Background: On 16 – 18 October 2019, a panel of independent reviewers was assembled to review the NOAA Office of Ocean Exploration and Research (OER). Reviewers were charged to: 1) review the quality, relevance, and performance of OER over the previous five years and 2) assess the strategic positioning of OER going forward. Each reviewer provided a write-up of their own observations, recommendations, and comments to the Office of Oceanic and Atmospheric Research (OAR). Those discrete submissions were compiled into a summary report that was organized across the four goals described in OER's 2016 - 2020 strategic plan:

- Ocean Exploration: Mapping and Characterization
- Technology: Development, Application, and Program Use
- Data and Information: Availability and Access
- Engagement: Reaching the Public

The Summary Report is highly complementary to OER's success in "taking the program through challenging circumstances" and maturing into a well-run, successful program. The program review addressed numerous topics and issues, however, a small number of themes consistently emerged: 1) OER's role in providing reliable access to ship time and observation days-at-sea; 2) OER's leadership role in developing national policy, technology standards, and strategic objectives; 3) OER's relationship with data; and 4) OER's role in shaping the general public's perception and understanding of ocean science. Each of the report's 22 Recommendations speak to at least one or more of these central themes.

Below, each Recommendation is organized under its related theme. The "response" section, under each Recommendation, includes a concurrence statement (concur, concur with the intent, or non-concur) and a brief description of OER's rationale for its position. The "action plan" section is a listing of activities and projects that address the call to action within each Recommendation. Some activities, identified in the Action Plan section, reflect current projects while others describe new initiatives.

Theme: OER's role in providing reliable access to ship time and operational days-at-sea

OER has set highly ambitious exploration targets which will require significant ship-based operations. Allowing for appropriate budget and operational conditions, OER will set a target for ensuring a minimum of 365 at-sea exploration days per year. This goal will be achieved by using the full range of resources and assets available, including both NOAA and non-NOAA assets, including uncrewed vehicles, and chartered vessels. OER has placed a particular focus on determining which operating modality is the most appropriate approach for planned mission objectives. In an ideal setting, this would allow for an al-a-carte approach where the best fitting solution can be applied to a specific campaign, cruise, or dive.

- **R1: Set a Path Forward for Ship Access**
  - **Response:** OER concurs with this recommendation. It is important to note that at the time of the Program Review (Oct. 2019) NOAA Ship *Okeanos Explorer* was slated for end-of-life lay-up by 2025 which created an operational imperative for OER to secure ship time and days-at-sea. Since that time, however, several developments have occurred that changed the conditions associated with this recommendation. First, the end of life for

Okeanos Explorer has been extended by several years and second, NOAA has committed to providing OER with a new ship, *Discoverer,* which will be online around 2025. These two events meaningfully reduced the immediate risk of a compromised operational capability the Program was considering in the Fall of 2019. OER is currently developing both a new five-year strategic plan and a focused Exploration Strategy to guide operations planning, budget decisions, and investment opportunities.

- ○ **Action Plan:**
  1. Action: OER is currently developing an Exploration Strategy to define exploration priorities and outline the methods, platforms, and technologies that will be used to meet mission objectives over the next five years.
  2. Action: OER is developing, based upon the findings and recommendations of this Program Review, a new five-year strategic plan to define mission objectives and inform resource allocation decisions.

- ● **R5: Take advantage of emerging technology**
  - ○ **Response:** OER concurs with this recommendation. The pace of technology refresh, within the ocean science community, is unprecedented and reflects meaningful increases in exploration capabilities. A significant challenge is simply maintaining a functional awareness of the full range of technological innovations and improvements that seem to appear on an almost daily basis. OER is fortunate to maintain an extensive alliance of partnerships with organizations like the Marine Technology Society who can provide a deep understanding of the marine technology industry. OER will actively engage with its partners to better understand the emerging capabilities and identify opportunities to incorporate them into exploration activities.
  - ○ **Action Plan:**
    1. Action: OER will develop a Technology Roadmap to guide internal deliberations and priority setting regarding acquisitions, grant agreements, and project selection.
    2. Action: OER will collaborate with its partners and stakeholders to develop a concept of operations for an asset survey of the federal ocean exploration community to better understand the current technology capacity in use across the enterprise.
    3. Action: OER will develop a concept of operations for conducting a life-cycle analysis of its ROV assets.

