NOAA Administrative Order (NAO) 216-115:

Strengthening NOAA's Research and Development Enterprise

Procedural Handbook Appendices

Table of Contents

Appendix 1.1: Glossary for NAO Procedural Handbook 2

Appendix 1.2: References for NAO Procedural Handbook..... 5

Appendix 1.3: Abbreviations Used in NAO Procedural Handbook 7

Appendix 2.1: Drivers, Benefits, and Functional Requirements Definition for NOAA Enterprise Research and Development (R&D) Projects Portfolio Management System (PPMS)..... 9

Appendix 2.2: NOAA Enterprise Research and Development Projects Portfolio Management Data Fields 18

Appendix 3.1: Evaluation Descriptions for Quality, Relevance, and Performance of NOAA Research Programs..... 37

Appendix 3.2: Potential Evaluation Questions for NOAA Portfolio Reviews..... 42

Appendix 3.3: Supplemental Information for NOAA Benchmark Reviews 43

Appendix 3.4: Additional Documentation..... 45

Appendix 1.1: Glossary for NAO Procedural Handbook

Activity: Activities are the processes through which NOAA uses assets to generate outputs. NOAA's activities represent what NOAA needs to do in order to achieve its corporate strategic objectives.

Conflict of Interest: Any financial or other interest which conflicts with the service of the individual on the review panel because it (1) could significantly impair the individual's objectivity or (2) could create an unfair competitive advantage for any person or organization.

Core Evaluation Criterion: A major category by which the research program is judged (e.g., quality, relevance, performance).

Effectiveness: A project or program produces the intended results or strategic objectives.

Efficiency: Achieving the desired objective while minimizing the expenditure of resources, i.e., time, funding, labor, and materials/equipment.

Enterprise: an entity comprised of interdependent resources (e.g., people, processes, organizations, technology, funding) that interact with each other (to, e.g., coordinate functions, share information, allocate funding) and their environment to achieve goals. Enterprise and its boundary are virtual constructs that depend on the make-up, authority, and roles of the participating actors in a community of interest. Enterprises exhibit attributes of a complex adaptive system: they are evolutionary, emergent, adaptive, self-organizing, competitive and cooperative.

Function: Functions are required to execute the mission, consistent with the NOAA Functional Model. NOAA's functions are the highest-level categorization of NOAA's activities and are comprehensive—that is, all activities conducted by NOAA can be traced to a function. In this manner, all contributors to NOAA's mission can see how their activities support the plan. While activities are the particular things that NOAA does, functions are broad categories of these activities.

Goal: Goals specify the components of NOAA's vision, translating the vision into a limited number of high-level results that NOAA will seek to achieve. NOAA's strategic goals are outcome-oriented—that is, they specify future social, economic, and environmental conditions that the agency is committed to achieving, and how society will benefit from NOAA's success. The timeframe for NOAA's strategic goals is multi-decadal.

Mission: NOAA's mission summarizes the agency's fundamental mandates and responsibilities. It is a succinct and distinctive statement of what NOAA does. The mission statement encapsulates the set of statutory requirements that drive NOAA's functions, and is assumed to be stable over the planning period.

Objective: Objectives further describe strategic goals or enterprises by detailing the societal, environmental, or organizational benefits that NOAA seeks to achieve in the five year time

frame. Objectives toward goals are outcomes for society and the environment, whereas objectives toward enterprises are outcomes for NOAA to achieve its goals. Objectives should be specific, measurable, attainable, realistic, and time-bound (SMART).

Peer Review: A widely used, time-honored practice in the scientific and engineering community for judging and potentially improving a scientific or technical plan, proposal, activity, program or work product through documented critical evaluation by individuals or groups with relevant expertise who had no involvement in developing the object under review (NRC, 2000).

Performance: This refers to the effectiveness and efficiency with which R&D activities are organized, directed, and executed. Assessing performance involves evaluating the effectiveness and efficiency with which tasks are executed, as well as the adequacy of the leadership, workforce, and infrastructure needed to achieve the designated goals. This necessarily involves understanding the quality of management, including interaction with stakeholders, clear articulation of strategic direction, as well as development and management of an R&D portfolio appropriately balanced across objectives, dimensions, and intended applications. Performance is measured by both effectiveness (the ability to achieve useful results) and efficiency (the ability to achieve quality, relevance and effectiveness in a timely fashion and with little waste). This evaluation criterion considers how research activities are progressing relative to milestones and benchmarks as well as all aspects of how research is conducted, including all components that feed into creating a high quality research enterprise (e.g., leadership, innovation, planning, monitoring, efficiency and effectiveness of processes, resource utilization, reporting).

Planning: The formal process of establishing missions, goals and objectives (strategic planning) and describing how the goals and objectives are to be achieved by establishing performance expectations and resource requirements (implementation planning).

Portfolio: A set of investments that yield benefits, and have costs and associated risks. Through management of a portfolio, NOAA can explicitly assess the tradeoffs among competing investment opportunities in terms of their benefits, costs, and risks.

Portfolio Balance: The proportion of research projects (or resources) in a portfolio that are allocated among categories (e.g., among strategic goals, topics, risk, research horizon, investment). Such an analysis is used to evaluate whether research priorities are being adequately addressed.

Program: Throughout the evaluation chapter, the term “Program” is inclusive of laboratories, science centers, programs (e.g., OAR’s Office of Weather and Air Quality), and matrix organizations (e.g., Coral Reef Conservation Program).

Quality: This refers to the merit of R&D within the scientific community. Assessing the quality of scientific and technical work done involves the time honored tradition of peer review. Bibliometric data on peer-reviewed publications and citations, as well as awards and other professional recognitions, are critical to understanding the research quality of individuals and organizations, particularly for benchmarking against other organizations of

similar size and scope. Quality is measured by the novelty, soundness, accuracy, and reproducibility of a specific body of research, as represented by the outputs (i.e., products) delivered by the project or program. This evaluation criterion establishes the relative merit and repeatability of the research or program relative to that of contemporaries in the community of practice, whether the scientific methodologies were appropriate, adhered to, and thoroughly documented.

Relevance: This refers to the value of R&D to users beyond the scientific community. Relevance includes not only hypothetical value, but actual impact. Assessing NOAA's relevance involves measuring the broader benefits of the work. It answers the question, "What would not have happened if R&D did not exist, and how much would society have missed?" The impact of R&D can be realized through the application of scientific knowledge to policy decisions, through the improvement of operational capabilities at NOAA's service lines, or by patenting and licensing of inventions for commercial use. Relevance is measured by how well a specific body of research supports NOAA's mission and the needs of users and the broader society. At a minimum, this evaluation criterion establishes how the research aligns with the strategic plan and priorities of the agency, as demonstrated by links to validated agency requirements, key legislative mandates, administration priorities and societal benefits. Relevance is more reliably established by evidence of actual impact and retrospective (or concurrent) analysis of how R&D causes measurable improvements in operational performance and social and economic value.

Strategic plan: a plan that identifies what NOAA should produce in the future (i.e., outputs), and why those are important (i.e., outcomes). Distinguishing between outcomes and outputs gives flexibility to change agency activities while staying true to its overall purpose.

