National Oceanic and Atmospheric Administration
Hydrographic Services Review Panel

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Doubletree by Hilton Hotel
Salon AB
300 Army-Navy Dr.
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Transcript
Day 1
9:00 a.m.-5:30 p.m.

Mr. Nathan Wardwell: I think we'll go ahead and get started here. Welcome, everyone. I'm so pleased to be here in person as Chair of HSRP. And I'm really looking forward to what we have planned today. It's been a couple of years, and so having an in-person meeting is going to be great. I'm really looking forward to this. I'm Nathan Wardwell, Managing Partner at JOA Surveys, a survey company based in Anchorage, Alaska. I'd like to take a moment to recognize and warmly welcome Ms. Rachael Dempsey, the Deputy Assistant Administrator for the National Ocean Service. Welcome to the Fall 2026 Hydrographic Service Review Panel. And I get to do the actual gavel. So all right.

Welcome to our newest members, Jay Satalich, looking forward to it, and Kate Mickelson. They're both in the room. Yeah, round of applause. Not with us in person today are Jeanne Ferrer, who is hosting the AAPA meeting happening in our home port of New Orleans. And we're looking forward to having her expertise on the panel going forward.

With new beginnings come the end to others. This meeting marks the last in-person meeting for three of our members, Deanne Hargrave, Anuj Chopra, and Nicole Elko. So thank you for your time on the panel. And we still get to work together for a few more months, and looking forward to that.

It's great to see NOAA leadership here today, Rachael Dempsey, Rear Admiral Chris van Westendorp, Dr. Marian Westley, Captain Andrew Armstrong, and welcome to Laura Rear McLaughlin, who will be joining us here shortly. She's the new Deputy Director of the National Geodetic Survey as her new role.

It was very nice to see many familiar faces this week at the Alaska Geo Summit, where we heard about natural hazards and the challenges of mapping Alaska. We had a great opportunity to tour around Prince William Sound and see the natural beauty of Alaska and everything that goes along with that-- providing geospatial services to the State to

achieve challenges, to overcome challenges. And it was a great summit. So hopefully we can get more people to join us going forward.

Now I'll hand it over to Galen. If you can please go over some administrative matters before we go ahead and get started.

Mr. Galen Scott: Is this mic working? Good?

Mr. Nathan Wardwell: Yeah, I believe they're all live.

Mr. Galen Scott: All right, good. So I'm Galen Scott, and I am honored to be here to give you a reminder about privacy and a disclaimer.

The privacy disclaimer is to set the rules and regulations for all that are part of this meeting, both in person and virtually. This is to assist and protect our organizers, panel members, speakers, and attendees. For all speakers today, please respect the posted agenda times and any guidance given by organizers, so we can stay on time and have ample time for all of the topics that we will cover during the meeting. For our virtual attendees, please use the questions pod found in the panel on the bottom of your screen. Can we go to slide two?

You can submit comments or questions at any time that can be shared during our public comment period at our scheduled time in the agenda. You can also follow up with us at any time with an email to hydroservices.panel@NOAA.gov. If you're having any connectivity problems at any time, please contact virginia.dentler@NOAA.gov.

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Admiral van Westendorp, over to you.

Rear Admiral Chris van Westendorp: Thank you, Galen, for those reminders. And thank you, Nathan, for kicking us off. It's good to see everyone here. Good morning, I'm Admiral Chris van Westendorp, Director of NOAA's Office of Coast Survey, and happy to serve as the Designated Federal Official for the Fall 2026 meeting of the Hydrographic Services Review Panel. I want to welcome all of the HSRP members, congressional staffers, partners, stakeholders, and NOAA staff. Thank you all for joining us in person and on the webinar.

Before we get the meeting started, I will go over some necessary logistics. Restrooms, if you haven't found them already, are located to the right of the elevators as you walk out.

Emergency exits are located at the front, rear, and side of the room. HSRP members are reminded of the ethics requirements for public meetings in your capacity as a special government employee.

Your service to strengthening NOAA's Hydrographic and Navigation Observations and Positioning Services portfolio is greatly appreciated. The NOAA Administrator, DAA Dempsey, my fellow directors, and I all appreciate your vision and really are grateful for your presence and your service on this panel.