- ● **R6: Identify those techniques and strategies that enable the ocean to be observed remotely**
  - ○ **Response:** OER concurs with the recommendation. Uncrewed systems, such as remotely operated vehicles or uncrewed underwater vehicles, have tremendous potential to meaningfully expand OER's capacity to conduct ocean exploration activities. OER is committed to using and promoting the use of those innovative technologies to meet its own highly ambitious targets.
  - ○ **Action Plan:**
    1. Action: OER will work with the NOAA UxS Oversight Board and the OMAO UxS Operations Center to better understand the range of capabilities that are available to support ocean exploration and scientific activities.
    2. Action: OER is developing multiple products that will provide guidance and standards for deepwater operations using autonomous and uncrewed systems;

examples include the Deepwater Exploration Mapping Procedures Manual the Telepresence Deep Water Exploration Procedures Manual; and the Technology Roadmap.

3. Action: OER is currently supporting technology demonstration projects that explore innovations in Telepresence and remotely operated and autonomous platforms.
4. Action: OER is adjusting its operational portfolio to encourage an increase of information from uncrewed systems and has developed an annual performance measure "Annual number of UxS executed days at sea (DAS) funded by OER" to better track and understand the mix of uncrewed missions in the OER portfolio.

- **R17: Produce a master remotely operated vehicle sensor and position reference file**
  - **Response:** OER concurs with this recommendation. OER will explore options for developing such a tool and determine its feasibility.
  - **Action Plan:**
    1. Action: OER will develop a concept of operations for a ROV sensor and position reference tool to determine the approach, the level-of-effort, and the costs for such a project. This effort will contribute to the long term evolution to shore-side operations management and coordination.

Theme: OER's leadership role in developing national policy, technology standards, and strategic objectives

Many recommendations in the summary report encourage OER to step into a more clearly defined leadership role within the national community of ocean exploration organizations. By virtue of its authorizing statutes and unique mission, OER enjoys an unusual platform that can be used to convene interested parties, encourage productive collaboration, and garner consensus on a wide variety of issues. Several recommendations highlight the need for consistent technology standards, data governance, and policy positions across the entire ocean exploration enterprise. Through its active involvement on the National Ocean Mapping, Exploration, and Characterization Council (NOMEC Council) and the Interagency Working Group on Ocean Exploration and Characterization (IWGOEC), OER addresses those concerns.

- **R2: Coordinate information and gap-fill across the combined U.S. fleet.**
  - **Response:** OER concurs with the intent of this recommendation. A clear identification and understanding of priorities, plans, and performance targets across the ocean exploration community would be highly valuable. However, OER is not in a position to assume that responsibility for the combined fleet. OER, through its leadership role on the National Ocean Mapping, Exploration, and Characterization Council, will continue collaborating with its partners, coordinating multi-organizational campaigns and explorations, and sharing strategic goals, objectives, and performance targets.
  - **Action Plan:**
    1. Action: OER is developing a Deepwater Exploration Mapping Procedures Manual to encourage operational consistency within the Program. Upon completion, the product could be shared as a best practice.

2. Action: OER is currently developing an Exploration Strategy to define exploration priorities and outline the methods, platforms, and technologies that the Program will use to meet mission objectives over the next five years. Upon completion, the product could be shared with partners and collaborators.
3. Action: OER is currently developing a Remotely Operated Vehicle (ROV) and Telepresence Deep Water Exploration Procedures Manual to encourage operational consistency. Upon completion, the product could be shared as a best practice.
4. Action: OER is currently developing a Spatial Definition of Exploration document which, among other things, will inform the identification of data gaps in the collection process. Upon completion, the product could be shared as a best practice. Upon completion, the product could be shared as a best practice.

- **R4: Identify Goals and a Strategy for a National Program of Ocean Exploration**
  - **Response:** OER concurs with intent of the recommendation, however, the release of the NATIONAL STRATEGY FOR MAPPING, EXPLORING, AND CHARACTERIZING THE UNITED STATES EXCLUSIVE ECONOMIC ZONE in June 2020 has largely filled this gap. OER will continue to provide leadership and support to the community in pursuit of the goals and objectives defined in the National Strategy.
  - **Action Plan:**
    1. Action: OER, through its leadership roles on the NOMEC Council and the Interagency Working Group on Ocean Exploration and Characterization, will support the development of an Implementation Plan to identify specific actions that describe how the goals, objectives, and associated timelines presented in the National Strategy will be accomplished.

