Meeting Summary
NOAA Hydrographic Services Review Panel
September 1-2, 2021
Webinar

Wednesday, September 1, 2021

On the call of the acting Designated Federal Officer (DFO), John Nyberg, NOAA, the Hydrographic Services Review Panel (HSRP) meeting was convened on September 1, 2021, via webinar. The following report summarizes the deliberations of this meeting. The agenda, presentations, and documents are available for public inspection and downloading online at:

http://www.nauticalcharts.noaa.gov/hsrp/meetings.html

Opening and Introductions

John Nyberg, Deputy Hydrographer, Office of Coast Survey (OCS), National Ocean Service (NOS), and acting HSRP Designated Federal Officer, called the virtual meeting to order at 12:41 p.m. and welcomed the attendees.

Julie Thomas, Chair, HSRP, briefly discussed the impact of Hurricane Ida on HSRP members and their colleagues, and commended the work of NOS and the National Weather Service (NWS) whose data, response, and work tracking the storm has saved countless lives. She reflected on the recent loss of RDML Rick Brennan, the Director of OCS and HSRP DFO. Mr. Nyberg further discussed RDML Brennan's contributions to the hydrographic community and NOAA.

Senator Sheldon Whitehouse, United States Senator for Rhode Island (via video), discussed the successes of the bipartisan Senate Oceans Caucus, which has grown to nearly 40 members and is currently working on several items. These include the Blue Carbon bill, which will help with take-up of carbon in the oceans, and BLUE GLOBE, which would greatly expand ocean data and monitoring. The Oceans Caucus is also working on an ocean exploration bill and the RISE Act, which would send money to states and to an oceans and coasts fund from the development of offshore wind. All of these bipartisan bills are moving forward, along with bills on fisheries and ocean plastics. A lot of work remains to be done and Senator Whitehouse looks forward to working with NOAA and the HSRP to ensure that their expert voices are heard and considered.

Dr. Richard Spinrad, Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator, began his comments with a remembrance of RDML Rick Brennan and said that he is working very hard to fill in his role at OCS. In 2023, the HSRP will be celebrating its 20th anniversary and they need to make sure it is a highly visible activity for the Panel. The fruits of HSRP's labors can be seen in the work of NGS, CO-OPS, and OCS, but the impact and response to Hurricane Ida demonstrates that their work is directly relevant to a broad portfolio of NOAA responsibilities. Dr. Spinrad discussed his priorities as NOAA Administrator and vision for the future of the agency. These priorities fall in three main areas: (1) establishing NOAA's

primacy and role as the authoritative source for mission-agnostic climate products and services; (2) balancing NOAA's environmental stewardship efforts with new economic development; and (3) equitable distribution and services and an internal focus on a diverse and inclusive workforce. His vision for a "new blue economy" focuses on adding new capabilities for providing data, information, and knowledge to the robust blue economy built around shipping, fishing, and oil and gas. These new capabilities should help to seed new economic opportunities and development and NOAA is well positioned to take the lead in this area. The proposed FY 2022 budget for NOAA is historic and represents a significant recognition of NOAA's needs and society's needs for NOAA's products and services. The infrastructure bill also presents major opportunities for the agency to address the nation's increasing challenges from climate change. Dr. Spinrad is committed to moving forward NOAA's research-to-operations/applications/commercialization process. As NOAA is housed within the Department of Commerce, they ought to be very concerned about this transition and how their products and services can facilitate commerce. Dr. Spinrad challenged the HSRP members to think about how NOAA can meet today's challenges by partnering with and encouraging innovation from all sectors, ensure equity and racial justice in the delivery of products and services, and utilize new technology to support resilient infrastructure.

John Nyberg, Deputy Hydrographer, Office of Coast Survey, National Ocean Service, NOAA, and HSRP acting Designated Federal Officer, recognized the work of the NOAA team, as well as federal and private sector partners, in addressing the impacts of Hurricane Ida. He noted the 30th anniversary of the Physical Oceanographic Real Time System (PORTS) and congratulated CO-OPS for their hard work on the program. Dr. Tuba Ozkan-Haller, Rear Admiral (Navy, ret.) Ann Phillips, and Nathan Wardwell will join the HSRP in January 2022. Mr. Nyberg thanked outgoing members Captain Sal Rassello, Captain Ed Page, and Ed Kelly for their time and commitment. He reviewed the meeting's agenda and discussed how the topics were relevant to NOAA's mission.

Nicole LeBoeuf, Assistant Administrator, National Ocean Service, NOAA, discussed some of the NOS' efforts currently underway in response to Hurricane Ida. She is honored to be NOS' Assistant Administrator after having served in an acting capacity, and thanked HSRP for their support throughout her tenure. Ms. LeBoeuf reflected on the loss of RDML Brennan and announced that OCS has made available an innovative matching mapping fund opportunity named after him to symbolize his commitment to working across organizational boundaries. She thanked the outgoing HSRP members and encouraged them to stay engaged with the Panel to build on the successes they advanced during their time as members. Changes along U.S. coasts are being acutely felt and acknowledged for the risks they represent to our way of life. NOS is at the forefront of the U.S. government's efforts to create a more resilient, climate-ready coast now and for the future. The HSRP has already contributed to this work with recommendations highlighting the role of the programs under their purview in supporting coastal resilience and climate change adaptation. Tackling sea level rise and inundation will require an all-of-government approach along with partners from many sectors.

In FY21, NOS received its largest appropriation ever and the President's FY22 budget proposal is even larger, and includes increases NOS proposed for foundational observations that are the cornerstones of their coastal resilience work. Enacting the FY22 budget may be delayed due in large part to the other funding efforts, including addressing the pandemic, infrastructure, and

budget reconciliation. The bipartisan $1.2 trillion Infrastructure Investment and Jobs Act passed the Senate and includes nearly $3 billion for NOAA, including support for coastal mapping, observing and modeling, and many other programs related to coastal resilience. The newly formed White House Interagency Working Group on Coastal Resilience is a great example of the collaborations underway in support of the nation's efforts to build more resilient and climate-ready infrastructure. This group of 11 federal agencies is designed to elevate, coordinate, and accelerate federal efforts to increase resilience on U.S. coasts and in coastal communities. NOS' foundational programs will be integral to its success. The White House Office of Science & Technology Policy will also be re-establishing the interagency Ocean Resources Management Subcommittee to address the nation's most pressing ocean use issues.

Mark S. Osler, Senior Advisor for Coastal Inundation and Resilience Science and Services, NOS, NOAA, said NOS science plays a critical role in providing observations and monitoring, modeling and prediction, including the foundational geospatial data that enable an integrated understanding of changes in our physical environment. These foundational data are provided primarily in support of NOAA's navigation services mission, but are also essential to advancing the nation's resilience in coastal areas. He highlighted some of the activities relevant to the HSRP's area of interest, including two reports on the importance of NOAA's ability to advance an integrated suite of coastal data, information, and services. Congress has included authorizing language for NOAA in the National Coastal Resilience Data and Services Act, which is reflected in the much larger Ocean-Based Climate Solutions Act and exists as a standalone bill. Encouraged by this favorable dialog and the amount of new funding, NOAA's attention has turned towards coordination and execution to ensure that the new investment enables them to make advancements to improve the nation's resilience. He reviewed the goals of some of the new whole-of-government efforts underway, including the resilience-focused working group within the White House National Climate Task Force, the Subcommittee on Ocean Science and Technology, and the Interagency Council for Advancing Meteorological Services. Mr. Osler has convened a Tiger Team of experts across each program office within NOS to discuss coordination on coastal resilience. They have helped to strategize and set policy and priorities, convening regularly to help coordinate, advise, and collaborate on projects with near-term outcomes. Working groups like this are the key to ensuring that improved coastal observations, data, and modeling are seamlessly passed along to advance equitable access and service delivery on the ground across all U.S. states and territories.

Updates: Opportunities, Challenges and Priorities for NOS' Navigation Services Portfolio

Captain (NOAA, ret.) Andy Armstrong, Co-Director, NOAA-UNH Joint Hydrographic Center (JHC), University of New Hampshire (UNH), discussed research themes for the new FY21-25 NOAA-UNH Cooperative Agreement for scientific seafloor mapping research at the NOAA-UNH JHC. The JHC currently has two grants, one a no-cost extension of a previous grant delayed due to COVID and the other a new five-year agreement which includes 48 tasks in three categories: (1) advance the technology to map U.S. waters; (2) advance the technology for digital navigation services; and (3) develop and advance marine geospatial and soundscape expertise. The collaboration with UNH now includes 58 industrial partners, which have relationships with UNH distinct from the NOAA-UNH JHC allowing for productive collaborations between university researchers and the private sector. Capt. Armstrong highlighted the partnership with iXblue working on advanced autonomy development. The

uncrewed surface vessel (USV) research and development (R&D) at the JHC covers the full range of autonomy research from the vessel systems to situational awareness and mapping itself. In addition to industrial partners, UNH is collaborating with OCS, the National Marine Fisheries Service (NMFS), and the Office of Marine and Aviation Operations (OMAO) to develop capabilities to make USVs force multipliers for hydrographic and fishery surveys. UNH has just completed its Summer Undergraduate Internship which gave interns an opportunity to participate in mapping and other activities onboard NOAA vessels.

John Nyberg, Deputy Hydrographer, OCS, NOS, NOAA, provided an update on the Standard Ocean Mapping Protocol (SOMP), the Precision Marine Navigation program, improvements to the electronic navigational charts and raster chart sunsetting, and highlights of OCS priorities and programs. He briefly discussed the OCS assets deployed in the aftermath of Hurricane Ida, including three Navigation Response Teams (NRTs) in the water currently surveying the area. OCS is staffed for five NRTs and responded to four named storms during the 2020 hurricane season. They are in the process of ramping up the uncrewed response team at the Stennis facility, which involves upgrading one of their echoboats to a larger model that can handle rougher sea state conditions. Eight contracted surveys were planned for 2021, two of which have been completed. Mr. Nyberg recognized the efforts of NOAA's contractors to adhere to COVID guidelines and move forward with their work. For the National Bathymetric Source project OCS continues to collaborate with the external source team to build out the Gulf of Mexico region, which should be completed by the end of the fiscal year. OCS is conducting autonomous Arctic surveys with industry partners collecting information for forecasting models as well as depth data for uncharted waters. This work should be completed by the end of September. The raster transition and rescheming is underway and is expected to be completed by January 2025. This will allow OCS to focus resources on improving coverage and content of the electronic navigation charts. Mariners will be officially notified of paper chart cancelation through the U.S. Coast Guard's Local Notice to Mariners and a note on the charts that it is the final paper edition. In July, OCS upgraded to version 2 of the Global Extratropical Surge and Tide Operational Forecast System and it has gone into service on NWS' Weather and Climate Operational Supercomputing System. OCS' Precision Marine Navigation program is launching a new website soon and they intend for it to be a central hub for all of NOAA's marine navigation resources. OCS' partnerships with UNH and the University of South Florida continue to be productive and Mr. Nyberg discussed some of their projects. The Interagency Working Group on Ocean and Coastal Mapping has submitted a draft of the SOMP for review by the National Ocean Mapping, Exploration, and Characterization (NOMEC) Council. The SOMP is a key deliverable in the NOMEC strategy for ocean mapping. It will serve as an acquisition guide for all contributors of mapping data to ensure the widest usability of the data, minimize duplication of effort, and move data efficiently from acquisition to archive.