Strategy: explains what the agency intends to do and why it intends to do it. It relates a statement of output (e.g., mission, functions or activities) to a statement of outcome (e.g., vision, long-term strategic goals or objectives) to succinctly convey NOAA's fundamental purpose, direction, and value to society.

Vision: An envisioned future state of society and the environment that, implicitly, cannot be achieved without NOAA. The vision describes long-term success in terms of the value that NOAA will generate for society—in effect, why the agency exists. The timeframe for NOAA's vision is multi-decadal.

Appendix 1.2: References for NAO Procedural Handbook

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Appendix 1.3: Abbreviations Used in NAO Procedural Handbook

AA	Assistant Administrator
AGM	Annual Guidance Memorandum
AOP	Annual Operating Plan
CIO	Chief Information Officer
CPA	Corporate Portfolio Analysis
CRADA	Cooperative Research and Development Agreement
CS	NOAA Chief Scientist
DoC	Department of Commerce
FACA	Federal Advisory Committee Act
FY	Fiscal Year
IP	Implementation Plan
LO	Line Office
NAO	NOAA Administrative Order
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
OAR	Office of Oceanic and Atmospheric Research
OMB	Office of Management and Budget
PPMS	Project Portfolio Management System
R&D	Research and Development
RC	NOAA Research Council
RDEC	Research and Development Enterprise Committee
SAB	NOAA Science Advisory Board

SBIR	Small Business Innovation Research
SEE	Strategy Execution and Evaluation
SO	Staff Office
SONR	State of NOAA Research Report

Appendix 2.1: Drivers, Benefits, and Functional Requirements Definition for NOAA Enterprise Research and Development (R&D) Projects Portfolio Management System (PPMS)

Why Manage R&D projects?

The ability to develop and manage R&D projects is essential to successfully achieving program outcomes and providing NOAA's mandated services to the American people. To communicate and prioritize research investments, management must have a clear understanding of projects, what functions they will perform, and how new capabilities, products, or information will integrate into the larger NOAA enterprise and its mission. Additionally, management must understand how projects are performing relative to approved milestones, and timelines for completion or transition of project deliverables to operations or applications.

Effective management of science R&D investments starts with a clear expectation of the project its outcomes and/or deliverables, and its budget. Lack of initial clarity will likely lead to disappointment as management sees the science R&D project they thought they understood looking different, costing more or taking longer than expected to complete.

This *Enterprise R&D Project Portfolio Management System (PPMS) Requirements Definition (RD)* is intended to serve as a bridge, enabling R&D project managers/leads to establish clear mutual expectations and agreement with management.

Purpose of the Functional Requirements Definition Document

The intended audience of the Functional Requirements Definition is the R&D project manager/lead, R&D project sponsor, R&D project team, management, client/user, and any stakeholder whose input/approval into the requirements definitions process is needed.

This RD document establishes NOAA's management expectations, and captures the organizational agreement, and criteria for the R&D PPM project success. It will ensure that the affected organizations are engaged and aligned around a common vision.

Workshop on Strengthening NOAA Science

On April 20-22, 2010, seventy scientists and science managers from across NOAA's Line and Staff Offices attended the "Workshop on Strengthening NOAA Science." The purpose of this workshop was to brainstorm and discuss both the grand science challenges facing NOAA and opportunities to improve how NOAA conducts its science. The findings from the workshop are documented in the "Strengthening NOAA Science Findings from the NOAA Science Workshop April 20-22, 2010" whitepaper prepared by the NOAA Science Workshop Program Committee. Several identified challenges are discussed in the section that follows.

NOAA's Science Goal

The workshop described NOAA's grand science challenge as "(to) develop and apply holistic, integrated Earth system approaches to understand the processes that connect changes in the

atmosphere, ocean, space, land surface, and cryosphere with ecosystems, organisms and humans over different scales" (i.e., A holistic understanding of the Earth system through research). The overarching grand challenge is referred to in this document as ***NOAA's Science Goal.***

The Problems (Major Science Challenges)

In addition to the overarching grand challenge (*NOAA's Science Goal*), several major science challenges and science risks and uncertainties were identified. To meet NOAA's Science Goal the major science challenges must be addressed, and their risks and uncertainties must be tracked and managed. The science challenges are to:

- Acquire and incorporate knowledge of human behavior, societal values, and economics into our weather, climate, and ecosystem assessments to enhance our understanding of the interaction between human activities and the Earth system;
- Understand and quantify the interactions between atmospheric composition and climate variations and change;
- Understand and characterize the role of the oceans in climate change and variability and the effects of climate change on the ocean and coasts, including biological, chemical, and geophysical effects (e.g., sea level rise, ocean acidification, living marine resources);
- Assess and understand the roles of ecosystem processes and biodiversity in sustaining ecosystem services and the connections among ecosystem condition, resilience, and the health of marine organisms, humans, and communities;
- Improve understanding and predictions of the water cycle from global to local scales to improve our ability to forecast weather, climate, water resources and ecosystem health;
- Develop and evaluate approaches to substantially reduce environmental degradation, overfishing, and climate change in ways that maximize benefits and minimize adverse impacts; and
- Sustain and enhance atmosphere-ocean-land-biology and human observing systems, and their long-term data sets, and develop and transition new observing technologies.

Project Needs Statement (purpose and use)

The "Strengthening NOAA Science Findings from the NOAA Science Workshop April 20-22, 2010" document stated "To achieve NOAA's overarching grand challenge, NOAA science must improve understanding of the causes and consequences of climate variations and change, including the interactions between atmospheric composition and climate, and the physical, chemical, biological and ecological impacts" It also stated that this " is critical to NOAA's mission and mandates and will require many partners, both nationally and internationally. At the same time, the agency has unmatched and distinguished capabilities in its core areas of science expertise."

NOAA's science goal will be achieved through improved collaboration with a wide array of partners both internal and external (government, private, academia. etc.). NOAA must provide information that will improve the public well-being while supporting and protecting the planet's life system. There is a need for improved communication between NOAA and society so that the

benefits of its science-based outcomes are known and understood.

High capacity computing capabilities are necessary to support the NOAA science goal and NOAA's global scientific leadership. Enterprise standards should be implemented to ensure the integrity of scientific information. For example, an "enterprise-wide NOAA science dictionary for ecosystems, earth system, climate, weather, variability, uncertainty, social science and its subcategories would improve communication and collaborations among scientists from different disciplines and backgrounds."

Finally, there is a need for a PPMS for collaboration, analysis of information for decisions, tracking and monitoring, alignment of funds, and easy retrieval of information about all of NOAA's R&D projects. Systematic monitoring of NOAA R&D is needed to:

- Collect, track, analyze, and monitor R&D projects and funding,
- Catalogue and manage Research to Applications transition projects in their various states of technology readiness levels,
- Provide query and reporting capability on NOAA's R&D projects,
- Increase collaboration among both internal and external partners,
- Calculate metrics that can be used to analyze and demonstrate the performance, quality, and relevance of NOAA's R&D projects and the associated programs.

Current methods and procedures

Currently, each individual Line and Staff Office has distinct processes/methods for collecting, storing, tracking, monitoring, and sharing information about their R&D and funding among their areas to satisfy the NOAA Science Goal (outdated database systems, spread sheets, individual data calls, etc.). There is some communication, collaboration, and information sharing among internal (i.e., NOAA Line and Staff Offices) and external partners, usually ad hoc.