- **R3: Explore New Approaches with a Higher Risk Profile**
  - **Response:** OER concurs with this recommendation. OER has a long track record of supporting emerging and innovative technologies to enhance ocean exploration capabilities through opportunities like the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs, Federal Funding Opportunities (grants) and contracts with small and mid-sized companies. These can be highly effective tools for spurring innovation and encouraging fresh approaches for addressing OER's challenges. Defining a specific problem or question to be answered in a solicitation will encourage creative and inventive proposals from the business and academic communities.
  - **Action Plan:**
    1. Action: OER will develop an easy to use risk assessment tool that will be used by proposal reviewers to quantify the risk profile of potential projects.

- **R7: Identify talent and innovation to solve today's ocean exploration problems**
  - **Response:** OER concurs with this recommendation and will continue with its tradition of supporting cutting-edge small business and academic research and development focused on ocean science.
  - **Action Plan:**
    1. Action: OER will use the Ocean Exploration Cooperative Institute (OECI) as a source for talent and capabilities necessary to tackle highly ambitious challenges.

- **R8: Develop a Formal Mechanism for Evaluating Exploration Architectures**

- ○ **Response:** OER concurs with this recommendation and will continue participating in the interagency community to determine evaluation criteria for new and innovative technologies and their impact on ocean science.
- ○ **Action Plan:**
    1. Action: OER, through its participation on the National Ocean Mapping, Exploration, and Characterization Council (NOMEC Council), is contributing to the development of a Standard Ocean Mapping Protocol to ensure that the technical standards for mapping conducted in support of the National Strategy will be broadly applicable.
    2. Action: OER, through its participation on the NOMEC Council will contribute to interagency efforts to establish a suite of standards and protocols for exploration and characterization that will meet the information needs of agency requirements.

Theme: Redefining OER's relationship with data

The data landscape has changed dramatically in the five years since OER wrote its last strategic plan. New technologies and platforms have created opportunities that simply did not exist even a short time ago. The data related recommendations in the summary report speak to many of those opportunities and encourage OER to reexamine how it acquires and prepares data, how it governs its data assets, and the data infrastructure it uses to manage those assets. OER concurs with many of these recommendations, however, the Program does not see its role as "a producer of data" as being a limiting one; rather, OER identifies that role as a core programmatic function. The focus is on acquiring data, through ocean exploration and observation, and ensuring those data assets are made appropriately available to whomever wants them. OER's use of data is primarily for its operational, scientific, technical, and administrative purposes and not to produce bespoke data products for external consumers. As OER considered these recommendations it did so from the perspective of how it can improve the way it structures datasets; how it can improve the way datasets are used internally, and how its approach to data governance can be improved.

The summary report contains 10 data-related recommendations and while they address a wide range of topics, they generally fall into three categories; 1) data acquisition and preparation, 2) data use, and 3) data governance. These are not necessarily neat or clean distinctions and many recommendations are strongly related to or overlap with others.

Data Acquisition and Preparation:

A central challenge of modern data management is to create sufficient structure so that datasets from different sources can be interoperable with one another. The capability to effectively connect data from a variety of locations and collection points into functional and comparable datasets is the necessary condition for scientists and researchers to conduct any type of analysis. When that data structure must be applied after-the-fact, it can be a long, labor intensive, and meticulous endeavor that meaningfully reduces the value and utility of data assets across the entire ocean exploration and science enterprise. OER's vision is for a community with a clear understanding of its collective data assets, shared agreements regarding data collection and standardization, and commitment to investing in the software and tools needed to manage such extensive integrated datasets.