Juliana Blackwell, Director, National Geodetic Survey (NGS), NOS, NOAA, provided an update on the modernization of the National Spatial Reference System (NSRS), Coastal Mapping Program activities, the Alaska Coastal Mapping Strategy (ACMS) implementation plans, and program highlights for FY21-22. NGS held its 2021 Geospatial Summit and its Industry Workshop which were both well attended. Stakeholders were eager to hear about progress on modernizing the NSRS, which is now expected to be available in 2025 due to delays. In response to industry feedback, NGS has made improvements over the past year to better synch with commercial software vendors, such as using GitHub for collaborating with partners on software

development. As part of the Gravity for the Redefinition of the American Vertical Datum (GRAV-D) effort, NGS completed 88.46% of their target area to build out the new geopotential datum. The GPS on Benchmarks Campaign has continued to grow over the years and they are seeing an increase in crowdsourced contributions, which will help NGS to build better models and transformation tools for stakeholders. NGS was able to upgrade its coastal mapping camera system this year and it is now operational. NGS is leading efforts to look at small uncrewed aircraft systems for coastal mapping applications and collaborating with OCS to develop shipborne operating procedures for coastal mapping. The new capabilities will enable shoreline surveys, situational awareness, vessel inspection, and a host of other applications. Ms. Blackwell reviewed some of NGS' emergency response efforts following Hurricanes Henri and Ida. The feedback NGS has received thus far on their imagery after Ida was that it is helping the Louisiana National Guard with search and rescue response efforts, the Coast Guard is using it to determine which waterways can be opened and which are blocked, researchers are using the imagery to do rapid damage assessments in support of Tribes living along the barrier islands, it enabled the Federal Emergency Management Agency's (FEMA) blue tarp teams to protect houses from additional rains, and it is being used and integrated with pollution target identifications. The White House Interagency Working Group on Coastal Resilience has included geospatial resources in its key goals and NGS' Alaska Regional Advisor, Nic Kinsman, is serving as the lead NOAA staffer in that group. The ACMS implementation plan is currently waiting for the new administration team to review and approve it before it gets sent out for public comment and an Alaska Coastal and Ocean Mapping Summit is planned for December 1-2, 2021. NGS is continuing to integrate their Field Operations Branch with CO-OPS' Field Operations Division to increase operational awareness and collaboration. They expect that by the beginning of FY22 they will be co-located into one combined facility in Chesapeake, Virginia. The two programs are also collaborating on the development of a mapping tool showing the operational status of projects and infrastructure.

Richard Edwing, Director, Center for Operational Oceanographic Products and Services (CO-OPS), NOS, NOAA, provided an overview of recent FY21 accomplishments for navigation safety, coastal resilience, and inundation products and services, and future milestones for FY22. Mr. Edwing summarized CO-OPS' work to sustain and advance their end-to-end navigation safety and coastal resilience observing systems, modeling infrastructure, and products and services. To realign with NOAA and NOS' priorities, CO-OPS added two new branches to the Oceanographic Division, Coastal Hazards Branch and Stakeholder Services Branch, as well as establishing a Business Operations Division. CO-OPS published a recapitalization plan looking at the life cycles of the National Water Level Observation Network (NWLON) that proposes developing a proactive strategy for keeping the systems in a state of operational readiness. In FY21, CO-OPS re-established two stations, rebuilt two stations, and relocated nine stations. If the funding proposals for the NWLON stations are approved, it will allow CO-OPS to be able to fully implement their NWLON recapitalization strategy and restore comprehensive annual maintenance. It could also enhance their efforts to fill gap areas through partnerships and further advance their work on dual purposing the microwave water level sensors in order to gather wave observations. CO-OPS' National Current Observation Program (NCOP) has begun Phase 1 of its survey of Delaware Bay, deploying 18 acoustic Doppler current profiler (ADCP) current meters and four conductivity, temperature, and depth (CDT) sensors and includes the first operational use of subsurface ellipsoidal ADCP buoys. While only one new PORTS was installed in FY21, enhancements were made to nine existing systems and at least six new sensors

are planned to be integrated into existing PORTS in FY22. CO-OPS is celebrating the 30th anniversary of PORTS and has conducted a wide array of outreach activities to mark the occasion. The new West Coast Operational Forecast System is up and running and is their first model to use real time data assimilation. The Northern Gulf of Mexico Operational Forecast System upgrade included a consolidation of three separate models, higher resolution output, and expanded coverage. 100 NWLON stations have now been converted to microwave water level sensors. CO-OPS collaborated with NOAA's Office of Response and Restoration to develop buoys that can be quickly deployed to aid incident responders in predicting the fate and trajectory of spilled pollutants as well as provide additional capability for NCOP surveys. In FY21, CO-OPS added several new capabilities to their Coastal Inundation Dashboard, including a multi-station view feature and improved display of annual and seasonal High Tide Flooding statistics. Coastal resilience efforts in FY22 are expected to include: improving statistics for the annual High Tide Flooding Outlook; building climate outlook capabilities into the Coastal Inundation Dashboard and integrate Great Lakes NWLON stations; a collaborative multiyear project to conduct a 40-year reanalysis of water level data to build a national assessment of contemporary and future flooding; integrating updated sea level rise graphics into the NOAA Climate.gov Coastal Resilience Toolkit; and supporting the 5th National Climate Assessment Report.

HSRP Q&A

Dave Maune said that in several coastal communities he has studied the magnitude of land subsidence is greater than the magnitude of sea level rise. Since land subsidence is largely caused by the extraction of ground water, the Hampton Roads Sanitation District has developed the Sustainable Water Initiative for Tomorrow (SWIFT) to replenish the Potomac Aquifer with a million gallons of purified drinking water daily, with a goal of five plants pumping 100 million gallons a day to halt land subsidence. He asked if it is within the realm of House Resolution 3228 for NOAA to investigate if the SWIFT initiative is actually reducing the rate of subsidence and if it could be applied to other areas experiencing this issue. Glenn Boledovich said the overarching goal of the resolution is to identify the causes and effects of coastal flooding to help people plan and work towards resilience. He believed the bill would be supportive of best practices, but was not sure it would be the federal government's role to monitor and evaluate local efforts. Ms. LeBoeuf said NOS is in touch with many people on the ground that have come up with innovative ways to address coastal changes and they'll be looking for any best practices that they can share with others. She and others in NOS will review the HSRP's issue papers on this topic.

Sean Duffy said there is a lot of great coordination with NOAA and the Army Corps of Engineers directing assets to proper places as part of the response to Hurricane Ida. NOAA's efforts are greatly appreciated in the area for saving lives, protecting property, and getting commerce moving again.

Offshore Wind Energy and Ocean Mapping: A Paradigm for Geoscience Data and Information Sharing

Deanne Hargrave, HSRP member, Ed Saade, HSRP member, and Ashley Chappell, IOCM Program Manager, NOS, NOAA, moderated the session focusing on offshore wind energy's potential to transform renewable energy development, as well as ocean mapping with data

sharing. The session focused on geoscience data needs and opportunities for data collection and sharing. The session provided attendees with a perspective on the future for renewable energy technologies and applications beneficial to the blue economy and supporting climate change adaptation. Nicole LeBoeuf offered opening remarks concerning the administration's initiative to expand offshore wind and the importance of NOAA supporting the nation's goal of deploying 30 gigawatts of offshore wind energy by 2030 while protecting biodiversity and promoting multiple ocean uses. In order to enable development and mitigate any impacts from offshore wind development, NOAA needs to remain fully engaged in this discussion.

Mary Boatman, PhD, Senior Coordinator, Office of Renewable Energy Programs, Bureau of Ocean Energy Management (BOEM), presented background and some of the current activities around offshore wind on the outer continental shelf along the Atlantic Coast. BOEM is responsible for the expeditious and orderly development of resources on the outer continental shelf, including renewables like wind. Executive Order 14008 called for the Interior Department to identify steps to increase responsible renewable energy development on public lands and waters. The Departments of Energy, the Interior, and Commerce committed to a target to deploy 30 gigawatts of offshore wind energy by 2030, which would create nearly 80,000 jobs. The Northeastern U.S. is the furthest along in the process with 16 active leases from Massachusetts to Cape Hatteras, North Carolina. Dr. Boatman reviewed the outer continental shelf renewable energy authorization process and the intergovernmental coordination that occurs at several points along the process. State leadership drives offshore wind development and most Atlantic states have renewable energy goals as well as specific offshore wind goals and offshore offtake agreements in place. Along the Atlantic coast there are currently eight lease sales, seventeen active commercial leases, eleven site assessment plans approved, two general activities and research plans, and BOEM is reviewing fourteen construction and operation plans with two more expected in the coming year. In 2020, the Coastal Virginia Offshore Wind Project was the first steel in the water and includes two six megawatt turbines. In May 2021, the Department of the Interior approved the first large-scale offshore project in the U.S. off the coast of Massachusetts. Issues and opportunities BOEM is addressing include employment, industrial synergies, turbine size, transmission, radar, wildlife, visual effects, navigation, and commercial and recreational fishing. The technology has grown significantly since 1991 and turbines are now six to eight megawatts. They are looking to deliver twelve megawatt turbines in the coming years and the Department of Energy is studying the possibility of a 50 megawatt system.

Deanne Hargrave, HSRP member, Geoscience Manager, Atlantic Shores Offshore Wind LLC, presented on the role of geoscience in offshore wind development, the types of data being acquired, and how the information can be leveraged. She provided an overview of the types of geophysical and geotechnical tools that are used to gather data sets analyzed by a wide array of specialists. The data sets required for each lease and associated export cable routes includes surface and subsurface data. Bathymetry is one of these data sets and is collected by dual head multibeam echosounders. Typical line spacing in the offshore lease areas is 30m, which provides

for 150-200% coverage with 50-200 pings per square meter. This high-resolution bathymetry allows for detailed modeling and analysis of seafloor geometry to support planning for cable and foundation installation. For the subsurface, they collect high resolution shallow seismic data using higher frequency subbottom profilers and lower frequency single or multichannel seismic systems. These surveys are used for geohazard, archaeological, and benthic clearance for permitting and safety of construction/installation. Surveys are also used for development of a nearly 3D ground model, which results in very detailed mapping of horizons and channels within the units. Geophysical and geotechnical surveys are an integral part of the development process from inception through decommissioning, though the most intensive efforts occur during the development project stage. Each time a new data set is collected it is incorporated into the ground model to improve its robustness and usability for design and engineering. The development process for offshore wind turbines can take as little as two years, but usually requires three to four years of sequential work for full completion. The maps, charts, statistics, and models that are created from the collected data are submitted to BOEM with their reports, which they then make available to the public. Data sharing agreements are in place or underway to incorporate bathymetry, backscatter, and sonar data into NOAA's portfolio and developers are eager to find new ways of sharing data for common benefit.