Deficiencies

Tracking and analyzing NOAA's R&D funding and performance data is a fundamental premise of the Research Council charter and essential to managing NOAA's R&D portfolio. The Research and Development Enterprise Committee (RDEC), a subcommittee of NOAA's Research Council, was established, in part, to develop and implement a corporate R&D data management strategy.

NOAA's success is often hampered by erratic funding processes, inability to make long-term funding commitments, and the administrative burden of MOUs that make NOAA an unattractive partner for collaboration.

Current methods and procedures employed to satisfy the NOAA Science Goal through collaboration and information sharing are lacking. There are disparate and inconsistent processes and systems among the NOAA enterprise.

The current methods do not provide a holistic assessment of the R&D portfolio across NOAA based on performance and benefits due to these disparate processes.

Benefits

There are many benefits to having a NOAA R&D PPMS. The benefits are the ability to:

- Identify, track and facilitate transition projects (i.e., research-to-applications using NOAA-adopted technical readiness levels (as recommended by SAB, 2004)
- Track and align funds with the source of funding
- Share information across NOAA's enterprise to improve communication, collaboration, coordination and planning across NOAA and decrease project redundancy
- Improve performance management through a system of interdependent, corporate decision-making processes for planning, budget, execution and evaluation. Strengthen the linkage between strategy and execution; strengthen linkage across line and staff offices
- Provide corporate reporting of performance (as mandated in the reports for Government Performance and Results Act (GPRA), Department of Commerce performance reporting, Annual Performance Plan (APP), Annual Operating Plan (AOP), and other ad-hoc customizable requests);
- Plan, schedule, and track execution and evaluation of progress;
- Identify, assess, and mitigate risk; and,
- Capture trends in R&D investments.

Project Assumptions / Constraints

Assumptions

Below is a list of assumptions required to ensure the success of the R&D PPM project

- *Resource Assumptions*
  - Project staff resources will be available when and as they are needed.
  - Required hardware resources will be available when and as they are needed.
  - Required customer resources will be available when and as they are needed.
  - Partners and stakeholder resources will be available when and as they are needed.
- *Environment Assumptions*
  - Access to industry experts and specialized skills will occur as needed.
  - A "full-time" resource implies at least 35 hours productive work per week.
- *Organizational Assumptions*
  - No industrial action will be taken that will affect the project.
  - No Federal mandates, policies, laws will be enacted that will affect the project
  - Issues will be resolved in a timely manner.
  - The project team described in the project plan will be put in place.
  - All Line and Staff Offices buy into and support the project
  - Systems components will be capable of being integrated with minimum rework.
- *Funding Assumptions*
  - Fully funded
  - On schedule and at the cost specified

- *Functionality Assumptions*
    - The scope of the project is limited to that described in the project charter.
    - Formal charter and scope change procedures will be followed.

Constraints

Below is a list of constraints or project limits.

- *Resource Constraints*
    - Key stakeholders/partner resources will be available on a limited basis.
    - The customer has limited staff capable of adequately describing in detail the functional requirements of the system.
    - The customer has limited staff capable of adequately describing in detail the operational requirements of the system.
    - A significant percentage of the project team will not be experienced with implementing the PPMS requirements,
- *Organizational Constraints*
    - Approval of all Line and Staff Offices key decision-makers will require time
- *Functionality Constraints*
    - The project depends upon receiving data from other, external applications.
- *Federal Laws/Mandates/Policies Constraints*
    - The project and system must adhered to all Federal mandates, laws, policies including security

Scope

Develop and use a NOAA Enterprise R&D PPMS to meet the challenges by implementing process changes and creating a management tool to collect, track, analyze, and monitor R&D projects and money, manage the transition portfolio, provide reporting capability, and increase collaboration among both internal and external partners.

Project Oversight

The project is major and is a necessity to improve and support strengthening of NOAA's science. The project oversight authority is the NOAA Research Council led by NOAA's Chief Scientist.

Project Management

The Office of Oceanic and Atmospheric Research (OAR) will provide project management. The Line and Staff Offices are responsible for collaboration, providing and sharing information, and attending meetings.

Project Requirements

The project requirements captured below specify intended behavior of the R&D project portfolio management system and its performance. System calculations, data manipulation and processing, user interface, interaction with the application, and other specific functionality showing how the

user requirements are satisfied are listed.

Req ID	Requirements
	Performance Requirements
PR 1.0	The system shall have a system availability of 99.9% with minimal data loss. The vendor shall install appropriate measures to protect against data loss, for example, rolling back transactions in progress when service is interrupted.
PR 1.1	The system shall allow varying system access rights and permissions for different user groups types, (including read/write/field locking/approvals) associated with the groups. User group types include the following at a minimum: admin, approver, read-only, read-write.
PR 1.2	The system shall use SAML standards for authentication as follows: Support SAML 2.0, WS-Federation 1.2, WS-Trust 2005/1.3, OpenID 2.0, metadata exchange (MEX), Authentication context, and Auto-Connect; Consume SAML assertions. The application should prefer two-factor authentication using Common Access Card (CAC).
PR 1.3	The system shall comply with Section 508 (Rehabilitation Act 1998).
PR 1.4	The system shall be internet web accessible. All client/user, administrator features and functions shall be available through the browser, and the browser should not be brand specific. It shall be available for browsers and versions currently in use at NOAA, including, but not limited to, Internet Explorer, Safari, Chrome, Firefox, and etc. Specific versions will be jointly determined after award.
PR 1.5	The system shall have the capability to monitor system performance.
FR 1.6	The system shall have workflow capability with review, authorization, and approval mechanism for project data entered and stored in the official record.
PR 1.7	The system shall allow tasking (e.g., within workflow) of system users and/or user groups to perform functions such as data entry or approvals.
PR 1.8	The system shall allow notification to the appropriate user groups that information entered is ready for review or approval.
PR 1.9	The system shall denote the status of the information entered into the system. The status may be at a minimum: pending, approved, rejected.
PR 1.10	The system shall have different views for different users. User groups will only see relevant information and data fields

PR 1.11	The system shall have the capability of different menus for different user groups in different organizational components.
PR 1.12	The system shall limit data fields viewable or editable to a user based upon user group access rights and permissions.