- **R9: Dissolve data discovery stovepipes**
  - **Response:** OER concurs with this recommendation. Internally, OER has a great deal of latitude in addressing its own data stovepipe issues and has embraced an approach that identifies gaps in its data landscape to focus attention on areas of improvement. The Exploration Variables Technical Memo will directly consider gaps in OER's ocean exploration operations. OER does not have the authority to directly control how other federal agencies, academic institutions, private sector businesses, or nonprofit organizations approach this problem. However, OER enjoys a prominent leadership role within that community and will use its platform to encourage and influence the collective integration of datasets through existing agreements and partnerships.
  - **Action Plan:**
    1. Action: OER, through its leadership role on the National Ocean Mapping, Exploration, and Characterization Council, will contribute to its strategic milestones 2.3.1 "Inventory, promote, and utilize centralized national repositories, data portals, and clearinghouses for OCM data management, access, synthesis, and archival"
    2. Action: OER, through its leadership role on the National Ocean Mapping, Exploration, and Characterization Council, will contribute to its strategic milestones 2.3.2 "Evaluate Federal agency mapping data holdings to ensure adherence to open data delivery commitments (formats, metadata, archive, and accessibility) to enhance interoperability".
    3. Action: OER will finalize its Exploration Variables Tech Memo to identify data gaps in ocean exploration operations for OER to determine how to best address them moving forward.
    4. Action: OER will solicit community input about the discoverability and accessibility of its data holdings to better understand how people find and retrieve those data.
- **R15: Create a Standardized Template for Baseline Site Descriptions**
  - **Response:** OER concurs with this recommendation. Real-time site and campaign descriptions may not be feasible given current operational constraints, however, OER is committed to ensuring that all quality controlled data are reported to the NOAA data archive within 90 days of a completed cruise. OER recognizes the value of data templates and currently employs several for a variety of internal reporting purposes. Those examples can be shared as best practices.
  - **Action Plan:**
    1. Action: OER will ensure standardized data reporting templates are consistently used for internal purposes.
    2. Action: OER will share standardized data templates as a best practice.
- **R16: Support the development of artificial intelligence and machine learning tools**
  - **Response:** OER concurs with the intent of this recommendation. Artificial intelligence (AI) and machine learning (ML) capabilities are revolutionizing data management and analysis across nearly every industrial and academic sector. AI and ML tools could offer researchers an invaluable resource for managing, structuring, and analyzing the vast amounts of ocean exploration and scientific data that are generated daily. OER will

explore options for supporting the development and evolution of those capabilities and will determine the most appropriate path forward for the program.
- ○ **Action Plan:**
    1. Action: OER will use its funding and support tools (FFOs, CRADAs, Cooperative Agreements, NOPP agreements, STTR, SBIR, etc) to encourage innovative AI and ML capabilities for the classification and exploration of ocean exploration data.

Data Infrastructure:

OER is committed to sharing data as openly and widely as possible. OER is required to ensure data are documented, easily discoverable, and accessible to anyone with an interest in that resource. Given the vast array of OER's data holdings, it requires meaningful investments in the necessary infrastructure to collect, store, and disseminate that information to the public. OER's partnership with National Centers for Environmental Information (NCEI) has been effective, however, given the increasing demands on the existing infrastructure, increasing expectations from the user community, and increasing federal open data requirements, OER is prepared to reexamine its data infrastructure needs.

- ● **R10: Improve Searchability and Accessibility of Video Data**
    - ○ **Response:** OER concurs with this recommendation. As noted in the summary report, OER has been recognized as a leader for developing and deploying "a system for searchable and discoverable archive of video clips leveraging rich metadata curated by the program." OER's relationship with Ocean Networks Canada (ONC) has enabled it to implement SeaTube, a web-based annotation interface for ROV operations for expeditions aboard NOAA Ship Okeanos Explorer. This is a powerful tool, however, there are limitations associated with the availability of subject metadata. The technological capability to expand this service to other than NOAA Ship Okeanos Explorer exists; the questions for consideration are about the capacity of the existing data infrastructure to carry that additional load; the interoperability of those data with other datasets; and the programmatic costs associated with offering that service. OER will work with ONC and NCEI to study the question and make a determination about the feasibility offering this type of data product.
    - ○ **Action Plan:**
        1. Action: OER will solicit community input about the discoverability and accessibility of its data holdings to better understand how people find and retrieve those data.
        2. Action: OER will continue to collaborate with CVISION AI as part of NOAA SBIR project to develop an AI enabled cloud-based video playback tool (Tator) and to develop training data sets to aid AI enabled annotations.
- ● **R11: Develop a Strategy[1] to Accommodate a Significant Increase in Data Volume**
    - ○ **Response:** OER concurs with this recommendation. The volume of data being generated and disseminated by OER and its partners and stakeholders is increasing at an unprecedented rate. OER's current data infrastructure is insufficient to keep pace with

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[1] NOAA released an enterprise level data strategy in July of 2020.

this increase. OER has an opportunity to consider the role data will play within its mission space and to define its specific IT and data management requirements.

- ○ **Action Plan:**
    1. Action: OER will develop a data principles document that will incorporate NOAA and OAR guidance and directives into an Office-level plan. This document will establish functional goals for OER's data management approach and will define the functional IT requirements necessary to support the Program's mission objectives.