Ruth Perry, PhD, Business Environment Advisor, Offshore Wind Americas, Shell Renewables and Energy Solutions, presented on how offshore wind is part of Shell's broader integrated energy strategy and how offshore wind can contribute to the blue economy. Shell has set a goal to be a net-zero emissions energy business by 2050 or sooner. They see an opportunity to help enable a growing renewable energy market that can address the stresses on the environment, particularly climate change. Shell is a strong supporter of the Paris Accord and seeks to work with their customers to reduce the emissions of their products while ensuring that the energy they provide is affordable. Shell Wind is one part of their renewable generation portfolio and includes projects in South Korea, the Netherlands, Norway, and France, as well as six across the U.S. Shell supports NOAA's efforts to address climate change and views public-private partnerships as a mechanism to advance sustainable development. They have been collaborating with NOAA since 2008 in four different areas: advancing ocean technology and capability, providing offshore data to communities, exploring and monitoring the deep, and supporting the next generation by sponsoring educational outreach, research, and competitions. They look forward to working with NOAA on utilizing the construction of wind structures as platforms of opportunity to collect data that can be critical to understanding climate and change in these areas. Categories of emerging partnerships with the offshore wind industry include data sharing, monitoring, and research.

Elizabeth Dewing Andrews, PhD, Lead Geophysicist, Ørsted Offshore North America, presented on the new Memorandum of Agreement (MOA) between NOAA and Ørsted, how a connected blue economy can be powered by offshore wind energy and data, and opportunities to consider, collect, and leverage data going forward. In January 2021, Ørsted entered into an MOA

with NOAA committing to outline a smooth and productive data share process which will pave the way for similar agreements with other offshore wind developers. The goal of the partnership is to deliver meaningful and accessible data while at the same time mitigating the effects of climate change. Ørsted has a high standard for data specifications and believes every gigabyte of data they acquire should be multipurpose and contribute to the effort to build a complete data set which can be used to better protect the planet. The data share themes covered under the MOA include: air quality, water quality, and emissions; biological communities; meteorology; coastal and ocean currents, circulation, and waves; hydrographic services and mapping; physical oceanography; and fostering preeminent science and technological innovation that can support NOAA and the Department of Commerce's goals to stimulate sustainable growth in the U.S. blue economy. Ørsted hopes the MOA can advance the NOMEC mandate to coordinate federal agency policy and actions needed to advance ocean mapping, exploration, and characterization. Data handover is complex and Ørsted's objective is to facilitate the end user's ability to access the value of this very high specification data. Dr. Andrews reviewed how data coverage is built up over the development of an offshore wind farm. She hoped to hear more information on opportunities for the industry to apply NOAA data to the permitting process to redistribute some of the heaviest data requirements from the very earliest project phases without disrupting the consultation process or adding unworkable delays. She also wanted to explore if there is a mechanism by which data logged by individual developers would inform all of the input into the consultation and approvals process to provide an opportunity to further develop the envelope for these projects before sending vessels out to log the highest specification data.

HSRP Q&A

Dave Maune asked about the possibility of offshore wind development off the coast of the Aleutian Islands, since the area has the highest average wind speed of any in the U.S. Ms. Hargrave said the challenge is bringing the energy to market. They need to be able to tie into the grid where there is large enough demand in order for the project to be economically feasible. Dr. Perry agreed and said that the State of Alaska is interested in wind energy opportunities in areas near population centers. Shell R&D is looking into technologies that could deliver very localized energy and wouldn't require commercial utility scale projects.

Ed Kelly noted that every panelist said their companies have data they are willing to share in some way and there is only one MOA. He encouraged NOAA to facilitate and expedite the collection and management of the data. They need to do this before the data already collected or being collected now is collected in nontransferable forms, becomes proprietary, or is out-of-date. Ms. Chappell said they are making improvements on NOAA's end to facilitate the transfer of data into NOAA's data centers. They're working with Ørsted to improve the process so that the next MOA goes even more smoothly. The SOMP should help with the standardization to data collection. Lindsay Gee said they should not underestimate the challenge of data management and NOAA is going to have to make sure that the resources are available, both internally and using external resources, to ensure they are able to handle the volume that will be coming soon.

Data handover may not even be necessary if it can stay with the operator or service provider and still be accessible.

Qassim Abdullah asked the panelists where they see NOAA's role in coordinating this data collection. He also asked for more information on the leasing negotiations. Dr. Barton described the process of identifying the area and offering it for lease, companies then bid on the area, and the highest bidder wins the lease which grants them the right to conduct site assessments and evaluation for offshore wind, but they do not yet have the right to build their project at that point. There are many stipulations the companies have to follow. It is not very different from the leasing process oil and gas companies have used for decades. Dr. Perry said standardization is very important as is metadata, but there are also resourcing challenges. Data management and storage are not free and data handover has costs as well. Shell collects many kinds of ocean data from their platforms and trying to coordinate that with the various parts of NOAA is challenging. They need to get the right people together to address the issues and figure out how to do this at the scale that the offshore wind industry is approaching. Dr. Andrews said Ørsted is eager to work with NOAA, especially in areas where there is already a lot of data coverage to see how they can use that data more intelligently.

Anuj Chopra said challenges have come up in the field between these highly specialized fleets and the local fleets because of a lack of standards of operation. He asked if there is a plan to develop something similar to the standard operating procedures in place for the oil and gas companies. Dr. Barton said the industry already has very high standards for operation and the Coast Guard is engaged on this topic as well. Dr. Perry said Shell's offshore wind projects have the same standards as oil and gas operators for all their vessels. There are also efforts through Coast Guard, the Bureau of Safety and Environmental Enforcement, Department of Energy, and the Offshore Operators Committee on developing standards and utilizing the oil and gas framework adapted to the specificities of offshore wind. Mr. Kelly said there has been robust governmental engagement with the commercial side with the navigation aspect overseen by the Coast Guard. Safety is being addressed well and there is an effort underway looking into developing a Jones Act compliant fleet.

Deanne Hargrave asked where the interagency coordination between BOEM and NOAA is going well and where it could be improved. Dr. Barton said they have worked with NOAA for decades and while there can be conflicts where the mandates of the respective agencies overlap, they all want to see this be successful and things are moving in the direction of better alignment and coordination. Ms. LeBoeuf said an example of the two agencies working well together was in the development and ongoing maintenance of the Marine Cadaster and OceanReports. As the potential for conflicts arise in the ocean, NOAA and BOEM are leaning into new ways to ramp up OceanReports so that more users can benefit from it. Ms. Chappell added that the two agencies are also collaborating on data acquisition on the front end and have an existing agreement for work off California and will begin another agreement soon where funding from one agency can flow to the other where it supports both agencies' requirements.

Public Comment

John Nyberg summarized public comments received in advance of the meeting. Several comments related to GIS management software, better data dissemination and integration for a diverse range of applications. Others related to data applications beyond navigation, including search and rescue and port facility resilience. One comment inquired about Tribal consultations as part of the government-to-government trust responsibilities. Other comments requested increasing the use of satellite-derived bathymetry and uncrewed surface vessels. Another comment focused on the surveying and other work being done in Alaska and opportunities for private sector contributions. In Alaska, where geo-data gaps are vast and coastal mapping programs are in their infancy, one of the first steps should be completing the VDatum transformation tool beyond the Alaska Southeast regional model. The complete text of the advanced public comments is available on the HSRP meeting website.

Lynne Mersfelder-Lewis read the following comments received during the first day of the meeting:

Rada Khadjinova, Fugro, said that Administrator Spinrad talked about NOAA's primacy of authoritative foundational geodata, including shallow water and coastal bathymetry. Looking at the Infrastructure bill and overlapping mandates between NOAA and USACE on the coast, she would appreciate more context of how the Alaska Coastal Mapping program is envisioned to be coordinated between NOAA/ USACE/ JALBTCX and how private sector contract partners can find onramps to increase use of advanced technology to increase pace and scope of data collection.

Denis Hains, h2i, thanked the HSRP members for their leadership and for the professional introductions from NOAA leadership. Their openness and transparency to invite public participation is much appreciated and demonstrates NOAA's commitment to listen, consider and implement public feedback and comments. He asked if collaboration with Canada is currently taking place in JHC's Arctic cruise. He also asked if there are other specific initiatives in OCS, NGS and CO-OPS that are conducted in collaboration with contiguous countries to the U.S. to maximize outputs & outcomes.

John Byrd, U.S. Geospatial Executives Organization, commented that the LoBiondo Coast Guard Authorization Act of 2018, PL 115-282, included the current Hydrographic Services Improvement Act reauthorization. In Section 1002, NOAA was required to submit two reports to Congress. One was a method for comparing the cost of NOAA performance of hydrographic surveys with the cost of contractor performance. That was due to Congress one year after the date of enactment, which would have been December 4, 2019. The second was a strategy for how NOAA will increase contracting with nongovernmental entities for hydrographic data collection. That was due 180 days after the date of enactment, which would be June 2, 2019. According to the committees of Congress with jurisdiction over NOAA's hydrographic surveying, those reports have not been submitted. These address questions HSRP has raised many times in the past. Mr. Byrd asked if the HSRP is aware of these provisions of law, if they have been consulted in the preparation of these deliverables to Congress, what the status is of these reports, what NOAA's process is for seeking private sector input to the development of these reports, and if they have not yet been submitted, why have the deadlines set in law by Congress been violated, and when the reports will be provided to Congress.

Shawntel Johnson, Director of Business Development, Ocean Infinity, asked if there is any possibility of opening the five year hydrographic survey contract for rolling admissions to allow new industry partners the opportunity to participate. If so, when does the HSRP anticipate this occurring?

Denis Hains, h2i, asked if the offshore wind presenters were seeing ALL data "openly and freely" shared with no restrictions or that some data sets might not be shared due to commercial or defense restrictions. He asked if they are making sure that the all the data they will contribute will respect standards to be easily Findable, Accessible, Interoperable, and Reusable.

Jason Creech, David Evans and Associates, Inc., asked if there are any MOUs, partnerships, etc., between offshore wind operators and the federal government that would allow installation of scientific sensors on the wind platforms. He sees lots of potential to push critical NOAA programs into the offshore environment.

Joyce Miller, University of Hawaii, asked about the status of getting interagency agreements and contracts better streamlined. This has been an on-going HSRP issue since at least 2011.