Back to you, Nathan.

Mr. Nathan Wardwell: All right, great. Well, we have all the logistics out of the way now, and we can go ahead and move into introductions for the panel. We're a little ahead of schedule. We've got a few extra minutes, I think. So attendees, you can find member and speaker bios in the advanced materials on the web. And then, members, we'll go around the panel, around the table, alphabetical order, and just introduce your name, organization, job title, and geographic location. And I believe we're starting with Ms. Mary Paige Abbott, over here.

Ms. Mary Paige Abbott: Good morning, I'm Mary Paige Abbott, and I reside currently on the East Coast of Florida, formerly on the West Coast of Florida. I am a past Chief Commander of the United States Power Squadron's America's Boating Club. And my contribution to the panel is that, as a recreational boater, I have had the privilege of boating myself through the Great Lakes, Mississippi River, Gulf of, at the time, it was the Gulf of Mexico, and the coast of Florida, pretty much having done nearly the Great Loop. But regardless, I pretty much have that experience, and it's a different perspective than some of our other members of the panel. Thank you.

Mr. Nathan Wardwell: It goes over next to you, Qassim.

Dr. Qassim Abdullah: Oh, sorry, Qassim Abdullah. I'm Vice President and Chief Scientist with Woolpert, and I also teach at UMBC and Penn State. I've been here on this panel for like seven years now, and I will be looking forward for today's agenda. Thank you.

Captain Anuj Chopra: I think this one. I'm on. Okay, awesome. Sorry, the light wasn't coming on. Good morning, everyone. Pleasure to be here. Anuj Chopra, I'm based out of Sugar Land, Texas. I wear a few hats at the moment. I teach at University of Houston on supply chain. I do risk consulting, project risk consulting under ESGplus. And I'm an independent board member on a tokenized ship finance platform, a fully regulated ship finance platform. But today and tomorrow I'm looking forward to our issue paper on precision navigation. I'm a mariner. I sailed for 15 years, ran ships for 20 years, so want

to share that expertise and see how we can make this better. Looking forward to today and tomorrow. Thank you.

Captain Alex Cruz: Good morning, my name is Captain Alex Cruz. I'm from Ponce, Puerto Rico. I'm a Senior Harbor Pilot for the island, also owner of West Indies Marine Services, Vice Chairman of the South Coast Safety and Security Committee. I've been with HSRP for 5 years now, I believe, and looking forward to work with you all during these sessions. Thank you.

Dr. Nicole Elko: Good morning, my name is Nicole Elko. I am based outside of Charleston, South Carolina. Thank you for having me remotely today. I also wear several hats. I'm the president of a consulting firm where I work with communities on coastal resilience. I'm the Executive Director of two nonprofit organizations, one here in South Carolina called the South Carolina Beach Advocates. The board is the mayors of the South Carolina communities from North Myrtle Beach to Hilton Head. And I'm the Executive Director of the American Shore and Beach Preservation Association, a national organization that is in our 100th year. We're getting ready to have a centennial celebration next week, which explains my absence and I do look forward to the conversations this week. Thank you for having me.

Ms. Deanne Hargrave: I'm Deanne Hargrave. As Nathan said, this is my last in-person HSRP meeting, but look forward to staying engaged after this one. I'm recently retired as a Geoscience Manager from Shell. Since our last meeting, I've relocated back to Alaska. My journey started in Alaska with this group, and now it's ending there. And along the way, we've had a nice journey. So I really appreciate that. Look forward to working on the Arctic issue paper, which we, my first meeting, we worked on, and it's so interesting to see how much has changed in that short period. I'm very happy to be here and see everybody in person. So thank you.

Mr. Nathan Wardwell: Kim's not on the line? Okay. Well. It is. This is true. This is true. Earlier in Alaska. Carolyn. Yes, over here.

Captain CarolynKurtz: Good morning, everybody. I'm Carolyn Kurtz. I'm a retired Tampa Bay pilot and holder of an unlimited master's license. I shipped out for several years before becoming a pilot. And currently, I'm a part-time ship handling instructor at Maritime Pilots Institute in Louisiana. And I'm just really excited to be here for my first in-person meeting after being on the panel for 2 years. So hello and thank you.