Data Governance:

Data governance refers to all of the planning, management, and implementation of data related policies and functional standards necessary to make the data enterprise functional. Governance is also the key to unlocking the strategic value of data assets. The scientific value of OER's data is fairly straightforward; the main challenge is ensuring its data are well structured, interoperable with comparable datasets, available in the appropriate formats, accompanied by appropriate operational and subject metadata and have gone through appropriate QA/QC . There is also management and administrative value to OER's data that can enable the timely extraction of actionable information from diverse data sources to drive effective decision making. OER's approach to data governance will focus on identifying existing and developing a framework for how those assets can be most effectively integrated.

- ● **R12: Strategically position OER to fully realize the value of its data**
    - ○ **Response:** OER concurs with this recommendation. Data is a critical strategic asset and OER is committed to effectively managing it.
    - ○ **Action Plan:**
        1. Action: OER will develop a data principles document that will incorporate NOAA and OAR guidance and directives into an Office-level plan. This document will establish functional goals for OER's data management approach and will define the IT requirements necessary to support the Program's mission objective
        2. Action: OER will conduct an internal audit of the terms and conditions in contracts, cooperative agreements, and grants related to data and intellectual property rights to ensure that OER data assets are open and available to the widest possible audience.
        3. Action: OER is committed to the principles described in NOAA's Public Access to Research Results (PARR) plan and currently works to ensure that data from cooperative institutes and other OER-funded partners must be made publicly available and interoperable with other NOAA data. OER will launch a review process to ensure its funded partners are in compliance with that standard.
- ● **R13: Accelerate Telepresence Deployment with Low-Cost Pilots**
    - ○ **Response:** OER concurs with this recommendation. Telepresence capabilities are heavily dependent upon access to a reliable broadband infrastructure. Determining performance requirements and securing bandwidth are as important as the technological engineering of a piece of hardware. OER, through its active partnership with the Ocean Exploration Cooperative Institute (OECI), will continue supporting the evolution of affordable,

reliable, and high-quality telepresence capabilities as a means to expand ocean exploration opportunities.
- ○ **Action Plan:**
  1. Action: OER will use its funding and support tools (FFOs, CRADAs, Cooperative Agreements, NOPP agreements, STTR, SBIR, etc) and specefically its relationship with the Ocean Exploration Cooperative Institute (OECI) to highlight low-cost telepresence capabilities enabled by cloud computing or commercially available satellite internet capacity.

- ● **R14: Invest in Data Leadership and Harmonization**
  - ○ **Response:** OER concurs with this recommendation. At the heart of this recommendation is a question of data interoperability. Ideally, data collected from the Okeanos or other OER-supported platforms would be interoperable with data collected from any other source in the ocean exploration community.
  - ○ **Action Plan:**
    1. Action: OER is committed to the principles described in NOAA's Public Access to Research Results (PARR) plan and currently works to ensure that data from cooperative institutes and other OER-funded partners must be made publicly available and interoperable with other NOAA data. OER will launch a review process to ensure its funded partners are in compliance with that standard.
    2. Action: OER, through its role on the National Ocean Mapping, Exploration, and Characterization Council (NOMEC Council) will contribute to developing common data architectures, repositories, and stewardship requirements.
- ● **R18: Build In-house Data Science Capability**
  - ○ **Response:** OER concurs with the intent of this recommendation. OER will develop a data principles document to guide data integration across the Program. Building an in-house data science capability within OER is a consequential decision that will require thoughtful consideration and extensive additional resources.
  - ○ **Action Plan:**
    1. Action: OER will determine the feasibility of designating a Chief Data Officer to oversee and coordinate all of OER's overlapping data related projects and initiatives.
    2. Action: OER will develop a OER data principles document that will incorporate NOAA and OAR guidance and directives into a local-level plan. This document will establish functional goals for OER's data management approach and will define the IT requirements necessary to support the Program's mission objectives.
- ● **R21: Engage the public in various activities that encourage the use, or "mining," of data**
  - ○ **Response:** OER does not concur with this recommendation. The intent of this recommendation seems to be focused on encouraging high school and college students to engage with ocean exploration data and there are numerous interesting ideas in the recommendation. OER relies upon its Education Program to engage those communities through professional development for educators, high quality lesson plans and teaching materials, and internships.