Day 1 Meeting Recap and Round Robin with HSRP Members, Actions, and Wrap-up

HSRP members provided final comments on the meeting, including: commenting on the great work NOAA is doing coordinating with other agencies following Hurricane Ida; the potential for offshore wind farms demonstrate the need for accurate and precise data; pleased to see all the attention being paid to surveying in Alaska and NOAA has been very responsive to the state's charting needs; guidance from Dr. Spinrad was very valuable; eager to see how offshore wind operators will adapt to the very different environment of the West Coast; kudos to NOAA for keeping things moving and getting a tremendous amount of work done despite all of the COVID restrictions; very encouraged to hear the Administrator's comments on the new blue economy; happy to hear the recognition that NOAA is within the Department of Commerce and the HSRP should reinforce how the agency creates conditions, information, and operational expertise to increase commerce and the benefit to U.S.; offshore wind is a great opportunity but NOAA needs to act fast to get standardization agreements worked out; this is the first time the administration is giving a lot of attention to coastal resilience; the offshore wind panel was very informative and timely; interesting to hear about the NGS and CO-OPS Field Operation Teams being combined, which seems like a positive move; Dr. Spinrad's focus on research-to-operations is a key area that is tough to do well; having the precision navigation tools all in one place will be very valuable; NOAA is ahead of the curve in the offshore space and they need to maintain leadership there and lead the interagency partnership. Rich Edwing said the impacts of Hurricane Ida underscored the importance of NOAA's products and services and the work of the HSRP. He also said that it was helpful to hear Dr. Spinrad discuss his vision for the agency and he learned a lot from the wind panel. Juliana Blackwell invited Panel members to send her any technical questions about what NGS is working on. Andy Armstrong said the presentations were a great demonstration of the complexity involved in ocean mapping and the management of that data, which provides a good perspective for moving forward on those issues. Nicole LeBoeuf noted common themes like collaboration, equitable delivery of data and services, innovation, and generosity of spirit. She thanked members for pushing NOAA to enhance their relationship with the private sector meaningfully and durably for the public good. She was also pleased to see diversity represented at the meeting and contributing to big topics that all can benefit from.

Glenn Boledovich appreciated that the Director's updates provide him with a chance to get reacquainted with the on-the-ground work at NOAA and its value. John Nyberg said that hurricane responses are where the data, services, and research all come together and each of those came up during the day's meeting. The opportunity for data sharing with offshore wind developers is ripe and he looks forward to expanding on that. He was also pleased to hear the ties to the UN Decade of Ocean Science and Seabed 2030.

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Thursday, September 2, 2021

Round Robin recap from Day 1 and continued HSRP discussion

HSRP members shared additional thoughts on the previous day, including: NOAA partnerships with private survey assets has been put to good use in the Hurricane Ida response and with more challenges coming it is reassuring that NOAA will make further improvements; the HSRP taking up emerging issues and technologies is a positive direction; gaps in NOAA's products are an issue for the small boat fleet as the agency transitions to an all-digital navigation, observations, and positioning portfolio; the HSRP should dig into Dr. Spinrad's priorities to see if they can develop issue papers that touch on them; and the impact of large ships and how increasingly important precision navigation and PORTS are as the consequences become greater. Glenn Boledovich noted that while the statutory authority for permitting and licensing of offshore wind development is a BOEM function, NOAA has a role to play. He did not hear as much about how shoreside and nearshore infrastructure along with NOAA's data and services could be used to support the work. There is expected to be a lot of increased pressure on ports to support that industry and this may be worth further discussion. He added that coastal resilience and port resilience are one and the same. Nicole LeBoeuf said she would be happy to work with the HSRP as they refine their work with the Administrator's priorities in mind. John Nyberg said he greatly appreciated the public comments, particularly their focus on the value of data/data availability, bathymetry, and navigation. There is a wealth of expertise available and ready to work with NOAA. Qassim Abdullah suggested inviting representatives from private companies that contract with NOAA for a future panel to discuss what both sides want public-private partnerships to look like, what they are achieving, and where they want it to go. Gary Thompson discussed possible partnerships between the HSRP and the National Geospatial Advisory Committee to explore additional areas where there could be more public-private partnerships. Ed Page said there are a lot of public-private partnerships happening now and they need to focus on where these partnerships are the right tool and benefit all parties, as some things are inherently governmental. Ed Kelly added that cooperation has to be done with a high degree of specificity. The HSRP needs to be responsible to put forward workable, practical, and affordable ways to partner and highlight the ones that are most important and will yield success. Anuj Chopra discussed some of the challenges of managing big data and asked if NOAA would like to hear expert opinion or guidance from industry. There have been many advances in technologies and processes to keep data sanitized. John Nyberg said this might be a topic for the Technical Working Group moving forward and an area where NOAA could work with their partners in

academia to address the topic. Julie Thomas reviewed some of Dr. Spinrad's priorities as he presented them to the HSRP on day one.

Technology in Support of Shallow Water Surveys in Under 40 Meters and the Blue Economy

Ed Saade, HSRP member, and Captain (NOAA, ret.) Andy Armstrong, Co-Director, NOAA-UNH Joint Hydrographic Center, moderated the panel focused on NOS' work on coastal and ocean surveys in support of a wide range of programs and projects to broaden the scientific knowledge and to increase existing and emerging coastal, social, and ecological sustainability and hydrographic issues. New technology and frameworks are needed to generate products supporting resilient communities and promote coastal economies in areas such as satellite-derived bathymetry, lidar, and multibeam.

Carol Lockhart, Vice President and Chief Hydrographer, Woolpert, Inc., presented on the organizational process and benefits of multi-sensor approaches to efficiently map in less than 40m of water using satellite-derived bathymetry, lidar, and multibeam. Bathymetry produces consistent and predictable swath widths for an area, which make the technology more efficient when covering large expanses of shallow water. It provides more information than a single beam and can eliminate safety concerns of boat operations in shallow uncharted water. Lidar can also provide data where it is not practical to send a vessel. Ms. Lockhart discussed the technical specifications of bathymetric lidar technologies currently available and how the various types of lasers are used to gather a wide array of data. Regardless of the system being used, depth penetration depends on water clarity and turbidity, as well as seafloor reflectance. Additional operational considerations when deploying bathymetric lidar include weather, flight logistics, and positioning plan. A multisensor approach combining satellite-derived bathymetry, lidar, and multibeam echosounder can be very effective in mapping 0-40m depths. Ms. Lockhart discussed the project flow of an example case using all three and then discussed each phase of the process. Refinements made to the lidar survey extents based on the results of the satellite-derived data led to substantial cost and time savings. With the time saved by removing some areas they were able to add areas elsewhere. They also had to adjust the location of some areas due to datum errors on the original charts, which they saw once they had the satellite-derived information. Lidar then enabled multibeam decisions to be made, with survey time being reallocated to new areas. The lidar data was used by the multibeam acquisition team to provide them with confidence to conduct 24/7 operations and increased the survey efficiency around reefs. Lidar coverage in shallow complex seabeds significantly reduced risk to the vessel survey team. Together, the multisensor approach allows for surveys that are more efficient and effective, provide significantly more coverage than using a single sensor, and full coverage of a project area is possible. In order to take full advantage of its possibilities, the clients and contractors must have the flexibility to adapt to changes. Good coordination and teamwork are also needed between each phase.

Duncan Mallace, Chief Strategy Officer, XOCEAN, presented on how XOCEAN has optimized shallow water hydrographic surveys over the horizon using multiple USVs. XOCEAN operates a fleet of 15 USVs with an additional four vessels currently in production. He discussed the key features of XOCEAN's USVs which are equipped with commercial grade sensors and whose 6-8m size allows them to be deployed rapidly. XOCEAN's USV platforms are uncrewed but not autonomous. Pilots and online surveyors monitor and control the vessels and survey

system remotely in real-time 24/7. Using three USVs on one project costs clients at least 25% less and is three times faster. Additionally, computers are better at driving boats than humans which leads to more efficient data collection. Supplemental sensors can be added to collect sub-seabed data, weather observations, and marine mammal information. Weather downtime costs are substantially lower for USVs because no one is on board the platform. One of the biggest advantages is that remote access brings experts to the boats, which allows for a more balanced lifestyle for staff that includes working from home rather than being on a vessel for three weeks. Having a global remote workforce means that no one has to work a night shift. The environmental advantages of USVs include minimal carbon usage, quiet and slow platforms which do not interference with marine mammals, and the footage acquired can be used for automatic identification of species. Mr. Mallace discussed examples of surveys XOCEAN has been conducting in the Canadian Arctic. For coastal surveys of smaller areas, combining USV and UAV data sets provides a seamless surface and being able to survey the coastline with both on the same tide is key to tying the two data sets together.

Richard Stumpf, PhD, Oceanographer, National Centers for Coastal Ocean Science, Stressor Detection and Impacts Division, NOS, NOAA, presented on what SDB can offer coastal mapping, including complementing high accuracy bathymetric methods by providing rapid and repetitive estimates of shallow bathymetry for reconnaissance, mission planning, mapping of remote areas, assessing storm impacts, and monitoring of areas with dynamic bathymetry. He provided background on the development of satellite-derived bathymetry and described NGS' effort using it to correct the chart for the Northwestern Hawaiian Islands by over two kilometers in some places. Issues addressed by satellite-derived bathymetry include reconnaissance, mission planning, monitoring of shoals, storm response, and infilling of lidar or multibeam. The operational planning advantages that satellite-derived bathymetry can offer include being able to tell where shoals are to ensure vessels are close enough for small field vessels to be deployed without putting the mother vessel at risk. Areas of interest for use of satellite-derived bathymetry include coral reefs, which have infrequent turbidity, but also inlets, capes, and shoals, which do have turbidity issues. Dr. Stumpf discussed the various satellite-derived bathymetry methods, the most common of which is passive optical. Passive optical has two approaches - an empirically tuned approach and an optimization tuned approach - both based on the physics of how light behaves in water. These offer different values for different cases but generally yield comparable results. Machine learning, wave refraction, photogrammetry, and lidar from space are all being examined and researched as methods for satellite-derived bathymetry and in the future may be combined with other approaches for better results. Satellite-derived bathymetry is applicable up to 20m in clear water, but turbidity determines the extinction depth. Composite images of different water scenarios at the same place offer improved results with turbidity and reducing noise. Satellite-derived bathymetry is also great for tracking change and filling in or expanding lidar data, which is still limited by turbidity. NOS' goal is to mostly automate satellite-derived bathymetry at 10m resolution to provide routine coverage, immediate assessments, and expanded coverage.

<u>HSRP Q&A</u>

Dave Maune asked if NOS has had success using satellite-derived bathymetry in Western Alaska north of the Aleutians. Dr. Stumpf said they have looked at the North Slope and believe they should be able to retrieve data there. The Yukon River is very turbid and would require different

methods. NOS has evaluated water clarity in Alaska and could map out the areas where it is achievable.

Dave Maune asked if contracted surveyors would consider collecting data on a larger area than a specific project calls for if there is some assurance that it would be funded in a future fiscal year. Mr. Mallace said this has not yet come up but he did not see any reason why XOCEAN would not do it. It is a good approach to mapping remote areas where the cost of getting assets there and back is very high.

Ed Saade described the distinction between Fugro's Rapid Airborne Multibeam Mapping System (RAMMS) and other systems. RAMMS was developed by the Navy and a DARPA group approached Fugro about converting it into a hydrographic lidar system. Its size makes it usable with very small aircraft which has saved Fugro around 90% of their fuel and transportation costs compared to other systems. It has much more data density than conventional lidar systems and has been used heavily around the world for a variety of applications. The autonomous aspect of the system is what Fugro is mainly focusing its efforts on developing.