Mr. Nathan Wardwell: Great, Kate.

Ms. Kate Mickelson: Good morning, my name is Kate Mickelson. I'm the Executive Director for the Columbia River Steamship Operators Association. We're located in

Portland, Oregon, and we represent vessels, deep-draft commercial shipping vessels, that are calling the Columbia, Willamette, Snake River System and the Oregon Coast ports. This is also my first meeting in person, many virtually. But I'm thrilled to be here thank you.

Dr. Tuba Özkan-Haller: Good morning, everybody. My name is Tuba Ozkan-Haller, and I hail from Oregon as well, where I am currently the Dean of Oregon State University's College of Earth, Ocean, and Atmospheric Sciences. Before becoming Dean, I worked there 25 years now as a faculty member. My area of expertise is really within the near shore and coastal ocean, and much of my work has been geared towards building and implementing predictive models of ocean conditions that have been used primarily really for navigational planning purposes. So I have worked for example, with the Columbia River Bar Pilots and other ocean users around how to bring forecasting tools to bear on decisions that they're making. And I am looking forward to this meeting. Thank you for having me.

Mr. Eric Peace. Good morning. Eric Peace, Vice President of the Lake Carriers Association, which represents the U.S. Flag Fleet on the Great Lakes, based out of Cleveland, Ohio.

Mr. Nathan Wardwell: Rebecca is online. Rebecca, if you can go ahead.

Ms. Rebecca Quintal: Hello. Rebecca Quintal. I am on the panel contributing through my experience with hydrographic surveying. I live in Rhode Island, and I regret that I'm not with everyone today in person.

Mr. Nathan Wardwell: Thank you very much. Jay.

Mr. Jay Satalich: Jay Satalich. Good morning. I am the Chief of the Office of Surveys at Caltrans District 7 in Los Angeles. Our jurisdiction is Los Angeles and Ventura counties. I'm a professional land surveyor and GIS professional. My professional background includes a lot of work in geodetic surveying, photogrammetry, and airborne LiDAR.

Mr. Nathan Wardwell: Thank you, Jay. We're cruising right along. We've got plenty of time here that we'll figure out how to fill. For those that were not able to attend in person, Nicole and Kim and Rebecca, thank you for joining us virtually online. Looks like maybe I'm introducing myself. So I'm Nathan Wardwell. I'm Managing Partner, JOA Surveys, located in Anchorage, Alaska. I studied at UNH under Captain Andy Armstrong. I also wear a few different hats. I'm on the advisory board for University of Anchorage, Alaska within the geomatics department and help out with the Alaska Water Level Watch Steering Committee in Anchorage, Alaska. Water levels has kind of been my passion for a long time along with Alaska.

I've been on this panel for about 6 years now. It's been a great honor to be part of this panel. One of the major values that I see with this panel is our opportunity to get input from different regions of the country and find out what the stakeholders need. And there's always common themes: geodesy, water levels, waves, winds, better charts. But there's also unique challenges in each location. And with my perspective, being in Alaska with our challenges, but then also in the Great Lakes region and the Mississippi region, every location has its challenges. And getting that input from the stakeholders so we can then gather recommendations for the Administrator on how to improve and innovate is of great value.

So thank you, looking forward to great discussions today. And if our NOAA leadership could go ahead and please introduce yourselves, starting with Ms. Dempsey. And then our non-voting members, if I can read correctly. So yeah, then we'll move on to our panel.

Ms. Rachael Dempsey: All right, good morning, everyone. Rachael Dempsey. I am the NOS Deputy Assistant Administrator. Actually, those of you who've known me for some time, I am filling the role of the Navigation, Observations, and Positioning, DAA, which means that I've been here at HSRP since I started here. But I'm also filling the role as the DAA for Ocean Services and Coastal Zone Management at this point in time. So thank you for having me.

Mr. Nathan Wardwell: Captain Armstrong.

Captain Andy Armstrong: Thank you, Nathan. Thank you for the little plug, too.

Mr. Nathan Wardwell: You're welcome.

