the American Meteorological Society, American Geophysical Union or the American Association for the Advancement of Science etc.).
- Service of individuals in technical and scientific societies such as journal editorships, service on U.S. interagency groups, service of individuals on boards and committees of international research-coordination organizations.
- A measure (often in the form of an index) that represents the value of either individual scientist or the Laboratory's integrated contribution of

refereed publications to the advancement of knowledge (e.g., Hirsch Index).

- Evidence of collaboration with other national and international research groups, both inside and outside of NOAA including Cooperative Institutes and universities, as well as reimbursable support from non-NOAA sponsors.
- Significance and impact of involvement with patents, invention disclosures, Cooperative Research and Development Agreements and other activities with industry.
- Other forms of recognition from NOAA information customers such as decision-makers in government, private industry, the media, education communities, and the public.
- Contributions of data to national and international research, databases, and programs, and involvement in international quality-control activities to ensure accuracy, precision, inter-comparability, and accessibility of global data sets.

2. Relevance: Evaluate the degree to which the research and development is relevant to NOAA's mission and of value to the Nation.

➤ **Relevance Rating Criteria:**

- *Satisfactory* rating -- The R&D enterprise of the Laboratory shows linkages to NOAA's mission, Strategic Plan, and Research Plan, and is of value to the Nation. There are some efforts to work with customer needs but these are not consistent throughout the research area.

➤ **Evaluation Questions to consider:**

- Does the research address existing (or future) societally relevant needs (national and international)?
- How well does it address issues identified in the NOAA strategic plan and research plans or other policy or guiding documents?
- Are customers engaged to ensure relevance of the research? How does the Laboratory foster an environmentally literate society and the future environmental workforce? What is the quality of outreach and education programming and products?
- Are there R&D topics relevant to national needs that the Laboratory should be pursuing but is not? Are there R&D topics in NOAA and OAR plans that the Laboratory should be pursuing but is not?

➤ **Indicators of Relevance:** Indicators can include, but not be limited to the following (note: not all may be relevant to each Laboratory)

- Results of written customer survey and interviews
- A list of research products, information and services, models and model simulations, and an assessment of their impact by end users, including participation or leadership in national and international state-of-science assessments.
- Evidence of linkages to objectives in the NOAA strategic plan, for example, milestones completed in the Annual Operating Plan

3. **Performance:** Evaluate the overall effectiveness with which the Laboratory plans and conducts its research and development, given the resources provided, to meet NOAA Strategic Plan objectives and the needs of the Nation. The evaluation will be conducted within the context of three sub-categories: **a) Research Leadership and Planning, b) Efficiency and Effectiveness, c) Transition of Research to Applications (when applicable and/or appropriate).**
- **Performance Rating Criteria:**
 - *Satisfactory* rating --
 - The Laboratory generally has documented scientific objectives and strategies through strategic and implementation plans (e.g., Annual Operating Plan) and a process for evaluating and prioritizing activities.
 - The Laboratory management generally functions as a team and works to improve the operation of the Laboratory.
 - The Laboratory usually demonstrates effectiveness in completing its established objectives, milestones, and products.
 - The Laboratory often works to increase efficiency (e.g., through leveraging partnerships).
 - The Laboratory is generally effective and efficient in delivering most of its products/outputs to applications, operations or users.
 - A. Research Leadership and Planning:** Assess whether the Laboratory has clearly defined objectives, scope, and methodologies for its key projects.
 - **Evaluation Questions to consider:**
 - Does the Laboratory have clearly defined and documented scientific objectives, rationale and methodologies for key projects?
 - Does the Laboratory have an evaluation process for projects: selecting/continuing those projects with consistently high marks for merit, application, and priority fit; ending projects; or transitioning projects?
 - Does the laboratory have the leadership and flexibility (i.e., time and resources) to respond to unanticipated events or opportunities that require new research and development activities?
 - Does the Laboratory provide effective scientific leadership to and interaction with NOAA and the external community on issues within its purview?
 - Does Laboratory management function as a team and strive to improve operations? Are there institutional, managerial, resource, or other barriers to the team working effectively?
 - Has the Laboratory effectively responded to and/or implemented recommendations from previous science reviews?
 - **Indicators of Leadership and Planning:** Indicators can include, but not be limited to, the following (Note: Not all may be relevant to each Laboratory).
 - a. Laboratory Strategic Plan
 - b. Program/Project Implementation Plans.

- c. Laboratory Annual Operation Plan milestones
- d. Active involvement in NOAA planning and budgeting process.
- e. Final report of implementation of recommendations from previous Laboratory review.

B. Efficiency and Effectiveness: Assess the efficiency and effectiveness of the Laboratory's research and development, given the Laboratory's goals, resources, and constraints and how effective the Laboratory is in obtaining needed resources through NOAA and other sources.

➤ **Evaluation Questions to consider:**

- Does the Laboratory execute its research in an efficient and effective manner given the Laboratory goals, resources, and constraints?
- Is the Laboratory organized and managed to optimize the conduct and planning of research, including the support of creativity? How well integrated is the work with NOAA's and OAR's planning and execution activities? Are there adequate inputs to NOAA's and OAR's planning and budgeting processes?
- Is the proportion of the external funding appropriate relative to its NOAA base funding?
- Is the Laboratory leveraging relationships with internal and external collaborators and stakeholders to maximize research outputs?
- Are human resources adequate to meet current and future needs? Is the Laboratory organized and managed to ensure diversity in its workforce? Does the Laboratory provide professional development opportunities for staff?
- Are appropriate resources and support services available? Are investments being made in the right places?
- Is infrastructure sufficient to support high quality research and development?
- Are projects on track and meeting appropriate milestones and targets? What processes does management employ to monitor the execution of projects?