Lindsay Gee made a comment about the importance of efficiently transitioning research into operations. This session demonstrates how industry has done this efficiently and monetized it. NOAA needs to benefit from this and not redo others' work, while ensuring the efficiency can optimize operations and rate of progress for surveying in depths of 0-40m. He also said that there needs to be a focus and suitable resources dedicated to making sure that all the data gets to the various products and users and that NOAA is prepared to handle the data volumes anticipated in the near future.

Captain (US Navy, ret.) Brian Connon, Vice President of Ocean Mapping, Saildrone, commented that the costs of ship, staff, and production are all increasing and more affordable ways to perform the work are needed. USVs provide safer operations and a more efficient way to map the most challenging part of the U.S. Exclusive Economic Zone (EEZ). USVs are an especially good option when they are paired up with lidar and satellite-derived bathymetry.

CDR Briana Welton Hillstrom, Chief, Hydrographic Services Division, OCS, NOS, NOAA, said having the right sensor in the right place at the right time is the key point. There is no one-size-fits-all solution for every geographical area OCS surveys. OCS has worked with autonomous systems aboard NOAA ships and OMAO has provided them a grant to purchase an autonomous system that would fit into the standard davits of NOAA's entire fleet, including fishery and oceanographic vessels.

Gary Thompson asked what techniques are used to perform independent quality control of the topo-bathy lidar. Ms. Lockhart said it depends on which sensor is being used, but there are many ways, including checking lasers against each other or against other sensors. Flying the same line every day before doing a survey will give operators a sense if they have any system issues or gross errors. It is essential to check the systems on land and in water.

Qassim Abdullah asked if the operational limitation of 22 days was due to the battery life of XOCEAN's vessels. He also asked how far they are from fully autonomous navigation for USVs. Mr. Mallace said the 22 days reflects the length of time the diesel generator is able to run intermittently in order to recharge the battery. Right now, a team usually comes in once a week

to download data. If more bandwidth was available they would be able to immediately send the data to the cloud and start processing it, which would be game changing. Regulation is the main barrier to full automation for navigation, but because it is new technology they want to be observing the vessels to know what is going on. Improving object detection would mean they would not require one pilot per USV. It would not a big step to make them fully autonomous, but the requirement is not there to do that yet and companies would rather put their resources towards developing the boats and getting the data off of them. Captain Connon added that coding in rules of the road is easy but platforms being able to take visual cues of other vessels for autonomous decisionmaking would require further development. Mr. Saade added that, similar to autonomous planes, federal agencies have not yet determined who has jurisdiction over these vessels.

Nicole Elko asked the panelists where the challenges are greatest within their realms and what their thoughts are on overcoming challenges in shallower water, such as turbidity, sandbars, and unknowns. Ms. Lockhart said a lot of robust planning has to happen upfront to figure out which tool is going to work where. When working with light, there will always be a physics problem with turbidity but technological improvements are promising in this regard. Dealing with the volume of data and stitching data sets together from multisensor technologies is a bigger challenge. CDR Hillstrom mentioned the National Bathymetric Source, which is OCS' effort to build out a curated bathymetric data set. While navigation is the primary driver of the effort, it will have many implications for modelers as well. Dr. Stumpf said the key thing is to reduce the amount of turbid shallow water. His team is working with NGS on turbidity mapping to more strategically conduct lidar missions.

Ed Page commented that in many cases the shallow water habitat is going to be highly dynamic, which would require it to be routinely updated to be accurate. NOAA should prioritize what areas need this level of attention, how stable the situation is, and develop a realistic approach.

Ann Kinner commented on the vulnerabilities of GPS and GNSS and asked how they confirm the positioning of these systems. Juliana Blackwell said the resilience of NGS' Position, Navigation, and Timing assets is a major issue for them and there are many efforts underway across the federal and commercial spectrum looking at how to mitigate the risks. Capt. Kinner said this is one reason small craft operators will still need access to nondigital charts to help them know where they are and what is underneath them. The process of sunsetting paper charts needs further consideration. CDR Hillstrom said that visual navigation and terrestrial navigation does not go away with the sunsetting of raster charts. Radar overlays and duplicate GPS is also available. OCS has rigorous quality control processes for all of their survey GPS data as well. Mr. Mallace said that XOCEAN positions their posts with GPS, but that feeds into an inertial system that tells them in real time how the GPS is operating. There is also Galileo, GLONASS, and BeiDou for redundancy.

Ed Saade asked whether, with all the new satellites going up, there will be much greater volume of data for NOS to pull from for satellite-derived bathymetry in the future. Dr. Stumpf said the challenge with a lot of the satellites is the calibration between them, as they are not calibrated to a common source. Research will need to focus on how to intercalibrate them so that NOAA can get a consistent product off of the satellites. If they can do that it would open up an enormous capability for NOAA to work with.

Ed Saade asked about the direct applications of shallow water mapping now and in the future. Captain Armstrong said NOAA and its contractors are going to need every asset and force multiplier they can get in order to meet the goals of NOMEC and Seabed 2030. There is still room for R&D and the challenge is that the companies are moving so fast that they need to keep changing their research goals because there are new problems to solve. The enormous challenge is why they wanted to share this and get the HSRP thinking about what NOAA can do to meet the 0-40m challenge.

Public Comment

John Nyberg read the following comments received during the second day of the meeting:

Carl Gouldman, Chief, IOOS, said NOAA should keep working with customers to refine service delivery.

Praveen Vamadevan, Fugro, said that Fugro can provide reliable geo-data effectively and to the highest standards, contributing to safe navigation and development.

Andrew MacInnes, Moonbeam Sail, said that NOAA should prepare more consumer near shore charting for public access to and from waterways that may be outside navigable waterways.

Alessandra Bianchi, SeaTrac Systems, Inc., said that SeaTrac's versatile, persistent carbon-neutral USV is ready to assist in shallow mapping and ocean monitoring.

Chelsea Fairbanks, SBG Systems, said that there are very few options for inertial navigation for surveyors. She works with SBG Systems which manufactures both inertial navigation and post-processing software. The solution has been adopted by the French hydrographic agency SHOM. She asked what common avenues are available for private companies, such as SBG, to introduce new developments or technology.

Kyle Goodrich, President & Founder, TCarta, expressed concern that the HSRP is missing out on technology developed by TCarta under a NSF-funded SBIR grant to produce global 10m satellite-derived bathymetry, deploying deep learning to process the entirety of the ICESat-2 archive, and employing cloud computation to process every image collected in U.S waters, among numerous other advancements in satellite-derived bathymetry. He strongly encourages the HSRP to take a wider view on who it invites to brief the panel to ensure the panel receives the current state of the technology across the various experts - not just NOAA and prime contractors. He encouraged the Panel to include U.S. Small Business within the search for Subject Matter Experts on the topic. The Panel was briefed on the topic of "Technology in Support of Shallow Water Surveys in Under 40m and the Blue Economy" and two talks on satellite-derived bathymetry but did not hear from TCarta who has two U.S. government-funded research and development programs geared at scalability, standardization, and novel satellite-based technologies to address this topic and is generally viewed as a global leader in this field. He asked if the panel is aware that TCarta delivered a large-scale high resolution satellite-derived bathymetry project to the OCS in 2020, and if they would want to hear about this technology, its deployment, complexities and ongoing advancements from a commercial provider with extensive experience. There have been many industry partners, big and small, who know TCarta's work and have recommended that TCarta present to HSRP. TCarta stands ready to present their work to the HSRP, as they directly align with the meeting's topic and HSRP's

purpose. It is unclear how an entity such as TCarta can go beyond public statements to be invited to the table.

Denis Hains commented that technology in support of shallow water surveys in under 40m and the blue economy is critical. He suggested that satellite-derived bathymetry should "always" be used where conditions allow. It is the best by far cost effective tool/means for reconnaissance, planning and to identify where multibeam echosounder and lidar surveys are needed or to complement other surveys. In addition, satellite-derived bathymetry allows users to create time series of the past where satellite imagery is available over time. Lidar is much better in terms of accuracy and precision than satellite-derived bathymetry, but much more expensive to fly and not needed everywhere. Where turbidity allows, satellite-derived bathymetry might be sufficient to detect and report hazards to navigation and changes on the seabed and coastlines. USVs equipped with multibeam sensors are great but much more time consuming, weather dependent, and expensive to operate. They should be deployed in areas where more accuracy and resolution is needed than satellite-derived bathymetry and lidar. All technologies must be used in complementarity for their respective value and resolution, and not be considered to be in competition.

Bob Moshiri, Johnson Outdoors, had previously brought up the subject of boating accidents during one of HSRP's meetings. The U.S. Coast Guard has reported that the latest statistics show a 26% increase in boating accidents and deaths jumped by more than 25%; these were mainly due to record numbers of inexperienced boaters. There certainly were other contributing factors, but knowing that a third of new 310,000 boats purchased in 2020 were by first time boaters, it is not a surprise that accidents increased. The U.S. Coast Guard report says alcohol remains a leading factor in fatal boating accidents. The fatality rate was 6.5 deaths per 100,000 registered recreational vessels, the highest in the program's recent history. Where the cause of death was known, 75% of fatal boating accident victims drowned, with 86% of victims found not wearing a lifejacket. The report cites a sharp increase in overall boating activity during 2020 as pandemic-related travel restrictions resulted in boaters spending more time aboard their vessels with family instead of traveling abroad. The report also shows that claims for property damage resulting from boating accidents in the U.S. totaled approximately $62.5m. Captain Scott Johnson, Chief of the Office of Auxiliary and Boating Safety at Coast Guard headquarters, recommended that new boaters should be directed to take a boating safety course before heading out on the water.

Kim Holtz, Port of Long Beach, commented that for GPS corrections, surveyors near land can connect to state and U.S. Geological Survey's Real Time Networks (RTN). The Port of Long Beach has set up an RTN that the pilots use for centimeter level accuracy. Their system is based on the California Spatial Reference Center base stations. Other states have similar systems.

Clark Alexander, University of Georgia, commented that there is a lot of nearshore/inshore mapping going on in the academic community. There is no clear path to getting this highly accurate and modern bathymetry integrated into the authoritative national dataset. A mechanism and point person for this effort is needed.

Cristina Forbes, U.S. Coast Guard, asked what NOAA's plans are to implement algorithms that include wind farms' effects in their atmospheric and ocean numerical forecast models. The U.S. Coast Guard's search and rescue efforts use NOAA ocean and meteorological numerical models to perform drift simulations of persons and vessels lost at sea for search and rescue and planning

missions. The modification of winds and currents downwind of wind farms are currently not being modeled in their ocean/meteorological operational forecast systems. Without accurate ocean currents and winds, search and rescue is concerned that the search locations might not be able to be successful. The collection of data in and around the wind farm will be essential for future verification of the model results. This is an issue that was not discussed but perhaps could be recommended as future action.