Captain Andy Armstrong: So I'm Andy Armstrong, retired NOAA Captain and presently a NOAA civil servant. I'm the NOAA Co-director of the NOAA UNH Joint Hydrographic Center and in that capacity I'm a non-voting member of the panel. I'm also now the Director of NOAA's new Center of Excellence for Operational Oceans and Great Lakes Mapping, based also at the University of New Hampshire. Thank you.

Mr. Nathan Wardwell: Great, thank you very much. Dr. Marian.

Dr. Marian Westley: I'm Dr. Marian Westley. I'm the Director of CO-OPs, the Center for Operational Oceanographic Products and Services. And since January, I've been double- hatted as the Acting Director of the National Geodetic Survey. Job number one was to hire a strong Deputy Director. So I hired Laura Rear McLaughlin, who had been, I think many of you know she had been the Mapping and Charting Program Manager in CO-OPS before, so well-known to all of us. And I did send her to Alaska, so she's a little underslept.

Mr. Nathan Wardwell: Yes, great, thank you. And Laura is, oh, jeez. You made it. You snuck in here. Last time I looked over there, that seat was empty and now it's full. So perfect timing. You get a chance to introduce yourself.

Ms. Laura Rear McLaughlin: Laura Rear McLaughlin, as Marian said, I'm the Deputy Director of the National Geodetic Survey. And, yes, I was in Alaska last week with Rachael and Nathan and Qassim too.

Mr. Nathan Wardwell: Qassim's over here on this other side, yes. Great. We are a little ahead of schedule. Can we still just keep rolling with the agenda? Any issues with that? Okay.

Rear Admiral Chris van Westendorp: Seconded.

Mr. Nathan Wardwell: Seconded. Okay, great. So we can now move into opening remarks from Ms. Rachael Dempsey. Rachael is Deputy Administrator, Assistant Administrator of NOAA's National Ocean Service, and brings strong leadership, background in NOAA's navigation services and beyond. So I'll go ahead and pass it over to you for opening remarks.

Ms. Rachael Dempsey: Thanks, Nathan. Admiral, thank you so much for convening us today. Good morning and welcome to all of our HSRP members, to our distinguished congressional guests, colleagues from other federal agencies, state and local partners, and, of course, members of the public. I first want to thank everyone for joining us today and tomorrow for the Fall 2026 Hydrographic Services Review Panel. As many of you know, I currently oversee NOS's eight program offices, including the three offices that the HSRP advises: The National Geodetic Survey, the Office of Coast Survey, and the Center for Operational Oceanographic Products and Services, lovingly known as CO-OPs. And as part of that, I am greatly appreciative of the opportunity to meet with the HSRP and to take the guidance of this representative group into consideration as an important part of our mission to meet public need.

I want to acknowledge the fact that this federal advisory committee has not met in person since the Fall of 2024 in Detroit. We know that this gap has been frustrating, and we appreciate your patience as we have worked to return to hosting these meetings in person.

I greatly appreciate the members for their dedication to the HSRP. And again, I'd like to welcome the new members, Jay, Kate, and Jeanne, who all represent a range of expertise as well as geographies from California to the Columbia River to the Port of New Orleans. We look forward to your contributions today and throughout your HSRP membership. I also want to thank our Chair, Nathan Wardwell, and our Vice Chair, Eric

Peace, for taking on leadership of the HSRP this year, as well as to our executive team for the efforts in facilitating this meeting, if we can have a quick round. {applause}

NOAA staff remain steadfast in carrying out our mission to provide the public with dependable, timely, and precise ocean, coastal and geodetic data alongside historical and real-time observations, forecasts, and scientific analyses essential for safeguarding lives, property, and economic vitality. By gathering and sharing this data, our programs empower the public, industry, and our state and local partners to make well-informed choices across diverse needs, from coastal land use and marine recreation to disaster preparedness and emergency response.

Of course, a lot has changed for NOAA and NOS over the past year. So I'd like to provide you with a few high-level updates. In regards to agency leadership appointments, last October, Dr. Neil Jacobs was confirmed by the Senate as the Undersecretary of Commerce for Oceans and Atmosphere and NOAA Administrator. Dr. Tim Petty was confirmed this past December as NOAA's Assistant Secretary of Commerce for Oceans and Atmosphere and Deputy NOAA Administrator. Dr. Petty oversees the strategic vision, policy direction and oversight of NOAA's oceans, mapping and fishery programs, and has been a strong supporter of our surveying geospatial and tides and currents programs and capabilities since joining NOAA. Additionally, Laura Grimm was appointed as the NOAA Deputy Undersecretary for Oceans and Atmosphere, in addition to her duties as Chief of Staff.