➤ **Indicators of Efficiency and Effectiveness:** Indicators can include, but not be limited to, the following (Note: Not all may be relevant to each Laboratory).

- a. List of active collaborations
- b. Funding breakout by source
- c. Lab demographics

C. Transition of Research to Applications: How well has the Laboratory delivered products and communicated the results of their research? Evaluate the Laboratory's effectiveness in transitioning and/or disseminating its research and development into applications (operations and/or information services).

➤ **Evaluation Questions to consider:**

- How well is the transition of research to applications and/or dissemination of knowledge planned and executed?

- Are end users of the research and development involved in the planning and delivery of applications and/or information services? Are they satisfied?
 - Are the research results communicated to stakeholders and the public?
- **Indicators of Transition:** Indicators can include, but not be limited to, the following (Note: Not all may be relevant to each Laboratory).
- a. A list of technologies (e.g. observing systems, information technology, numerical modeling algorithms) transferred to operations/application and an assessment of their significance/impact on operations/applications.
 - b. Significance and impact of involvement with patents, Cooperative Research and Development Agreements (CRADAs) and other activities with industry, other sectors, etc.
 - c. Discussions or documentation from Laboratory stakeholders.

Appendix C: Worksheets

(Note in WORD the boxes below will expand to fit the text)

Evaluation Worksheet 1

Research Area: *Climate Research*

Reviewer:

Overall Evaluation:

- Highest Performance*--Laboratory greatly exceeds the Satisfactory level and is outstanding in almost all areas.
- Exceeds Expectations*--Laboratory goes well beyond the Satisfactory level and is outstanding in many areas.
- Satisfactory*--Laboratory meets expectations and the criteria for a Satisfactory rating.
- Needs Improvement*--Laboratory does not reach expectations and does not meet the criteria for a Satisfactory rating. The reviewer will identify specific problem areas that need to be addressed.

QUALITY	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
RELEVANCE	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
PERFORMANCE	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
Recommendations for <i>Climate Research</i> Please provide specific, actionable recommendations based on your observations/findings	
1. 2. <i>Etc.</i>	

Evaluation Worksheet 2

Research Area: *Marine Ecosystem Research*

Reviewer:

Overall Evaluation:

- Highest Performance*--Laboratory greatly exceeds the Satisfactory level and is outstanding in almost all areas.
- Exceeds Expectations*--Laboratory goes well beyond the Satisfactory level and is outstanding in many areas.
- Satisfactory*--Laboratory meets expectations and the criteria for a Satisfactory rating.
- Needs Improvement*--Laboratory does not reach expectations and does not meet the criteria for a Satisfactory rating. The reviewer will identify specific problem areas that need to be addressed.

QUALITY	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
RELEVANCE	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
PERFORMANCE	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
Recommendations for <i>Marine Ecosystem Research</i> Please provide specific, actionable recommendations based on your observations/findings	
1. 2. <i>Etc.</i>	

Evaluation Worksheet 3

Research Area: *Ocean and Coastal Processes Research*

Reviewer:

Overall Evaluation:

- Highest Performance*--Laboratory greatly exceeds the Satisfactory level and is outstanding in almost all areas.
- Exceeds Expectations*--Laboratory goes well beyond the Satisfactory level and is outstanding in many areas.
- Satisfactory*--Laboratory meets expectations and the criteria for a Satisfactory rating.
- Needs Improvement*--Laboratory does not reach expectations and does not meet the cri will identify specific problem areas that need to be addressed.

QUALITY	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
RELEVANCE	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
PERFORMANCE	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
Recommendations for <i>Ocean and Coastal Processes Research</i> Please provide specific, actionable recommendations based on your observations/findings	
1. 2. <i>Etc.</i>	

Evaluation Worksheet 4

Research Area: *Research Innovation*

Reviewer:

Overall Evaluation:

- Highest Performance*--Laboratory greatly exceeds the Satisfactory level and is outstanding in almost all areas.
- Exceeds Expectations*--Laboratory goes well beyond the Satisfactory level and is outstanding in many areas.
- Satisfactory*--Laboratory meets expectations and the criteria for a Satisfactory rating.
- Needs Improvement*--Laboratory does not reach expectations and does not meet the cri will identify specific problem areas that need to be addressed.

QUALITY	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
RELEVANCE	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
PERFORMANCE	<input type="checkbox"/> Highest Performance <input type="checkbox"/> Exceeds Expectations <input type="checkbox"/> Satisfactory <input type="checkbox"/> Needs Improvement
Comments and observations/findings:	
Recommendations for <i>Research Innovation</i> Please provide specific, actionable recommendations based on your observations/findings	
1. 2. <i>Etc.</i>	

**Reviewer Feedback Worksheet:
Additional Comments and Feedback on the Review Process**

Reviewer:

Additional comments for OAR and laboratory management

Additional comments and suggestions on conduct of the review for use in future laboratory reviews

Please help OAR improve our science review process by telling us what worked well and did not work well throughout the process. In order to reduce the burden on you and the Laboratory staff, we would like to provide only the most useful background information. Consider the following questions:

What information provided was especially useful in your evaluations?

What additional information would have helped you in your evaluation?

What information could have been omitted without impacting the quality of your review?

Appendix D: Contact Information

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