HSRP Discussion: HSRP Priorities, Issue Papers, Working Groups, other topics

Captain Anuj Chopra and Dr. Qassim Abdullah, Co-Chairs, HSRP Technology Working Group, provided an overview of the working group's recent activities, including presentations from Saildrone and XOCEAN. They have had many internal discussions on ASVs and USVs, and now they are hearing about subsurface and aerial vessels, as well as how all of the platforms can work together to gather data. They have discussed the application of swarm approaches among many other topics. The Co-Chairs gave a brief presentation on potential opportunities for improving the operational capability and competitiveness of U.S. ports and supply chain by providing leadership in precision navigation, navigation in restricted visibility, enhancing real-time sensors in congested waterways, cyber resilience, fostering offshore wind development, and digital twins for ports and their operations. Digital twins are dynamic, up-to-date replicas or representations of a physical object or system that continues to evolve with the flow of real-time inputs. Connection between the digital and physical worlds offers enhanced lifecycles, informed decision-making, past incident learnings, and predictive capabilities. They have been used in the aircraft and space industry for some time and have produced exceptional results. These are the areas the Technology Working Group thinks they should focus their work, develop further with the HSRP, and potentially provide recommendations to NOAA. **Galen Scott, Constituent Resources Manager, NGS, NOS, NOAA**, said the modernized NSRS will provide the spatial and temporal positioning that digital twins will be built in reference to. State geospatial information officers are assembling digital twins for cities in order to simulate flooding and other events.

Dr. Dave Maune and Julie Thomas, Co-Chairs, HSRP Planning and Engagement Working Group, discussed past issue papers and possible updates. The HSRP has produced 15 issue papers to date, most in 2016 and 2017 with revisions made in 2018. Dr. Maune sought to have new issue papers the Panel can vote on at their Spring 2022 meeting. Some members volunteered to work on issue papers, including Gary Thompson offering to update the issue paper on U.S. longitudes and elevations changing in 2022, Ann Kinner offering to update the issue paper on recreational boating, Nicole Elko offering to draft an issue paper on coastal resilience, and Deanne Hargrave will report back if she thinks offshore wind energy is a topic to take up as an issue paper. Ms. Hargrave suggested that data sharing opportunities and big data management might be a valuable topic for a future issue paper. Gary Thompson and Dave Maune will work on a public-private partnership issue paper. The Technology Working Group will look over their possible topics and decide which ones rise to the level of an issue paper, as well as revise their existing paper on precision navigation, potentially to include navigating in restricted visibility. Dr. Maune said it is incumbent on the HSRP members to think about the Administrator's comments and see if they can come up with ideas on where they can recommend ways to help advance his vision for the future.

Julie Thomas led a discussion on the HSRP priorities matrix. She reviewed each priority to ensure they were still relevant to the Panel's vision, discussed the current status of each, and entertained suggestions on modifications and actions. They will further consider whether to address the topic of restricted visibility as a Panel or to move it down the list of priorities. The IOOS Advisory Committee has asked if the HSRP would hold a joint session with them at some point in the future. They are planning to hold a spring meeting but the dates and location have not been decided. The IOOS Advisory Committee does not have official subcommittees, but could assemble small groups to meet with HSRP members in advance of a future meeting to develop topics where the two groups' interest overlaps. The HSRP staff will set up a meeting with the IOOS office to discuss this further.

Meeting Recap and Round Robin with HSRP members, Letter to the Administrator, and Wrap Up

Sean Duffy led the recap and members shared final thoughts on the meeting, including: there is a need to look at ways to survey 20m in-shore up rivers, as some of the changes happening on major American rivers could really drive the technology for navigation; there is a need to make sure agencies are prepared for datum changes coming in 2024; it was very valuable having ample opportunity for discussion with the panels; it will be challenging for end users to catch up with the advances and volume of data collected; the sensor presentation's emphasis on making surveys less expensive, more accurate, and more frequent is really important, especially as ships get larger and navigation parameters get smaller; it is interesting to see how uncrewed vessels have proliferated in every field of survey work; during the pandemic the number of recreational boaters have ballooned at the same time that many educational resources were not available, so there is a large class of operators who are not familiar with charts, rules, or what resources are available and NOAA needs to get information out to these people; PORTS should be federally funded to provide stable and consistent funding to expand and utilize PORTS data in support of the precision navigation products that will allow us to maximize American port assets; NOAA needs to create a profile and a position on data coming from offshore wind development; NOAA should continue to involve interagency and public-private cooperation; there are common themes around utilizing the data that is being gathered and making the most out of it; it could be valuable to highlight the impact of the HSRP over its history; the HSRP should look at water levels, coastal resilience, flooding, predictions, and how water levels are being measured; conducting NOAA and its contractors' missions in a sustainable way is a real concern for society; NOAA should place greater importance on its public relations and enhancing its image; CO-OPS' new branch for stakeholder services is a good move and a Public-Private Partnership Division with staff focusing on the topic might be a good idea; and there is a need for common data standards. Captain Sal Rassello, Captain Ed Page, and Ed Kelly made parting remarks. Rich Edwing said his takeaway from the sensor panel was just how far the technology has come in enabling large amounts of work to get done safely and efficiently. Juliana Blackwell said the Panel members' ideas and questions help NOAA understand a wide spectrum of stakeholder needs. Captain Armstrong expressed his appreciation to the panel speakers and participants and the HSRP for their engagement in the discussion. John Nyberg thanked everyone behind the scenes and the public that sent in comments.

Next Meeting

The next HSRP meeting is tentatively scheduled for March 9-11, 2022. The meeting was adjourned at 5:31 p.m.

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Attachment 1 Participants list, HSRP public meeting, September 1-2, 2021

HSRP VOTING MEMBERS IN ATTENDANCE:

Qassim Abdullah, Ph.D.	Vice President and Chief Scientist, Woolpert, Inc.; Adjunct Professor, Penn State University and University of Maryland Baltimore County
Capt. Anuj Chopra	CEO, ESGplus LLC
Sean M. Duffy, Sr., Co-Chair	Executive Director, Big River Coalition
Nicole Elko, Ph.D.	Science Director, American Shore and Beach Preservation Association; Executive Director, South Carolina Beach Advocates; President, Elko Consulting
Lindsay Gee	Mapping and Science Coordinator, Ocean Exploration Trust
Deanne Hargrave	Geoscience Manager, Atlantic Shores Offshore Wind LLC
Edward J. Kelly, Ph.D.	Executive Director, Maritime Association of the Port of NY/NJ
Capt. Ann Kinner	Owner, Seabreeze Books and Charts; Chair, San Diego Harbor Safety Committee
David Maune, PhD	Associate Vice President and Senior Remote Sensing Project Manager, Dewberry Engineers, Inc.

Capt. Anne McIntyre	Business Manager, San Francisco Bar Pilots
CAPT Ed Page (USCG, ret.)	Executive Director, Marine Exchange of Alaska
Capt. Salvatore Rassello	Director, Nautical Operations, Carnival Cruise Lines (retired)
Edward J. Saade	President USA, Fugro Inc. and Group Director Americas
Julie Thomas, Co-Chair	Senior Advisor, Southern California Coastal Observing System; Program Manager, Coastal Data Information Program, Scripps Institution of Oceanography (ret.)
Gary Thompson	Deputy Risk Management Chief and Chief, North Carolina Geodetic Survey, North Carolina Department of Public Safety

NOAA and NOS LEADERSHIP PRESENT:

Rick Spinrad, Ph.D.	Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator
Nicole LeBoeuf	Assistant Administrator, National Ocean Service (NOS), NOAA
Glenn Boledovich	Policy Director and Chief of Policy, NOS, NOAA
Mark Osler	Senior Advisor for Coastal Inundation and Resilience Science and Services, NOS, NOAA
John Nyberg	Deputy Hydrographer, Office of Coast Survey (OCS), NOS, NOAA, and acting HSRP Designated Federal Official
Capt. Andy Armstrong (NOAA, ret.)	Co-Director, UNH-NOAA Joint Hydrographic Center, University of New Hampshire
Juliana Blackwell	Director, National Geodetic Survey (NGS), NOS, NOAA
Richard Edwing	Director, Center for Operational Oceanographic Products & Services (CO-OPS), NOS, NOAA

NOS AND NOAA STAFF PRESENT:

Lynne Mersfelder-Lewis	HSRP Program Coordinator
Mike Aslaksen	NGS
Ashley Chappell	OCS
Melanie Colantuno	CO-OPS
Virginia Dentler	CO-OPS
Amanda Phelps	OCS
Galen Scott	NGS
Jill Stoddard	OCS

SPEAKERS:

Elizabeth Dewing Andrews	Lead Geophysicist, Ørsted Offshore North America
Mary Boatman	Science Coordinator, Office of Renewable Energy Programs, Bureau of Ocean Energy Management
Captain (U.S. Navy, ret.) Brian Connon	Vice President for Ocean Mapping, Saildrone
Deanne Hargrave	HSRP Member and Geoscience Manager, Atlantic Offshore Wind LLC
Commander Briana Welton Hillstrom	Chief, Hydrographic Services Division, OCS, NOS, NOAA
Carol Lockhart	Vice President and Chief Hydrographer, Woolpert, Inc.
Duncan Mallace	Chief Strategy Officer, XOCEAN
Ruth Perry	Business Environment Advisor, Offshore Wind Americas, Shell Renewables and Energy Solutions
Richard Stumpf, Ph.D.	Oceanographer, National Centers for Coastal Ocean Science, NOS, NOAA

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ATTENDEES:

Name

Domenico Accetta	Brent Ache	Brian Akers	Edward Albada
Clark Alexander	Christopher Amante	Mark Amend	Jeff Andrews
Joseph Arcano	Straud Armstrong	Krisa Arzayus	Mark Bailey
Bryan Balcome	Rebecca Barney	Courtney Barry	Megan Bartlett
Monique LaFrance Bartley	Colin Becker	Alessandra Bianchi	Rachel Bobich
Harold Boeschenstein	Justin Bordelon	Mary Bourgoyne	Philip Bourque
Donald Bowen	Jorge Brenner	Roger Briggs	Steve Brodet
Scott Brotemarkle	Aaron Broughton	Philip Brown	Rebecca Brown
Samantha Bruce	Clay Bryant	Andrew Bull	Patrick Burke
Rosemary Burkhalter-Castro	Douglas Burnett	Austen Burnside	Amber Butler
Desiree Butler-James	John Byrd	Dana Caccamise	Leslie Canavera
Edward Carlson Koterba	Kathy Carpenter	Shelly Carroll	Pamela Chelgren-
Chuanxu Chen	Emily Clark	Devon Colbeck	John Conyon
Justin Cooper	Jose Cordero	Chris Coyle	Jason Creech
Donald Darling	Ian Davies	Lauren Decker	Freedom Dennis
Daniel Determan	Paul Devine	Catherine Dietrick	Paul DiGiovanni
Geoff Dipre	Christopher DiVeglio	Stacy Dohse	Erin Donahue
Rob Downs	James Doyle	Jenna Ducharme	Darla Duet
Clint Edrington	Claire Enterline	Ben Evans	Rod Evans
Chelsea Fairbank	Colleen Fanelli	Tim Farrow	Jeffrey Ferguson
Nicole Fernandes	Italo Ferreira	Eric Fischer	James Fisher
Roger Flood	Bagnoumana Bazo Fofana	Cristina Forbes	Cherisa Friedlander
Mario Frontado	Kimberly Galvez	Sylvain Gautier	Brandy Geiger