There has been good news on hiring within NOAA, which I'm very excited to share. Since they've been onboard, NOAA leadership has acknowledged the need to address key operational and expertise vacancies to meet our core mission and support administrative priorities. I am proud to announce that we have now filled a number of our most critical positions, and hiring is finally surpassing attrition. Rear Admiral Ben Evans, retired from the NOAA Corps, who has joined us today. There he is. Thank you for joining us, sir. He was relieved by Rear Admiral van Westendorp in January of 2026 as our OCS Director. And again, a special thanks Rear Admiral Evans for your continued service to NOAA. While our permanent NGS Director position is still vacant, I'd like to thank Dr. Marian Westley for stepping in as Acting NGS Director in addition to performing her normal duties as CO-OPS Director. Marian has gotten a little relief with the ability to onboard our NGS Deputy Director, Laura Rear McLaughlin. And I also want to mention Dr. Stephan Smith of the Weather Service, who is on detail as our NOS modeling lead. He will be speaking at the modeling session tomorrow. Is Stephan here? Stephan is here. Thank you for joining us, Steve. Good to see you.

Additionally, NOS has had many positions posted and filled since the spring. The Office of Coast Survey has onboarded five positions, including the Navigation Response Team

in Seattle, UNH Center of Excellence Deputy Director, and several cartographers. We are in various stages of hiring more new OCS positions to rebuild expertise in nautical cartography, operations, business and IT functions, and more. The National Geodetic Survey hired six geodesists this summer to backfill many recent departures and help address the ongoing national shortage of geodesists and geospatial professionals. We expect to backfill the Remote Sensing Division Chief and Field Operations Branch Chief positions by the end of the year to provide added depth to our leadership team. CO-OPS has also hired Holly Fellows, an experienced federal administrative leader, previously with NIST. Holly was onboarded earlier this month as the new CO-OPS Chief of Staff and Business Manager. CO-OPS also filled a contract management position and a critical vacancy on their Gulf Coast Field Operations team.

As you'll hear, coastal modeling is a NOAA and an NOS priority. And NOS has recently onboarded three new modeling positions, a Modeling Program Manager, a Data Manager, and a Coastal Modeler, to reflect this. This surge in hiring has been a welcome infusion of support.

In addition to all that goes into hiring and training new personnel, we have been getting busy at our core mission. And I'm happy to highlight a few of our program's achievements this year. On September 15, NGS reached a critical milestone in the modernization of the National Spatial Reference System. NGS publicly released beta versions of its core supporting products and tools for a phased approach to ensure quality and usability. These beta products are now available through the NGS beta website for stakeholder evaluation and feedback. And testing will be open for 6 months. This is a monumental achievement that has been in the works for nearly 20 years. And over the coming weeks, NGS will also hold a series of public webinars providing detailed information about each product and the impacts of NSRS modernization of geospatial workflows.

This summer, for the first time since 2022, the NOAA ship *Thomas Jefferson* conducted surveys in the Great Lakes mapping to improve navigation survey and safety. Contracted vessels and our navigation response team also conducted work in the Great Lakes to map Thunder Bay National Marine Sanctuary, Western Lake Erie, Braddock Bay and vicinity in New York, and Green Bay, Michigan and Wisconsin.

In August, Coast Survey and the National Weather Service implemented a major upgrade of the Surge and Tide Operational Forecast System, or STOFS. This new version contains several enhancements that improve model performance, resolution, and coverage. These include upgrades to both the global and Atlantic components and the addition of a new component for the Pacific, filling a critical gap for users and stakeholders across that vast region.

In 2026, NOAA celebrated 35 years of the Physical Oceanographic Real-Time System, better known as PORTS, which added its 41st system in Boston Harbor in February of this year. PORTS now serves more than half the Nation's top 175 seaports.