	Functional Requirements
FR 1.0	The system shall perform quality checking (spelling, character length, etc.) on input.
FR 1.1	The system shall assign unique identifiers for each project.
FR 1.2	The system shall have a user-friendly web interface that minimizes the time spent entering data. This may include new windows for data entry, drop-down menus, check boxes, and radio buttons capability.
FR 1.3	The system shall have the capability to automatically populate fields based on known criteria or cases or business rules. These business rules/known criteria may include automatically populating names of subordinate departments/offices when a NOAA Line Office is selected, or tailoring the annual data fields to the project specified dates.
FR 1.4	The system shall have the capability to flag and send alerts to a user or user group where the current data exceeds a missed project, milestone, or deliverable end/due date.
FR 1.5	The system shall have the capability to send e-mail notifications to select user groups or specific users (e.g., if a due date is missed)
FR 1.6	The system shall have version control and audit trail capability. Version control capabilities may include keeping a record of all changes to the data field entries to allow restoration of previous field entry; time, date, name stamp to field entries;
FR 1.7	The system shall allow, at a minimum, for data entry of free text, numbers, dates, times, financial information, and email addresses.
FR 1.8	The system shall enforce the entry of mandatory data fields.
FR 1.9	The system shall have built in analytical capabilities to determine trends in field entries and historical extrapolation and to perform basic mathematical calculations
FR 1.10	The system shall allow for relational mappings among fields. This in includes one-to-one, one-to-many, many-to-one, and many-to-many mappings between

	data fields. Draft data fields are supplied in NOAA PDMS Data Fields.pdf and will be subject to refinement after award.
FR 1.11	The system shall have the capability to prepare end-user designed reports of selected data fields and calculate basic mathematical functions on the selected data. This may include calculations such as change in percentage of R&D projects tagged to the Weather-Ready Nation goal of NOAA's strategic plan compared to the Climate goal in a specific laboratory over 5 years.
FR 1.12	The system shall provide standard reports of select data fields relating to the R&D projects.
FR 1.13	The system shall provide a data import utility using Microsoft Excel as the data format.
FR 1.14	The system shall provide the capability to visualize select data fields as standard and end-user specified reports in tabular formats, text, charts, graphs, and dashboards.
FR 1.15	The system shall have the capability for reports to be exported to Microsoft Office Word and Excel, and Adobe Acrobat pdf format.
FR 1.16	The system shall provide the capability to calculate basic mathematical functions such as counts, number of days past a due date, summation, average, median, and percentage. These may include example metrics such as missed project milestone and deliverable end/due date, percentage of financial resources spent within (outside) agencies of the Federal Government, comparison of NOAA ship time across projects.
FR 1.17	The system shall visualize calculated mathematical functions in graphical formats (including pie chart, line chart, bar charts).
FR 1.18	The system shall visualize select R&D project information as a dashboard with select data fields and calculated metrics. This may include calculated metrics for the R&D project, project information, graphs of trends.
FR 1.19	The system shall have the capability to display in a new window external documents, websites, and/or images.
FR 1.20	The system shall have the capability to perform repeatable search inquiries of select data fields and end-user defined inquiries.
FR 1.21	The system shall have the capability to search by any word across all data fields.
FR 1.22	The system shall have the capability to limit searches to an end-user defined selection of fields.

FR 1.23	The system shall have the capability to search by character string.
FR 1.24	The system shall have the capability to review search results, edit-live the results, change/modify search, and filter results. This functionality will be dependent upon user access rights.
FR 1.25	The system shall have the capability to sort all data fields of the search results.
FR 1.26	The system shall have tiered sorting by field.
FR 1.27	The system shall have the capability to print search results and reports.

Appendix 2.2: NOAA Enterprise Research and Development Projects Portfolio Management Data Fields

Background:

The table below summarizes the proposed data fields to be included in the NOAA R&D PPMS. It includes field names and their definitions.

Field Name	**Field Name**	**Field Name**	**Definition (subject to change)**	**Comments**
(Main Fields)	(1st Sub Fields)	(2nd plus Sub Fields)		
Contact Information				
Project Unique Identifier				Mandatory, core field. This is expected to be automatically generated for each project.
Line Office Specific Project Unique Identifier			An identifier that may be used by a LO to cross reference a project in another database.	Could be entered manually. Actual implementation may vary.
NOAA POC First Name			The Point of Contact (POC), a NOAA staff, is the designated owner of the data. The POC will provide clarification and explanation and will contact Principal Investigator (PI), Partner, and others if necessary.	Mandatory, core field. Text Box. Actual implementation may vary.
NOAA POC Last Name			The POC, a NOAA staff, is the designated owner of the data. The POC will provide clarification and explanation and will	Mandatory, core field. Text Box. Actual implementation may vary

			contact PI, Partner, and others if necessary.	
	POC email address		The email address is the address that will be used to contact the POC (from Lightweight Directory Access Protocol, LDAP).	Mandatory, core field. Text Box. Or possible interface with the NOAA LDAP system to import POC information. Actual implementation may vary.
	POC telephone number		The office and/or cell telephone will be used to contact the POC (from LDAP).	Mandatory, core field. Text Box. Or possible interface with the NOAA LDAP system to import POC information. (Allow multiple entries - both office and cell numbers). Actual implementation may vary.
	POC Line or Staff Office		The official Line or Staff Office currently assigned to the POC (from LDAP).	Mandatory, core field. Text Box. Or possible interface with the NOAA LDAP system to import POC information. Actual implementation may vary.
	POC Program Office/Lab		The official POC Program Office/Lab currently assigned to the POC (from LDAP).	Mandatory, core field. Text Box. Or possible interface with the NOAA LDAP system to import POC information. Actual implementation may vary.
PI/Team Lead First Name			The PI is the lead investigator on the project. The PI provides clarification and explanation to the POC and guidance to the other Partners if necessary.	Mandatory, core field. Text Box.
			Could be the same person as the POC. Could be more than	(If the PI and POC are the same, all the POC information will be entered

			one PI.	automatically.) There may be more than one PI associated with the project. Actual implementation may vary.
PI/Team Lead Last Name			The PI is the lead investigator on the project. The PI provides clarification and explanation to the POC and guidance to the other Partners if necessary.	Mandatory, core field. Enter PI Last Name in a Text Box. There may be more than one PI associated with the project. Actual implementation may vary.
	PI email address		The email address is the address that will be used to contact the PI.	Mandatory, core field. Text Box. Or possible interface with the NOAA LDAP system to import POC information. Actual implementation may vary.
	PI Line or Staff Office (NOAA)		The PI affiliation, internal.	Core Field. An affiliation is mandatory, either internal to NOAA or external. May be selected from a pre-loaded list. Or possible interface with the NOAA LDAP system to import POC information. Actual implementation may vary.
	PI Affiliation non-NOAA		The PI affiliation, external.	Core Field. An affiliation is mandatory, either internal to NOAA or external. Text Box. Manually entered. Actual implementation may vary.
Accountable Entity			The LO or Matrix Managed Science Program in which the project resides	Mandatory, core field. May be selected from a pre-loaded list. Actual implementation may vary.
	Lab, Program Office, or		The subordinate office/department in which the project	Mandatory, core field. May be selected from a pre-loaded list. Actual

	Center		resides if not Matrixed.	implementation may vary.
Project Information				
R&D Project Title			The name of the Research and Development Project. This is the name the project will be known as and tracked by within the database system.	Mandatory, core field. Enter the project tile in Text Box. Limit characters. Actual implementation may vary.
			A project is defined in NAO #216-105 and by the following attributes: · Defined budget · Defined timeline (generally up to 4 yrs, the length of an Implementation Plan, but can be extended · Addresses a single hypothesis · Clearly defined endpoint, objective(s), and deliverable(s) · Independent and discrete · Identified by program manager or other higher authority	
	R&D Project Description		Summarize the project using layperson terminology addressing the following:	Mandatory, core field. Text Box - Limit Characters. Actual implementation may vary.
			· Purpose/Need/Scope, including research question or hypothesis to be tested, if applicable	