John Gerhard	Heather Gilbert	Sherryl Gilbert	Matthew Gipson
Peter Glick	Pam Goddard	Elizabeth Godsey	Kyle Goodrich
Carl Gouldman	Karen Gouws	Alastair Graham	Dale Gump
George Hagerman	Denis Hains	Robert Hamilton	Cheryl Hapke
Shayan Haque	Simon Hardern	Heather Harrison	Karen Hart
Phil Hartmeyer	James Haussener	Chrissy Hayes	Dwayne Hemmer
Jack Herbert	Alex Hess	Lucy Hick	Sue Hoegberg
Matt Holland	Brad Holleman	Susan Holmes	Amanda Holt
Daniel Holt	Kim Holtz	Matt Hommeyer	Liesl Hotaling
Gerald Hovis	Karen Hyun	Joshua Ibeakanma	Christopher Ilori
Stephanie Ingle	Sean Ireland	Will Jacobi	Inseong Jeong
Rachel Johnson	Shawntel Johnson	Rex Jones	Jim Joy
Noelani Kalipi	Mark Kasinskas	Analise Keeney	Jena Kent
Rada Khadjinova	John Kidd	Brad King	Shana Kinsey-Carlsen
Nic Kinsman	Keith Kneale	Jack Koban	Liz Kretovic
Jake Kritzer	Matt Kroll	Marta Kumle	Rick LaBlond
Tony LaVoi	Nicole Lawson	Vincent Lecours	Arron Lee
Chris Lee	Randy Lewis	Stuart Lilly	Charles Linderman
Carolyn Lindley	Nathan Littlejohn	Yonggang Liu	Scott Lokken
Matthew Long	Nina Loutchko	Scott Lundgren	Audra Luscher
Mark Luther	Mark MacDonald	Mike MacFerrin	Andrew MacInnes
Ross Mackay	Chris Macon	Shawn Maddock	Courtney Malott
Louis Maltais	Damian Manda	Hannah Marshburn	Jose Martinez Diaz
Evan Martzial	Alexis Maxwell	Bob McConnaughey	Andrew McCoy
Laura Rear McLaughlin	Rennie Meyers	Steven Meyers	Michael Michalski
Kate Mickelson	David Millar	Joyce Miller	Bryna Mills
Yasuyuki Miyoshi	Jonathan Morris	Robert Morris	Rick Morton
Kenneth Moser	Bob Moshiri	Gregory Mount	Cliff Mugnier
Steven Murawski	Harry Murphy	David Naar	David Neff

Gary Nelson
Alberto Costa Neves
Guy Noll
Ashley Norton
Daniel O'Connell
Casey O'Heran
Summer Ohlendorf
Jacquelyn Overbeck
Hadley Owen
Hillary Palmer
Leonardo Paranhos
Chris Paternostro
Meredith Payne
Eric Peace
Derrick Peyton
Joel Pfeiffer
Cesar Pimenta
J.J. Plunkett
Marshall Pounds
Julia Powell
Vitad Pradith
Daniel Prouty
Dave Purnell
Ken Quinones
Mohamed Radwan
Peter Ramsay
Jenifer Rhoades
Renee Richards
Sage Riddick
Katie Ries
Ellie Roberts
Luis Rodezno
Jackie Rolleri
Nicholas Rome
Catalina Rubiano
Greg Rudolph
Walter Runck
Robin Trinko Russell
Houssem Sadki
Melissa Sampson
Jay Satalich
Glen Schaefer
Erin Schnettler
Steve Schwartz
Peter Schwarzberg
MaryRose Sheldon
Matt Shultz
Ana Sirviente
Dave Skolnick
Marine Slingue
Jason Smith
Jesse Smith
Rob Smith
Shane Smith
Shepard Smith
Mark Smits
Drew Stephens
Jay Sterne
Peter Stone
Quentin Stubbs
Peter Swanson
Christine Taylor
Jordan Taylor
Melissa Taylor
David Tedford
Mike Thompson
Steve Thur
Ross Timmerman
Chris Tran
Lora Turner
Cristina Urizar
Praveen Vamadevan
E.J. Van Den Ameele
Jan van Smirren
Jorge Viso
Jennifer Walden
Carrie Wall
Gerard Walter
Marielle Walter
Jessica Ward
Kyle Ward
Nathan Wardwell
Meredith Westington
Marian Westley
Jeremy Wetzel
Dave White
Bastian Wichand
Ben Williams
Matt Wilson
Verner Wilson
Alyssa Winchell
Charles Wisotzkey
Jennifer Wozencraft
Daniel Wright
Darren Wright
Abraham Yehuda
Caitlin Young

Attachment 2 Public Comments, HSRP public meeting, September 1-2, 2021

Advance Public Comments

1) From: Cliff Mugnier, LSU
   The LSU C4G wants to install, maintain, and operate CORS at offshore oil & gas platforms (GoM). We need NOAA help to recruit.

2) From Cristina Forbes, US Coast Guard
   Need accurate modeled surface currents and winds in and around wind farms for USCG search and rescue missions.

3) From: Jose Martinez Diaz, Fugro
   Keep the good work to ensure dissemination of data/information/tools find the target audiences and users, public and private.

4) From: Clark Alexander, SKIO, University of Georgia
   We need to create a pathway and methodology for integrating bathymetry derived by non-NOAA entities into national databases

5) From: Matt Holland, XOcean
   Increase the use of Uncrewed Surface Vessels (USVs) for data collection to improve safety and lower environmental impact.

6) From: Guy Knoll, ESRI
   Blue economy is more than ops risk assessment (see EVERGIVEN) and needs digital infra baseline. Other sectors use GIS tools.

7) From: Rob Smith, Vice President Energies and Infrastructures Business Unit, Woods Hole Group
   Expanded NOAA real-time systems will be crucial for future port facility resilience, safe navigation & maritime operations.

8) From: Christopher Ilori, Simon Fraser University
   Physics-based satellite derived bathymetry (SDB) can be used for mapping shallow water (where clarity allows).

9) From: Verner Wilson, Senior Oceans Campaigner, Friends of the Earth, AK
   Question: Have you notified Native American Tribes as part of your government-to-government trust responsibility of this work?

10) From: Summer Ohlendorf, National Tsunami Warning Center (NOAA/NWS)
    A more consolidated approach to managing mapping efforts.

11) From: James Doyle, RPS Group
Easier to use software.

12) From: Houssem Sadki, Tunisian Navy
WebGis

13) From: Chelsea Fairbank, SBG Systems
Low SWAP INS and batch processing of INS data in Qinertia

14) From: Rada Khadjinova, Fugro-Alaska Area Manager - letter

Dear HSRP: Thank you for the opportunity to comment and for the work NOAA does both nationally and in Alaska, where I live and work. The baseline Geo-data and observations NOAA shares with the public make meaningful, positive difference to safety in navigation, while also protecting the built and natural environment and is essential to growing the blue economy and ensuring resilient coastal communities. I share your tremendous sadness at a loss of Rear Admiral Richard "Rick" Brennan, who I had the privilege of meeting in Alaska. During his visit in 2018, I saw first-hand his passion for hydrography, science, and innovation, and for building bridges across services, sectors, and mandates. His energy and hard work made a difference in the hydrographic health of our nation and especially in Alaska.

Fugro, as an active private sector contributor to the same mission, wants to see Admiral Brennan's efforts continue to grow. What do I mean by that? For Alaska, where the Geo-data gaps are vast and coastal mapping programs are in their infancy, one of the first steps is completing the Vertical Datum Transformation (VDatum) tool beyond the Alaska Southeast regional model. VDatum is an essential pre-requisite for efficiently acquiring and merging topographic and bathymetric datasets, which are the basis for informed decision-making for a sustainable blue economy and coastal resiliency.

As the Alaska Coastal mapping execution strategy is being finalized, it is my hope that the government takes full advantage of private-sector contributions. Qualified contract surveyors are ready and able to participate in what will be a very heavy lift to map the most variable and the longest coastline in the nation. If Alaska's hydrographic backlog is any indication, completing the Alaska coastal mapping within the next 10 years will require all hands-on deck. Collaboration with the private sector is the fastest route to tapping into technology innovations, optimizing technical approaches specific to different coastal areas, and increasing overall execution capacity. Fugro and other private sector firms provided practical suggestions through formal comments to the draft Alaska Coastal Mapping Strategy, and we look forward to seeing the difference those comments will make in the final execution strategy.

I am particularly proud of our most recent innovation in airborne lidar bathymetry (ALB) sensor technology, which combines superior depth penetration and data density while reducing fuel requirements by up to 98 % compared with legacy sensors used today. This technology is

drone-capable, and can offer dramatic gains in coastal mapping efficiency, data quality, and carbon reduction in the US, just like it has for numerous other national hydrographic agencies around the world. In Alaska, where airports are few and far between and backcountry airstrips have short dirt or gravel runways, a full-depth ALB sensor deployed from a rotary of fixed wing drone means simplified logistics, dramatic gains in efficiency and pace of collection.

Of equal importance is collaboration across agencies. In the context of Alaska coastal mapping, the value of coordination and collaboration between NOAA NGS, NOAA OCM, and the USACE JALBTCX cannot be overestimated. Afterall, the "J" in JALBTX stands for "joint". Fugro is eager to hear more about how USACE- and NOAA-led efforts are being coordinated, and how we, as private-sector stakeholders and potential contributors, can find on-ramps to these parallel efforts, which would also help reduce duplication and increase efficiency.

Talking about efficiency, this year Fugro was excited to again be back in Alaska surveying for NOAA, my home state. Despite the ongoing challenges of Covid-19, we successfully collected over 4,000 linear nautical miles around Unimak Island, an area whose maps in some cases predate the 1940s. We used satellite reconnaissance data to optimize and de-risk our operations in the shallow nearshore, found lots of kelp and two uncharted shipwrecks. We demobilized on the same day as the 6.9 magnitude earthquake, the epicentre of which was in very close proximity to our operations. It should be noted that coastal nearshore bathymetry is used not only for safety in navigation but also by many other agencies in our state to manage land and resources like forests, minerals, and seafood. This specific area of Aleutians is an important fishing ground. NOAA Geo-data is foundational for multitude of government agencies, researchers, and private sector stakeholders to achieve their respective objectives. So the pace of reducing hydrographic data gap in Alaska, including priority coastal areas should be increased. On a positive note, 2021 is the first in the last 5 years when multiple private sector contractors and NOAA have been tasked in Alaska.

In conclusion, I want to recognise the good work of HSRP and one specific HSRP member, my fellow Alaskan, Ed Page whose service on the board is coming to an end, thank you for your service Ed, and thank you for representing Alaska so well.