In 2026, CO-OPs released its Coastal Ocean Reanalysis, also known as CORA, for the U.S. West Coast, Hawaii, and Southern Alaska, which builds upon the East, Gulf, and Caribbean data set that was released the year prior, in 2025.

CORA combines NOAA's long-term tide gauge observations with coastal models to deliver simulated water level data every 500 meters along the coast, enabling the delivery of products and services to communities that lack such data.

I know our programs will continue to deliver on their mandates in the year ahead. Again, I want to thank the members in advance for your time and effort today to serve on this federal advisory committee, and for being here in person and online. As panel members, you all provide such a great service to NOAA in helping us to meet our mission. And your efforts are noted and greatly appreciated. I look forward to hearing your recommendations. I'll now turn it over to Rear Admiral van Westendorp, our HSRP Designated Federal Official and Director of the Office of Coast Survey.

Mr. Nathan Wardwell: Thank you, Rachael. Go right ahead.

Rear Admiral Chris van Westendorp: All right, thank you, Rachael. I just want to say good morning and welcome again. I echo Rachael's welcome and appreciation to our members, both new and pre-existing. We welcome all of your perspectives and insights, and I look forward to robust conversations over the next 2 days.

To both our returning panel members and those joining us for the first time, thank you for making a trip to the D.C. area. While you're here in the DMV, I'd like to share a quick note, and this was kind of an emerging opportunity. The NOAA Heritage Week "Treasures of NOAA's Ark" exhibit is at the NOAA Science Center in Silver Spring. We expected it to be shut down at the end of last week. However, it has been extended through this Friday. So that is an opportunity for all. And it's open on weekdays from 9 a.m. to 4 p.m. So unfortunately, not during scheduled panel times today and tomorrow, but it is there if you can make it out. And it does feature incredible pieces of our hydrographic history, including the famous Brass Brains, a mechanical tide computer with all of its constituents, and artifacts from the *USS Monitor*. So if your schedule can allow while you are in town, or if you can change your travel plans for those members who are going to be busy working hard for the next 2 days, I strongly encourage you to pop over and check it out. It is open to the public, and we do strongly encourage folks to head over and see a bit of our heritage there. This marks my very first HSRP meeting

as Director of Coast Survey, but it is my second overall. My first was in New Orleans in 2019, when I was the Chief of the Navigation Services Division.

As I look ahead to my tenure in this role, I welcome the challenges and the resulting opportunities for organizational progress that we're all looking at together. I do want to take a brief moment and share that we are all thinking of those currently impacted by Hurricane Nolo in the Hawaii area, as well as those along the Eastern seaboard that have been impacted from the nor'easter. I would say that it is moments like this when we gather together as a panel for our hydrographic services that it puts the value of all of our work in truly a bright light for how it will improve and impact the Nation.

I'd also like to recognize the NOAA staff at our meeting today. Just what a fantastic bunch. They have been working their tails off over the last, it's not even weeks, it's several months to pull this together and just have put on a great show here to bring us together. NOS and NOAA have a variety of staff who provide their subject matter expertise and program and administrative support. And I would be remiss if I didn't say that this federal advisory committee would not function at all without their outstanding commitment. So I just want to take a pause and let's acknowledge their efforts. {applause}

Okay, and with that, welcome again, and I will pass it back to Nate.

Mr. Nathan Wardwell: Thank you very much. I heard that Kim Holtz is online. Is she?

Ms. Kimberley Holtz: Yes, that's correct.

Mr. Nathan Wardwell: Oh, great, Kim. Could you go ahead and do your introduction for everybody in attendance here? And I'm curious, are you in California or are you in Alaska right now?

Ms. Kimberley Holtz: No, I'm in California right now. So I'm getting ready to leave for a trip. But I'm Kim Holtz. I was the Director of Survey at the Port of Long Beach. So I was over our hydrographic crews and installation of our new tide station out there. I have since retired, and I'm now Vice President of D. Woolley & Associates, working part-time. But, you know, a number of years in geodetic control, surveying, and then the last 7, 8 years in hydrographic surveying. Thank you.

Mr. Nathan Wardwell: Great, thank you very much, Kim.