			· Research Objectives	
			· Issues and/or problems addressed	
			· Other affiliated projects	
			· Research methods (e.g., field measurements, modeling)	
	Project URL		Enter the URL link if one exists for this project.	
	Link to other affiliated projects			Many-to-many relationship may occur. May select from list of previously entered projects, with associated unique project identifiers and project name. Actual implementation may vary.
Expected Project Start Date			The expected start date of the project based on expected funds and other resources (month and year)	Mandatory, core field. Enter date drop-down calendar. Actual implementation may vary.
Expected Project Completion Date			The expected completion date of the project based on expected funds and other resources (month and year or uncertain)	Mandatory, core field. Enter date drop-down calendar. Actual implementation may vary.
Actual Project Start Date			The actual start date of the project (month and year)	Enter date drop-down calendar. Actual implementation may vary.
Actual Project Completion Date			The actual completion date of the project (month and year)	Enter date drop-down calendar. System may tag the project as completed if the date has exceeded the current date. Authorized users required to make

				changes to the project. Actual implementation may vary.
TYPE OF PROJECT			Determine the classification of the project according to the categories below.	Core. Mandatory field. Project must be affiliated with one of the types below.
	Research		The systematic study directed toward a more complete scientific knowledge or understanding of the subject studied.	Text provided may be used in the help function to explain the meaning of the data field. Check box and number designation for Technology Readiness Level (TRL). Over time, project type may change. Actual implementation may vary.
	Development		The systematic use of the knowledge or understanding gained from research, directed toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes	Text provided may be used in the help function to explain the meaning of the data field. Check box and number designation for Technology Readiness Level (TRL). Over time, project type may change. Actual implementation may vary.
	Transition		The transfer of knowledge (either codified or tacit) or technology from a research or development setting to an operational setting. Transition occurs in two phases: demonstration (e.g., the use of test-beds to	Attributes: • Defined adopter • Agreement between researcher/developer and adopter • 5 years or less to complete deployment (full operational or application status)

			confirm operational usability or demonstration using rapid prototyping) and deployment (e.g., the integration of new people and equipment into an operational environment).	Text provided may be used in the help function to explain the meaning of the data field. Check box. Over time, project type may change. Actual implementation may vary.
		Demonstration	Type of transition project. Demonstration activities are the part of research or development that are intended to prove or test whether a technology or method does, in fact, work. This does not include activities intended primarily to make information available about new technologies or methods.	Text provided may be used in the help function to explain the meaning of the data field. Check box and number designation for Technology Readiness Level (TRL). Over time, project type may change. Actual implementation may vary.
		Deployment	Type of transition project. Adoption of knowledge or technology for operational use: sustained, systematic, reliable, and robust mission activities with an institutional commitment to deliver specified products and services.	Text provided may be used in the help function to explain the meaning of the data field. Check box and number designation for Technology Readiness Level (TRL). Over time, project type may change. Actual implementation may vary.
		Do you have a transition plan?		Mandatory field for Transition project type. yes/no. Actual implementation may vary.

		R2O or R2A Agreement	Such as a transition plan, Line Office Agreement, in the NWS Operations and Services Improvement Process (OSIP), etc.	Mandatory field for Transition project type. Dropdown. Text provided may be used in the help function to explain the meaning of the data field. List of possible R2O/ R2A agreements may be pre-loaded information. Actual implementation may vary.
		Estimated Time-Frame to Transition	Estimated month and year when deployment will be complete, and full operational status is achieved	Mandatory field for Transition project type. Month and year. Dropdown calendar, timeframe could be many years from today. Actual implementation may vary.
		Adopter	Recipient or beneficiary of transition	Mandatory field for Transition project type. Manually entered open field, text box that builds a master drop box menu. Actual implementation may vary.
Project outputs/ milestones/ outcomes				
Milestone(s)/ output(s)			Output (list any Product (e.g., publication name submitted), service, or process) that may be associated with the milestone	Mandatory core field. Enter the milestone or output for measuring performance. Short string of text and numbers for the name of the milestone and the values. Actual implementation may vary.
				Require at least one milestone/output for each year between the project's expected start and end date.
	Milestone(s) /output(s)		Month and year	Mandatory core field. Enter date drop-down

	Expected Completion Date			calendar. System may keep track of the status of the milestone and alert select users if overdue. Actual implementation may vary.
	Milestone(s)/ output(s) Actual Completion Date		Month and year	Enter date drop-down calendar. System may tag the milestone as complete. If overdue, an explanation may be needed. Actual implementation may vary.
	Milestones Met?			Enter (Yes/No) answer. Actual implementation may vary.
	If "No" Then Why?		Document why the milestones/outputs goals were not met. They may be legitimate reason why a milestone goal is not met such as bad weather, loss of funding, etc. Include steps to mitigate the effects of the missed milestone.	Mandatory field if milestone not met. Text box. Actual implementation may vary.
Benefit(s)			Include all expectations of achievements/findings and implications, outcomes, including, if appropriate, improvements in efficiency and effectiveness	Mandatory core field. Text box. Actual implementation may vary.
	Project Intended Outcome(s)		Purpose of the project	Mandatory core field. Text box. Actual implementation may vary.
Project Partners				

Project Partners			(Co- Investigators)	Mandatory core field. Question asking existence of partners. Yes/No. If No, users don't see the following sections. Actual implementation may vary.
			Recipients of grants, cooperative agreements, contracts, Intergovernmental Personnel Agreements (IPAs), etc.	
			May provide resources to the project, or matching funds	
	Partners Internal to NOAA		Determine if partner(s) is(are) internal to NOAA, i.e. within NOAA's Line or Staff Offices	(Multiple selections allowed for each project)
				May be selected from a pre-loaded list. List of Line/Staff offices may be pre-loaded. Actual implementation may vary.
		Collaborators Laboratories/ Centers/ Program Offices/Head Quarter	If within the project's Line Office (LO)	(Multiple selections allowed for each project)
				May be selected from a pre-loaded list. Labs/Centers/Program offices/HQ for the project accountable entity's LO may be pre-loaded and may populate this list. Actual implementation

				may vary.
		Collaborators Line and Staff Offices	If outside of the project's LO	(Multiple selections allowed for each project)
				May be selected from a pre-loaded list. Line Office and Staff Office lists may be preloaded. Actual implementation may vary.
		Collaborators Laboratories/ Centers/ Program Offices/Head Quarter	If outside of the project's LO	(Multiple selections allowed for each project)
				May be selected from a pre-loaded list. Labs, Centers, program offices, HQ may be preloaded. Actual implementation may vary.
	Partners External to NOAA		Determine if there is (are) partner(s) external to NOAA	(Multiple selections allowed for each project)
		Federal Government Agencies		(Multiple selections). List of applicable federal agencies may be preloaded. Actual implementation may vary.
		State Government Agencies		(Multiple selections) List of applicable state agencies may be preloaded. It may also be populated by the manual entry option and added to the master list. Actual implementation may vary.
		International Government Agencies		(Multiple selections) List of applicable international agencies may be

				preloaded. It may also be populated by the manual entry option and added to the master list. Actual implementation may vary.
		International Private		(Multiple selections) List of applicable federal agencies may be preloaded. It may also be populated by the manual entry option and added to the master list, pending approval of entry. Actual implementation may vary.
		Cooperative Agreement		Actual implementation may vary. (Yes/No or questions to determine if an agreement needs to be done.)
		Academia		(Multiple selections) List of applicable schools may be preloaded. It may also be populated by the manual entry option and added to the master list, pending approval of entry. Actual implementation may vary.
		Enter Partner Manually	Name of partner and the affiliation to any of the groupings of the external partners.	Option to enter the information manually and link to the external partners data fields to join that preloaded list. (Multiple values may be entered.)
				Message will be sent to administrator/authorized user to verify and approve entry based upon spelling, duplication, affiliation verification)
		Cooperative		List of applicable CIs may be preloaded. Actual