Yours faithfully, Rada Khadjinova, Fugro-Alaska Area Manager

Sept 1, 2021 Public Comments:

1) From: From: Rada Khadjinova, Fugro
Question to OCS and NGS / USACE:

Administrator Spinard talked about NOAA's primacy over authoritative foundational geo-data including shallow water and coastal bathymetry. Looking at the Infrastructure bill and overlapping mandates between NOAA and USACE on the coast, appreciate more context of how AK Coastal Mapping program is envisioned to be coordinated between NOAA/ USACE/

JALBCX and how private sector contract partners can find onramps to increase use of advanced technology to increase pace and scope of data collection. Thank you.

2) From: Denis Hains, h2i

Thank you for the HSRP members leadership; and for the professional introductions from the VIPs so far. Your opening and transparency to invite public participation is much appreciated and demonstrate the US-NOAA's commitment to listen, consider and implement public feedback and comments. :-)

Excellent presentations Andy, John, Julianna & Richard. Impressive work accomplished, congrats! I understood from Andy-JHC that international collaboration is currently taking place in the Arctic MB cruise with Canada. Q (to read to presenters)- Are there other specific initiatives in OCS, NGS and CO-OPS that are conducted in collaboration with contiguous countries to US to maximize outputs & outcomes?

3) From: John Byrd, U.S. Geospatial Executives Organization

Part one of question: I'm John Byrd with the U.S. Geospatial Executives Organization, U.S. GEO, a coalition of CEO's and senior executives of the nation's leading geospatial firms, including several that perform hydrographic surveys. The LoBiondo Coast Guard Authorization Act of 2018, PL 115-282, included the current Hydrographic Services Improvement Act reauthorization. In section 1002 NOAA was required to submit two reports to Congress. One was a method for comparing the cost of NOAA performance of hydrographic surveys with the cost of contractor performance. That was due to Congress one year after the date of enactment, which would have been December 4, 2019. The second was a strategy for how NOAA will increase contracting with nongovernmental entities for hydrographic data collection. That was due 180 days after the date of enactment, which would be June 2, 2019. According to the committees of Congress with jurisdiction over NOAA's hydrographic surveying, those reports have not been submitted.

Part two of question: These address questions HSRP has raised many times in the past. I'm wondering if the HSRP is aware of these provisions of law, has HSRP been consulted in the preparation of these deliverables to Congress, the status of these reports, NOAA's process for seeking private sector input to the development of these reports, and if they have not yet been submitted, why have the deadlines set in law by Congress been violated, and when the reports will be provided to Congress? These are important long standing issues and I appreciate HSRP providing this time for me to comment and ask these questions. Thank you.

4) From: Shawntel Johnson, Director of Business Development, Ocean Infinity

With the hydrographic survey technology improving and more contractors available to assist in the backlog and mapping goals, is there any possibility of opening the 5 year hydrographic survey contract for rolling admissions to allow new industry partners the opportunity to participate? If so, when does the HSRP anticipate this occurring?

Thank you in advance. Shawntel Johnson, Director of Business Development, Ocean Infinity

5) From: Denis Hains, h2i
Very interesting session on Offshore Wind Energy and Ocean Mapping. It's all about Hydrospatial (Blue Geospatial, Economy and Knowledge)... Q (to be read to presenters): Are you seeing ALL data "openly and freely" shared with no restrictions? Do you see that some data sets might not be shared for commercial or defence restrictions? Are you making sure that the all the data you'll contribute will be respecting Standards to be easily Findable, Accessible, Interoperable, and Reusable?

6) From: Jason Creech, David Evans and Associates, Inc.
Public comment / question. I apologize if this was already discussed. Are there any MOUs, partnerships etc. between offshore wind operators and the federal government that would allow installation of scientific sensors on the wind platforms? I see lots of potential to push critical NOAA programs into the offshore environment …. CORS, VDatum, tides, state GPS RTNs, to name a few.

7) From: Joyce Miller, University of Hawaii
What is the status of getting interagency agreements and contracts better streamlined? This was an on-going HSRP issue since at least 2011.

8) From: Guy Noll, ESRI
California looking at Morro Bay because there is an old coal station there, and the Nuclear plant at Point Diablo is just to the south, so that is where the grid tie can be utilized. Yes, a bit deep, but floating wind farms are also possible.

Sept 2, 2021 Public Comments:

1) From: Carl Gouldman, Chief, IOOS
Keep working with customers to refine your service delivery.

2) From: Praveen Vamadevan, Fugro
Fugro can provide reliable Geo-data effectively and to the highest standards, contributing to safe navigation & development.

3) From: Andrew MacInnes, Moonbeam Sail
Prepare more consumer near shore charting for public access to and from waterways that may be outside navigable waterways

4) From: Alessandra Bianchi, SeaTrac Systems, Inc.
SeaTrac's versatile, persistent carbon-neutral uncrewed surface vehicle ready to assist in shallow mapping and ocean monitoring.

5) From: Chelsea Fairbanks, SBG Systems

Having worked in hydrography since 2011, first with Fugro and following, Teledyne, there are very few options for Inertial Navigation for surveyors. I now work with SBG Systems which manufactures both Inertial Navigation and Post-processing software. The solution has been adopted by the French Hydrographic agency SHOM.

What are the common avenues for private companies, such as SBG, to introduce new developments/technology?

6) From: Kyle Goodrich, President & Founder, CARTA

I fear that the HSRP is missing out on technology developed by TCarta under a NSF-funded SBIR grant to produce global 10m Satellite Derived Bathymetry, deploying Deep Learning to process the entirety of the ICESat-2 archive, and employing cloud computation to process every image collected in U.S waters, among numerous other advancements in Satellite Derived Bathymetry. I would strongly encourage the HSRP to take a wider view on who it invites to brief the panel to ensure the panel receives the current state of the technology across the various experts - not just NOAA and Prime contractors. I encourage the Panel to include U.S. Small Business within your search for Subject Matter Experts on the topic.

The panel is hearing on the topic of "Technology in Support of Shallow Water Surveys in Under 40 Meters and the Blue Economy" and two talks on SDB but is not hearing from TCarta who has two U.S. Government funded research and development programs (totaling over 1.5 million dollars of government investment, and more than 5 years of RnD, and counting) geared at scalability, standardization, and novel satellite based technologies to address this topic and is generally viewed as a global leader in this field.

Is the panel aware that TCarta delivered a large-scale high resolution SDB project to the OCS in 2020? Would they want to hear about this technology, its deployment, complexities and ongoing advancements from a commercial provider with extensive experience? There have been many industry partners, big and small, who know our work & have recommended as recently as today that TCarta present to HSRP. We stand ready to present our work to you, as it directly aligns with today's topic and HSRP's purpose. Yet, we are unclear how an entity such as TCarta can go beyond public statements to be invited to the table, perhaps as part of the spring meeting? Best regards, Kyle Goodrich

7) From: Denis Hains

Technology in Support of Shallow Water Surveys in Under 40 Meters and the Blue Economy is critical. Excellent presentations by 3 presenters (C.Lockhart, D.Mallace, R.Stumpf). A comment (to read) for the HSRP: It is suggested that Satellite-Derived Bathymetry (SDB) should "always" be used where conditions (water turbidity) allow. It is the best by far cost-effective tool/means for reconnaissance, planning and to identify where MBES and LiDAR surveys are needed or to complement other surveys. In addition SDB allows to create time-series of the past where satellite imagery is available over time... LiDAR is much better in term of accuracy and precision than SDB, but much more expensive to fly and not needed everywhere... where turbidity allows SDB might be sufficient to detect and report hazards to navigation and changes on the seabed and coastlines... USVs equipped with MBES are great, they are the best

with also ship-based but much more time consuming, weather dependant and expensive to operate; they should be deployed in areas where more accuracy and resolution is needed than SDB and LiDAR! All technologies must be used in complementarity for their respective value, resolution and "not" be considered in competition. :-)

8) Bob Moshiri, Johnson Outdoors

I had brought up the subject of boating accidents during one of previous meetings. The US Coast Guard just reported that the latest stats show 25% increase in boating accidents, mainly due to record number of inexperienced boaters. There certainly were other contributing factors, but knowing that a third of new 310,000 boats purchased in 2020 were by first time boaters, it is not a surprise that accidents increased.

US Coast Guard study shows 26% increase in boating accidents last year as numbers of new boaters surge

According to a newly released report by the US Coast Guard, the number of boating accidents in the US increased by more than 26% in calendar year 2020 and the number of deaths jumped by more than 25%, reflecting higher numbers of inexperienced boaters taking to the water. Among the findings in the agency's 2020 Recreational Boating Statistics Report, the number of boating accidents was reported as 5,265, up by 24.3% from the 4,168 boating accidents reported during 2019. A US Coast Guard report says alcohol remains a leading factor in fatal boating accidents 8/9/2021 US boating accidents up in 2020 | News | International Boat Industry

https://www.ibinews.com/market-intelligence/us-boating-accidents-up-in-2020/39686.article?utm_medium=email&utm_campaign=Weekly IBI Daily Ne… 2/2

The Coast Guard reported 3,191 injuries resulting from those accidents – up by 24.7% over the 2,559 injuries reported in 2019 – and 767 fatalities for a 25.1% increase over 2019 figures. The fatality rate was 6.5 deaths per 100,000 registered recreational vessels, the highest in the program's recent history. Where the cause of death was known, 75% of fatal boating accident victims drowned, with 86% of victims found not wearing a lifejacket. The report cites a sharp increase in overall boating activity during 2020 as pandemic-related travel restrictions resulted in boaters spending more time aboard their vessels with family instead of traveling abroad. The Coast Guard also cited increased numbers of inexperienced, new boaters on the water, as evidenced by higher numbers of boat sales to first-time buyers. Alcohol continued to be the leading known contributing factor in fatal boating accidents in 2020, accounting for more than 100 deaths, or 18% of total fatalities. The report also shows that claims for property damage resulting from boating accidents in the US totaled approximately $62.5m. Captain Scott Johnson, chief of the Office of Auxiliary and Boating Safety at Coast Guard headquarters, recommended that new boaters should be directed to take a boating safety course before heading out on the water.

9) Kim Holtz, Port of Long Beach
For GPS corrections you are near land you can connect to State and USGS Real Time Networks (RTN. At the Port of Long Beach we have set up a RTN that the pilots use for cm level accuracy. Our system is based on Calif Spatial Reference Center base stations. Other States have similar systems.

10) Clark Alexander, University of Georgia
New comment - there is alot of nearshore/inshore mapping going on in the academic community. There is no clear path to getting this highly accurate and modern bathymetry integrated into the authoritative national dataset. A mechanism and point person for this effort is needed.

11) From: Cristina Forbes, USCG
What are NOAA plans to implement algorithms that include wind farms effects in their atmospheric and ocean numerical forecast models?

The USCG-SAR uses NOAA ocean and meteorological numerical models to perform drift simulations of persons/vessels lost at sea for search and rescue and planning missions. The modification of winds and currents downwind of wind farms are currently not being modeled in their ocean/meteorological operational forecast systems. Without accurate ocean currents and winds, USCG-SAR is concerned that the search locations might not be able to be successful. The collection of data in and around the wind farm will be essential for future verification of the model results. This is an issue that was not discussed but perhaps could be recommended as future action.