



United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Office of the Director
Reston, Virginia 20192

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Mail Stop 915B
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Mr. Thomas R. Kitsos
Executive Director
U.S. Commission on Ocean Policy
1120 20th Street, N.W.
Suite 200 North
Washington, D.C. 20036

Dear Mr. *Tom* Kitsos:

Thank you for the opportunity to provide additional information, for the public record, with regard to mapping of the seafloor. While the need for improved and expanded characterization of the seafloor remains, the past year has seen a great deal of effort expended in the development of strategies and priorities for meeting national needs. In all efforts we have operated on the principle that successful programs, responsive to the diversity of needs for seafloor maps, can only be defined, prioritized and implemented through a collaborative partnership amongst Federal agencies, academics, and the private sector. Virtually all seafloor mapping activities supported by the U.S. Geological Survey (USGS) are collaborative in design and implementation. Strategies and priorities are determined to meet partner needs effectively while supporting research that will increase the effectiveness of mapping programs and enhance the impact of the resulting products.

The central concern expressed by the committee is that "agencies must be able to answer the question of why mapping of the seafloor is needed." The simple answer is that the seafloor, particularly that area encompassed by the Exclusive Economic Zone (EEZ), represents a vast national resource--both in fact and in potential. Fisheries, mineral, and conventional and unconventional energy resources are all critical to the economic growth and security of the Nation. As the setting for offshore industry operations, for emplacement of pipelines, cables, and structures (e.g., windfarms), as well as habitat for commercially and ecologically important living resources, the seabed should be viewed as a valuable resource in its own right. Additionally, the safety of offshore operations and coastal communities depends on the hazard potential associated with seafloor geology and geologic processes. The safety of coastal populations and infrastructure to a variety of hazards, including earthquakes, landslides, tsunamis, coastal storms and the processes of sea-level rise and erosion, can only be assessed

and forecast with appropriate characterization of the sea-bed and understanding of its interaction with fluid processes. Finally, sea-bed mapping, particularly bathymetry, is essential to the safety of navigational operations and associated commerce. Increasingly seafloor maps are required to assess human impacts; whether from waste disposal, resource extraction, or fisheries activities. Broadly, characterization of the seafloor is essential to assessment of the resource and hazard potential of the EEZ and for management, use, and protection of seabed resources.

Clearly then the needs for seabed maps are diverse. While available technologies have greatly enhanced our ability to meet those needs, no single technology is suitable for all scales, all environments, or all needs. Effective mapping efforts must balance the breadth of application of seafloor data with specific priority needs to meet critical management or policy objectives. For example, USGS mapping programs to define the geologic controls on shoreline erosion are increasingly designed to provide enhanced information relevant to the identification of potential sand resources (for beach nourishment) and for identification of critical habitats of concern. Programs that recognize the multiple uses of seafloor maps and engage a diversity of end-users in the development of mapping strategies leads to sharing of resources and more effective mapping programs. Our experience has been that wherever seafloor maps are provided to meet one set of objectives, the resulting data is applied to a broad range of interests. For example, the USGS and the National Oceanic and Atmospheric Administration (NOAA) have collaboratively developed maps to inform management of the Stellwagen Bank National Marine Sanctuary. Additional mapping in Boston Harbor and Massachusetts Bay was developed to guide the design of the Boston wastewater outfall and to assess seabed disposal sites. The products of these efforts have found much wider application. They have supported research on regional sediment transport and on fisheries disturbance of habitats. They have also been used by the private sector to design pipeline and fiber-optic cable routes that balance environmental and economic (maintenance and installation costs) concerns. This diversity of requirements is a continuing challenge in developing priorities and strategies for seafloor mapping programs.

Part of the challenge in developing effective seafloor mapping programs is simply the scope and scale of the needs. The establishment of Marine Protected Areas (MPAs) is one important factor in determining priorities. As designated areas of special concern, with defined management and research plans, MPAs are clearly priorities for mapping programs. In most cases, the scale of MPAs allows and requires some level of comprehensive mapping. In contrast, broader needs to define Essential Fish Habitat and to assess resource and hazard potential widely provide insufficient constraint for setting priorities. In these cases, where information is required across large regions, new strategies must be developed. These strategies must consider not only management and policy needs, but also how available technologies are deployed to ensure appropriate coverage and resolution. We cannot and should not map the entire seafloor at the highest possible resolution. Moreover, the products resulting should support effective management by including diverse information on not just a physical setting, but also processes and change.

The diversity of map products required, as well as the diversity of applications of those products, speaks to the missions of many Federal agencies. Existing capabilities are spread across numerous Federal agencies as well as the private and academic sectors. Strategies to effectively

address the current gaps in available information should address coordination of priority setting, of data collection, and of efforts to share and distribute geospatial information digitally. Ongoing efforts to address this need for coordination, particularly at the Federal level, include:

- 1) Coordination amongst Federal agencies with respect to specific priority mapping efforts. For example, development of habitat maps for NOAA national marine sanctuaries (NOAA/NMS) and National Park Service (NPS) submerged lands is the subject of ongoing programmatic development by the USGS, NOAA, and NPS. Recent mapping in the Channel Islands (NPS), Glacier Bay (NPS), and Stellwagen Bank (NMS) has resulted from interagency collaboration. NOAA and the USGS are currently working together to develop strategies and priorities for joint programs to meet the needs of MPA management more effectively through the provision of up-to-date seafloor maps.