		Institute(s) (CI)		implementation may vary.
		Cooperative Science Center		List of applicable cooperative science centers may be preloaded. It may also be populated by the manual entry option and added to the master list. Actual implementation may vary.
		Sea Grant		List of Sea Grant programs may be preloaded. Actual implementation may vary.
		International Schools		It may be populated by the manual entry option to create or add to the master list. Multiple entries. Actual implementation may vary.
		Domestic Schools		It may be populated by the manual entry option to create or add to the master list. Multiple entries. Actual implementation may vary.
		Other domestic schools not listed		It may be populated by the manual entry option to create or add to the master list. Multiple entries. Actual implementation may vary.
PROJECT COST/FUNDING				
Project annual cost. (NOAA PI)			Incoming funds or other types of incoming support to the project. Estimated or planned cost entered initially, then updated for budget	Project costs estimated for each year between the expected project start and end date. Changes to costs must be approved by authorized user. Capture reasons for proposed

			revisions during the year (e.g., Continuing Resolutions), and final actual entered at after the end of the fiscal year.	changes. Send tasking message to authorized user for approval of change. Original and updated information saved by the system. Actual implementation may vary.
	Incoming funds		Determine the source of funding for the project	Enter money ($K) per project year. Actual implementation may vary.
		NOAA base funds within LO	E.g., from a Project Office or LO/SO CFO	May load the pre-selected project accountable entity's LO/SO. Money ($K) per project year. Actual implementation may vary.
		Other NOAA base	Other LO/SO sources	May load the pre-selected project accountable entity's LO/SO. Money ($K) per project year. Actual implementation may vary.
		Reimbursable funds	Sources from outside of NOAA such as other federal agencies, private sector, academia	Dropdown for sources(s) (To be linked to partnership field). Money ($K) per project year. Actual implementation may vary.
	Leveraged costs		Funding not specifically tied to the project, but used to support the work.	Money ($K) per project year. Actual implementation may vary.
		Matching funds	Matching funds from a partner, but no transfers directly to the project	Open field for source(s). (To be linked to partners). Money ($K) per project year. Actual implementation may vary.
		Federal salaries	Paid for by some other program/project source, but applied to this project	Dropdown for source(s). (To be linked to partners and accountable entity). Money ($K) per project year. Actual

				implementation may vary.
		Non-federal salaries	Such as contractors, IPAs, fellows, etc.	Dropdown for source(s). (To be linked to partners and accountable entity base funds). Money ($K) per project year. Actual implementation may vary.
		Ship time	In # of days/yr and translated into money	Dropdown for Source of vessel… list may be pre-loaded or updated manually with approval of entry. This is a four-component field (# days, money, vessel name), each per project year. Actual implementation may vary.
		Aircraft time	In # hours/yr translated into money	Dropdown for Source of aircraft... list may be pre-loaded or updated manually with approval of entry. This is a four-component field (# hours, money, aircraft name), each per project year. Actual implementation may vary.
		High performance computer (HPC) time	In # hours/yr and translated in money	Dropdown for Source of HPC... list may be pre-loaded or updated manually with approval of entry. This is a four-component field (# hours, money, HPC name), each per project year. Actual implementation may vary.
		Other indirect costs	Sources of project support, but no actual funds coming into the project, such as in kind support	Open field. Not included in leveraged costs summation. Actual implementation may vary.
	NOAA funds – selected		A small subset of the outgoing financial	The project partners (above) will be “tagged”

	outlays		support for the project	with funding as appropriate to avoid double entries of partner names. Actual implementation may vary.
		Federal FTEs		# of FTEs and their costs, each per project year. Actual implementation may vary.
		Non-Federal FTEs	Such as contractors, IPAs, fellows, etc.	# of FTEs and their costs, each per project year. Source may be selected from a pre-loaded list. Actual implementation may vary.
		Contracts		$K per project year; contractor name. Actual implementation may vary.
		Ship time	In # of days/yr and translated into money	Dropdown for vessel name. This is a four-component field (# days, money, vessel name), each per project year. Actual implementation may vary.
		Aircraft time	In # hours/yr translated into money	Dropdown for aircraft name. This is a four-component field (# hours, money, aircraft name), each per project year. Actual implementation may vary.
		High performance computer (HPC) time	In # hours/yr and translated in money	Dropdown for HPC name. This is a four-component field (# hours, money, HPC name), each per project year. Actual implementation may vary.
Project annual cost (non-NOAA PI)				If PI's affiliation above is external to NOAA, these entries below are

				mandatory.
	Financial award type		Select from Grant, cooperative agreement, contract, interagency agreement	Pre-loaded list with the options. Actual implementation may vary.
	Direct costs		Paid directly by the financial award	$K per project year; Actual implementation may vary.
		FTEs		# FTE and $K per project year; Actual implementation may vary.
		Subcontracts		$k per project year; Actual implementation may vary.
		Other		$k per project year; Actual implementation may vary.
	Leveraged costs		Funding not specifically tied to the project, but used to support the work.	Money ($K) per project year. Actual implementation may vary.
		Matching	Matching funds from a partner, but no transfers directly to the project	Open field for source(s). (To be linked to partners). Money ($K) per project year. Actual implementation may vary.
		FTEs		# FTE and $k per project year; Actual implementation may vary.
		Equipment		Money ($K) per project year. Actual implementation may vary.
		Travel		Money ($K) per project year. Actual implementation may vary.
		Other	Manually enter the matching fund type and the cost	Text box and Money ($K) per project year. Actual implementation may vary.
PROJECT PERFORMA				

NCE				
Next Generation Strategic Plan (NGSP) Goal and Enterprise Objective			There are 4 Goals and 3 Enterprise Objectives	Mandatory. Core field. Projects linked to at least 1 NGSP Goal. Goals and Enterprise objectives may be pre-loaded.
	Objectives		There are objectives for each NGSP Goal. Enterprise Objectives do not have separate objectives.	Mandatory. Core field. Projects linked to at least 1 Objective. Objectives may be pre-loaded. Milestones and performance measures may be linked. Actual implementation may vary.
		Evidence of Progress (EOPs)	Each objective has an Evidence of Progress.	Projects may be linked to at least 1 evidence progress. Milestones and performance measures may be linked. Actual implementation may vary.
NOAA Five Year R&D Plan Key Question				Mandatory. Core field. May select from a pre-loaded list. Actual implementation may vary.
	NOAA Five Year R&D Plan Objective			Mandatory. Core field. May select from a pre-loaded list. Actual implementation may vary.
		NOAA Five Year R&D Plan Target(s)		Mandatory. Core field. May select from a pre-loaded list. Actual implementation may vary.
Project Performance Measure(s)			New or existing performance measure to which the project partially or completely contributes	Mandatory. Core field. Question asking if the project contributes to an existing performance measure. If yes, may select from the pre-loaded lists below. If No, may suggest/manually enter a

				new performance measure for approval by authorized users. Actual implementation may vary.
	GPRA?		Government Performance and Results Act	May select from a pre-loaded list. Actual implementation may vary.
	Department of Commerce Performance Reporting		DoC Metric	May select from a pre-loaded list. Actual implementation may vary.
	Annual Performance Plan		NOAA APP metric	May select from a pre-loaded list. Actual implementation may vary.
	Annual Operating Plan Milestone(s)			Will be a linked into the quarterly milestone field. May select from the pre-loaded list in the milestones section above. Actual implementation may vary.