○ **Action Plan:** No action identified

Theme: OER's role in shaping the general public's perception and understanding of ocean science

Public outreach and engagement are a vital part of OER's legislative mandate and they represent a core principle for the Program. OER recognizes its unique voice and that it has an opportunity to stir the imagination and garner the attention of broad segments of the population. At the heart of these recommendations is the call to expand OER's outreach and communications focus beyond a predominately science-based audience. OER is leaning into that challenge. Investments in Telepresence capabilities have made it possible for citizens from around the Country to observe and share in the experience of ocean exploration in ways that were not possible even five years ago. OER intends to build upon that success to provide unprecedented access to ocean exploration missions to historically underserved and overlooked communities. OER has developed a robust social media presence that provides a platform to share images and stories of discovery with a worldwide audience. Clearly there remain many unexplored avenues for communicating with the general public, thought leaders, scientists, and students and OER is eager to explore those opportunities.

- **R19: "Make Oceans matter" to the public**
  - **Response:** OER concurs with the intent of this recommendation. There is undeniable value in exposing the general public to ocean science and exploration topics. OER is mandated to conduct "outreach and education programs to improve public understanding of ocean and coastal resources" by its authorizing legislation, but as a small program, it must be judicious with its investments. Members of the ocean-interested general public are a primary target audience for OER outreach products, and OER remains committed to exploring new ways to engage this audience on topics of ocean science and exploration, including through the use of traditional media, online communication tools, and telepresence. Additionally, education professionals are a key audience for OER engagement, precisely because they offer the means to introduce the ideas, the concepts, and the excitement of ocean exploration to students across the Nation.
  - **Action Plan:**
    1. Action: OER will conduct an evaluation of its outreach products and audiences, including members of the general public, in order to refine the office's messaging and product development approach to better engage the public and raise the visibility of the importance of the ocean and ocean exploration.
    2. Action: OER, in collaboration with its partners, will support the creation of a consolidated online "one-stop-shop" for education professionals and members of the public to easily access high-quality ocean exploration educational resources and other materials.
    3. Action: OER will increase the opportunities for all audiences to participate in telepresence-enabled ocean exploration expeditions.
- **R20: Improving media and other outreach products to allow greater accessibility to the broader public**
  - **Response:** OER concurs with this recommendation. OER has enjoyed tremendous success tailoring its science-based outreach and communication products to the ocean science and exploration communities. OER's leadership role, however, requires that it

produce clear impactful information that is easily understood and that can describe the benefits and achievements of the program to a wide range of audiences. OER understands its outreach and communications capabilities to be a strategic asset and it will 1) develop a comprehensive approach to outreach and messaging that reflects the full scope of the Program's operations; 2) work to better understand the effectiveness of its current outreach products; and 3) explore the tools and platforms available to enhance OER's ability to tell its story.

- **Action Plan:**
    1. Action: OER will develop a strategic communications plan to guide and inform the Program's external communications and outreach efforts to the general public, academica, industry, and other government agencies.
    2. Action: OER will conduct an evaluation of its audiences and current outreach products to better understand whether target audiences are consuming those products and whether improvements can be made to be most effective at communicating the Program's messages.
    3. Action: OER will develop a strategy to enhance videos produced using OER imagery to tell the story of the value and importance of ocean exploration and OER's role.

- **R22: Build on Partnerships**
  - **Response:** OER concurs with the recommendation. As a small program, with limited resources, it would be impossible to achieve many of its highly ambitious mission objectives without an effective and broad network of partners and stakeholders. OER's enthusiasm for collaboration has been a core principle of the Program since its inception and has resulted in dozens of formal institutional relationships and hundreds of informal peer-to-peer associations. OER will undertake a partnership mapping exercise to identify underserved areas that can be targeted for future engagements.
  - **Action Plan:**
    1. Action: OER will conduct a comprehensive inventory of its existing partners and stakeholders.
    2. Action: OER will conduct a gap analysis of its current stakeholder portfolio, set engagement priorities, and identify outreach targets.
    3. Action: OER will increase the number of Educator Professional Development partners, with an emphasis on non-coastal and underserved communities and locations
    4. Action: OER will increase the number of student development opportunities by maximizing the use of internships, fellowship, and other student engagement programs

Recommend Next Steps:
- This paper should be submitted to the OER Leadership Team for consideration and deliberation.
- A working session may be necessary for the OER Leadership Team to finalize any decisions regarding 1) concurrence for each recommendation, 2) action plans, and 3) timelines for the proposed projects.
- The leadership team should provide any edits, comments, or modifications for adjudication.

Attachments:

- [Summary Report of the Program Review of the NOAA Ocean Exploration Program](#)
- This [spreadsheet](#) organizes the comments, observations, and recommendations of the individual reviewers into three categories; 1) general or overarching comments about the program, 2) by OER strategic goal, and 3) and by recommendations. There is also a tab organizing all recommendations by OER strategic goal.