Recent mapping of shelf-edge habitats and protected areas of the northern Gulf of Mexico is one example of agency collaboration. Joint development of priorities and joint funding for commercial data collection by NOAA, the USGS, and the Minerals Management Service (MMS) has resulted in a multiyear effort to provide regional characterization of the seafloor in this area. This collaborative program has allowed a variety of agency requirements to be addressed across a broad region of critical importance. Similarly, joint MMS, USGS, Department of Energy and industry programs in the Gulf of Mexico have addressed mapping requirements for continued investigation and development of gas hydrate resources. In each of these cases, efforts acknowledging the unique expertise and mission requirements of the participating agencies have resulted in a more comprehensive strategy for data collection and dissemination.

Interagency collaboration has also greatly facilitated efforts to address the establishment of continental shelf limits under Article 76 of the International Law of the Sea Convention. Under the provisions of Article 76 the jurisdictional boundaries of the continental shelf may be extended beyond the 200 nautical mile limit, if specified geologic and bathymetric conditions are met. NOAA, the National Imagery and Mapping Agency, MMS, and the USGS have worked with the Department of State and the Joint Hydrographic Center/Center for Coastal and Ocean Mapping NOAA/University of New Hampshire to define data requirements and to assess existing data. This has resulted in a strategy and priorities for data collection and interpretation to meet the requirements for United States' claims to an expanded continental shelf. As a result of this joint effort, priority bathymetric data collection has commenced and plans for geophysical data collection have been initiated. A critical result of this effort has been development of a shared recognition of the critical interests and expertise resident across the multiple agencies.

- 2) Efforts to coordinate seafloor mapping efforts broadly across Federal agencies. In particular, NOAA and the USGS have ongoing efforts to develop joint programmatic priorities and strategies for seafloor mapping. NOAA and the USGS have, with the Environmental Protection Agency, funded a National Research Council study addressing "National Needs for Coastal Mapping and Charting." This report, in final review, will

provide an assessment across the Federal sector of existing mapping programs, identify mapping needs, and recommend strategies for more effectively addressing the needs for coastal and seafloor maps.

Concurrently, the USGS and NOAA are coordinating mapping programs at the agency level in an attempt to develop programs and budget documents that more effectively address the need for coastal and seafloor maps broadly. Initial efforts include development of a common database of seafloor mapping programs and priorities to facilitate coordination and sharing of resources. This effort expands on previous and ongoing activities focused on MPAs to address the full range of seafloor mapping activities within the agencies. At the broadest level, NOAA and the USGS are coordinating major agency initiatives (USGS: The National Map, NOAA: Digital Coast) to provide up-to-date digital information seamlessly spanning the terrestrial/marine boundary.

The USGS has long been the leading Federal agency in the collection of geophysical data to characterize geologic hazards and resources beneath the seafloor. Limited agency resources and the increasingly stringent demands for permitting (including significant increased operational costs) associated with environmental impacts of geophysical operations greatly limit our ability to collect new data. A wealth of exploration data has been collected by industry. This data is no longer considered of commercial value and is in danger of being lost or destroyed. The USGS, the National Science Foundation, and MMS are working to develop a Federal/academic partnership to ensure that this data is preserved and publicly available. This effort highlights the need to enhance the effectiveness of existing programs by ensuring that existing seafloor mapping data and products are shared and accessible.

Meeting the demands for seafloor mapping information greatly exceeds the resources available at the present time. In response, those agencies that use, procure, and/or provide seafloor maps are increasingly working together to plan and implement seafloor mapping programs. Seafloor maps, and geospatial data in general, will be essential if the objectives of, for example, the Integrated Ocean Observing System (IOOS) are to be met. The Federal agency members of the National Ocean Research Leadership Council (NORLC), through their representatives on the executive committee of Ocean.US, are currently developing implementation plans for the United States IOOS. By ensuring those plans include the immediate and long-term needs for seafloor maps to support coastal and ocean observing systems, the NORLC can further inform priorities and strategies for future seafloor mapping programs. Agency capabilities for seafloor mapping are both unique and overlapping, as are agency needs for seafloor maps. An effective Federal effort will coordinate agency efforts and reflect both unique and shared needs in developing strategies and priorities for filling the remaining large gaps in our knowledge of the seafloor. The development of the IOOS suggests the NORLC structure can greatly facilitate coordinated program planning and implementation. We are confident an NORLC-led effort

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similar to that for ocean observing, focusing on the provision of seafloor maps and other geospatial information, would greatly enhance the effectiveness of existing mapping programs while leading to the development of strategies and priorities for expanded programs.

Sincerely,

A handwritten signature in blue ink, appearing to read "Charles G. Groat". The signature is fluid and cursive, with a long horizontal stroke at the end.

Charles G. Groat
Director