Appendix 3.1: Evaluation Descriptions for Quality, Relevance, and Performance of NOAA Research Programs

The following criteria descriptions are guidelines for developing policies in Line Office-specific implementation plans. Standard criteria listed below are used to establish the assessment baseline "Meets Expectations." Standard criteria for meeting expectations can be augmented with additional base expectations as appropriate. Not all evaluation questions listed below will be appropriate for every review.

A. Quality

This refers to the merit of R&D within the scientific community. Assessing the quality of scientific and technical work done involves the time honored tradition of peer review. Bibliometric data on peer-reviewed publications and citations, as well as awards and other professional recognitions, are critical to understanding the research quality of individuals and organizations, particularly for benchmarking against other organizations of similar size and scope.

Quality is measured by the novelty, soundness, accuracy, and reproducibility of a specific body of research, as represented by the outputs (i.e., products) delivered by the project or program. This evaluation criterion establishes the relative merit and repeatability of the research or program relative to that of contemporaries in the community of practice, whether the scientific methodologies were appropriate, adhered to, and thoroughly documented.

Criteria for meeting expectations

- Program scientists and leadership are recognized for excellence through collaborations, research accomplishments, and national and international leadership positions.
- Programs have clear guidelines to ensure the quality of R&D products, including peer review, scientific integrity, data quality, and data management.
- … others as appropriate to the Program

Evaluation Questions to consider

- Does the Program conduct (or oversee/fund) preeminent research? Are the scientific products and/or services meritorious and significant contributions to the scientific community?
- How does the quality of the Program's R&D rank among programs in other U.S. Federal agencies? Other science agencies/institutions?
- Do Program researchers demonstrate scientific leadership and excellence in their respective fields (e.g., through collaborations, research accomplishments, externally funded grants, awards, societies)?
- (If applicable) What is the quality of outreach programming and products? How is the quality of communications and education programs maintained / improved?

The following Indicators of Preeminence may help assess these questions.

- Bibliometric representation of scientific literature output
    - A Program's total number of refereed publications per unit time, per scientific Full Time Equivalent staff (FTE), and/or per dollar invested
    - The number of citations for scientific staff by individual or some aggregate
- Technologies transferred to operations/application (e.g. observing systems, information technologies, numerical modeling algorithms)
- Research products, information, and services delivered to and used by stakeholders
- Patents, Cooperative Research and Development Agreements (CRADAs), and other activities with industry
- Collaborations with national and international research groups, both inside and outside of NOAA, as well as reimbursable support from non-NOAA sponsors
- Contributions of data and expertise to national and international databases, programs, and state-of-science assessments
- Service of individuals to technical and scientific societies (e.g., journal editorships, boards or executive-level offices), U.S. interagency groups, international research-coordination organizations, international quality-control activities (to ensure accuracy, precision, inter-comparability, and accessibility of global data sets**)**
- Memberships or fellowships in prestigious science organizations (e.g., National Academies of Sciences or Engineering, American Meteorological Society, American Geophysical Union, or American Association for the Advancement of Science)
- Awards or other recognition received by groups and individuals for research, development, application, and/or service

B. Relevance

This refers to the value of R&D to users beyond the scientific community. Relevance includes not only hypothetical value, but actual impact. Assessing NOAA's relevance involves measuring the broader benefits of the work. It answers the question, "What would not have happened if R&D did not exist, and how much would society have missed?" The impact of R&D can be realized through the application of scientific knowledge to policy decisions, through the improvement of operational capabilities at NOAA's service lines, or by patenting and licensing of inventions for commercial use.

Relevance is measured by how well a specific body of research supports NOAA's mission and the needs of users and the broader society. At a minimum, this evaluation criterion establishes how the research aligns with the strategic plan and priorities of the agency, as demonstrated by links to validated agency requirements, key legislative mandates, administration priorities and societal benefits. Relevance is more reliably established by evidence of actual impact and retrospective (or concurrent) analysis of how R&D causes measurable improvements in operational performance and social and economic value.

<u>Criteria for meeting expectations</u>

- The R&D enterprise of the Program is tied to NOAA's mission, Strategic Plan, and R&D Plan, and is of value to the nation.
- The Program is effective and efficient in delivering products/outputs to applications, operations or users.
- Current, desired outcomes can be traced back to R&D that was instrumental in realizing

those outcomes
- Return on investment, where "return" can be performance improvement (activities and outputs) and value to stakeholders (outcomes)

Evaluation Questions to consider

- "What would not have happened if the R&D did not exist, and how much would society have missed?"
- How well do R&D activities address issues/areas identified in the NOAA strategic and research plans or other policy or guiding documents?
- Do the R&D activities address existing (or future) societally-relevant needs (national and/or international)? Are there R&D topics relevant to national needs that the Program should be pursuing, but is not? Are there R&D topics in NOAA, Line Office, or Program plans that the Program should be pursuing, but is not?
- Are users/customers engaged to ensure the relevance of the research?
- Do program assessments address the alignment of the R&D portfolio with the unit's and NOAA's mission?

C. Performance

This refers to how effectiveness and efficiency with which R&D activities are organized, directed, and executed. Assessing performance involves evaluating the effectiveness and efficiency with which tasks are executed, as well as the adequacy of the leadership, workforce, and infrastructure needed to achieve the designated goals. This necessarily involves understanding the quality of management, including interaction with stakeholders, clear articulation of strategic direction, as well as development and management of an R&D portfolio appropriately balanced across objectives, dimensions, and intended applications.

Performance is measured by both effectiveness (the ability to achieve useful results) and efficiency (the ability to achieve quality, relevance and effectiveness in a timely fashion and with little waste). This evaluation criterion considers how research activities are progressing relative to milestones and benchmarks as well as all aspects of how research is conducted, including all components that feed into creating a high quality research enterprise (e.g., leadership, innovation, planning, monitoring, efficiency and effectiveness of processes, resource utilization, reporting).

Criteria for meeting expectations

- The Program has clearly documented scientific objectives and strategies through strategic and implementation plans (e.g., AOP) and a process for evaluating and prioritizing activities.
- The Program management functions as a true team and continuously strives to improve the operation of the Program.
- The Program demonstrates effectiveness in completing its established objectives, milestones, and products.
- The Program strives to increase efficiency (e.g., through leveraging partnerships).

Evaluation Questions to consider

Research Leadership and Planning

- Does the Program have clearly defined and documented scientific objectives, rationale, and methodologies for key projects and a selection process for new projects?
- Does the Program have an evaluation process for research projects: selecting / continuing those projects with consistently high marks for merit, application, and priority fit; ending projects; or transitioning projects?
- Does the Program have the leadership and flexibility to respond to unanticipated events or opportunities that require new research and outreach activities (i.e. time and resources)?
- Does the Program provide effective scientific leadership to and interaction with NOAA and the external community on issues within its purview?
- Does the Program management function as a team and strive to improve operations?
- Has the Program effectively responded to and / or implemented previous formal recommendations?
- Do program plans reflect a deliberate and appropriate balance across the spectrum of R&D dimensions, e.g., time horizon, risk level, degree of change, and driver of change?
- Do program assessments address the unit's R&D portfolio balance with respect to: strategy, time horizon, risk level, degree of change, driver of change, uniqueness to NOAA, how conducted, output type, and engaging other disciplines?
- Who designs and manages the assessment? What are the criteria for ensuring the credibility and validity of the assessment?

Program Efficiency and Effectiveness

- Does the Program execute its research in an efficient and effective manner, given the Program's goals, resources, and constraints? Are R&D investments being made in the right places (effectiveness)? Are the most economical R&D investments being made (efficiency)?
- Are research projects on track and meeting appropriate milestones and targets? If not, why, and how can effectiveness be improved?
- How well integrated is the work with NOAA's planning, budgeting, execution, and evaluation processes?
- Is the overall level of support provided by NOAA sufficient for efficient and effective operations? Are there institutional, managerial, resource, or other barriers to the team working effectively?
- Is the Program leveraging relationships with internal and external collaborators and stakeholders to maximize research outputs? Leveraging internal and external funds?
- Are human resources adequate to meet current and future needs? Does the Program provide professional development opportunities to its staff?
- Is infrastructure sufficient to support high quality research outputs?

Transition of Research to Operations/Applications/Users

- Does the organization have a process for identifying its stakeholders and customers?
- How well is the transition/dissemination of research to applications, operations and/or information services planned and executed?
- Does the Program's portfolio have an appropriate balance between transition and non-transition research?

- Has the Program defined who its stakeholders and end users are? Does it provide sufficient interactions/communication? Are end users of the R&D involved in the planning and delivery of applications and/or information services? Are they satisfied?

Appendix 3.2: Potential Evaluation Questions for NOAA Portfolio Reviews

A. Progress to Plan

Has NOAA made expected progress toward achieving Research Plan objectives? If not, why; and how can this be improved?

B. Relevance

Is the current set of NOAA R&D portfolio priorities relevant to its mission, strategic plan, administrator priorities, and the state of science and technology? If not, how should priorities be realigned?

Are there gaps that NOAA should be pursuing, but is not?

C. Portfolio Balance

Is the balance of the R&D portfolio aligned to expectations in the NOAA Research Plan?

- Mission balance: Does the relative balance of research among the strategic goals and objectives align with expectations? Among disciplines or topics? Are there portfolio gaps?
- Research type: Does the relative balance of basic research, applied research and development activities align with expectations?
- Research type: Does the relative balance of transformational vs. incremental (evolutionary) research align with expectations?
- Research timeframe: Does the relative balance of short term vs. long term research align with expectations?
- Research discipline: Does the relative balance of disciplinary vs. interdisciplinary align with expectations?
- Transition balance: Is there an appropriate balance of transition research that addresses priority user needs in the portfolio? What is the relative balance of science for understanding vs. science for application in the portfolio?
- Resources: Does NOAA provide sufficient resources for mission-critical R&D activities (financial, ship/air time)? Are resources appropriately apportioned among competing priorities?
- Extramural research: Does NOAA make appropriate use of extramural funding options (grants, contracts, cooperative agreements) to achieve mission objectives? Is intra vs. extramural research appropriately balanced; can greater efficiencies be achieved in research areas via external funding mechanisms?

Appendix 3.3: Supplemental Information for NOAA Benchmark Reviews

A. Sample of Peer Organizations for Comparison

Peer Organizations	Research Topics
Academic institutions	Various
Australian Department of Fisheries	Ecosystem Science & Fisheries
Department of Energy	Climate, Renewable Energy
Department of Fisheries and Oceans Canada	Ecosystem Science & Fisheries
Environmental Protection Agency	Atmospheric Science, Social Science
EUMETSAT	Climate, Weather, Satellites and Remote Sensing
European Severe Storms Laboratory	Weather
GEOSS	Satellites and Remote Sensing
International Panel on Climate Change	Climate
NASA	Climate & Weather
National Park Service	Social Science
National Science Foundation	Various
UK and Aus. Met offices	Weather
US Department of Agriculture	Ecosystem Science, Social Science
US Fish and Wildlife Service	Ecosystem Science & Fisheries
US Geological Survey	Climate, Ecosystem Science
Industry	Various

B. Potential Charge Questions for Benchmarking Evaluation Criteria

Relevance: NOAA Priorities and Outcomes

- What are high priority research issues that NOAA needs to address in the next 10 years to meet anticipated societal needs?
- Does NOAA R&D effectively contribute to the agency's mission and the needs of society?
- Do NOAA R&D investments target appropriate areas to support NOAA's service mandates to the Nation?
- How well is NOAA achieving its mandated research responsibilities?
- Is there similar research that validates and corroborates NOAA research (useful redundancy)? Are there research areas that are unnecessarily duplicative that might drive an efficiency decision?
- What gaps does NOAA need to fill in its research portfolio? In the global research and scientific leadership communities?

Performance: Best Practices

- Does NOAA have effective and efficient processes to plan and manage its research portfolio?
- Are there best practices at other agencies that could improve NOAA's efficiency, effectiveness, scientific leadership, or performance management?
- Is infrastructure sufficient for a high-quality research enterprise?

- How well does NOAA manage its technology life cycle (end-to-end; research to operations/applications) relative to its peers?
- Is NOAA research effectively integrated across and collaborating with other agencies and partners to achieve our outcomes?

Appendix 3.4: Additional Documentation

Evaluating Federal Research Programs (NRC, 1999) (PDF)

Logic Model Development (NOAA, 2004) (DOC)

Performance Measure Guidelines (NOAA) (DOC)

Performance Measure Training: Fundamentals of Performance Measures (Grant Thorton/NOAA, 2006) (PPT)

Performance Plans: Selected Approaches for Verification and Validation of Agency Performance Information (GAO, 1999) (PDF)

Preparation and Submission of Strategic Plans, Annual Performance Plans, and Annual Program Performance Reports (OMB Circular No. A-11, Part 6, 2010) (PDF)

Thinking Strategically: The Appropriate Use of Metrics for the Climate Change Science program (NRC, 2005) (PDF)

Recommended Guidelines for testbeds and proving grounds (NWS and OAR, May 19, 2001) (PDF)

Performance and Success Measures for NOAA Testbeds and Operational Proving Grounds (OAR) (PDF)

Laboratory/Science Center/Program Review Documents

These documents were examined for best practices in creating the NAO Evaluation Handbook. With the approval of this handbook, these guidelines documents need to be updated to meet the requirements for enterprise-wide R&D evaluation.

Laboratory Science Review Implementation Plan: Guidelines for Planning, Conducting, and Implementing Recommendations from an OAR Laboratory Science Review (NOAA, 2010) (DOC)

National Sea Grant College Program Evaluation (NOAA, 2009) (PDF)

Proposal to Establish Systematic Processes for Regular Peer Review Of NCCOS' Intramural Research (NOAA, 2006) (PDF)