Next on the agenda is going to be a break. We're a little ahead of schedule. We'll maybe take a break, come back at 10. I think after the break, we will have, let's see here, so we're going have opportunities and challenges for the National Ocean Service

with the Navigation, Observation, Positioning Portfolio, and then there'll be opportunities for Laura Rear McLaughlin and to hear further about NGS and then Rear Admiral van

Westendorp will have an opportunity along with Dr. Marian Westley and Captain Andy Armstrong. I always look forward to those briefings to see what the offices are up to. It's very exciting. And then that will be followed with a little bit of Q and A. And then I believe we roll into lunch after that.

And just a couple things from the opening remarks. It is great to hear about hiring now passing attrition. That's been, I know it's been a struggle within the National Ocean Service. So thank you for sharing that. And I can see the positions being filled. So that's great. And then if you haven't had the opportunity, I would recommend checking out Brass Brains. I got the opportunity to check it out during one of the last HSRP meetings. Obviously, I'm biased with my passion about tides and water levels, but it's quite the instrumentation to check out. So if you have the opportunity to go, go over there.

Rear Admiral Chris van Westendorp: And it's actually operating. They've got it running. So it's pretty cool.

Mr. Nathan Wardwell: Well, even better, yes, okay.

Dr. Marian Westley: The engineering team rebuilt the motor using their 3D printer to reprint parts for it. So they've completely restored it.

Mr. Nathan Wardwell: Yeah, all right, thank you for sharing that. Okay and with that, unless, I guess we'll go ahead and take a break and we'll start back up at 10 o'clock.

BREAK

Mr. Nathan Wardwell: All right, okay, we're going to go ahead, and we've got some more panelists that'll be trickling in here grabbing their drinks and getting ready. I'm going to hand it over to Deputy Assistant Administrator Rachael Dempsey to lead the next discussion with her opening remarks and the briefings from the Director.

Ms. Rachael Dempsey: All right, thank you so much, Nathan, and hopefully our panelists can get back in here soon because I know that this is often a highlight for many of you. And I am definitely excited to once again host this panel in order to give you guys a chance to hear from our NOS foundational four leadership directly. And while I don't want to steal their thunder, I do want to take a few more moments to highlight their efforts and accomplishments and to talk about how NOS supports the Administration and NOAA's priorities.

NOS is known for its expertise in providing the foundational data and information that supports our national security, safety, economic, and environmental interests. Maritime

commerce is a lifeline of the U.S. economy, with American ports handling 1.6 billion tons of international freight worth $2.3 trillion each year. And mariners rely on NOS products and services in order to understand how to navigate safely with our electronic navigational charts, as well as better understand and deal with varying ocean conditions through services such as our National Water Level Observation Network and ports. We're advancing the accuracy of the Nation's nautical charts, synchronizing the real-time data flows that guide safe vessel movement through critical waterways, and fortifying the domestic supply chain against emerging environmental threats and security threats.

For OCS, NOAA's hydrographic surveys provide the baseline data for maritime safety and economic prosperity. The data from these surveys and other available sources are combined into the National Bathymetric Source, providing the best available data not only for mariners and the production of nautical charts, but also for other uses like modeling and resource management. In FY26, we have 35 projects spanning an estimated 80,000 to 100,000 linear nautical miles across the U.S. oceans and Great Lakes. Rear Admiral van Westendorp will go into additional details on the specifics of some of those projects in his presentation.

An NGS or geospatial framework supports port and coastal infrastructure, dredging, shoreline mapping, emergency response, and other activities that require reliable sharing of location and elevation data across systems and organizations. The National Geodetic Survey defines, maintains, and provides access to the National Spatial Reference System, the authoritative foundation for latitude, longitude, height, and gravity-related measurements across the U.S. and its territories. NOAA is undertaking a once-in-a-generation modernization of the NSRS, which will enable agencies, ports, surveyors, defense partners, and commercial operators to combine spatial data more consistently across regions, systems, and time.

CO-OPS provides accurate, reliable, and timely water level and current measurement that supports safe and efficient maritime commerce, sound coastal management, and recreation. This includes tide predictions for over 3,000 locations and tidal current predictions for over 2,700 locations based on information collected through its network of real-time gauges and survey projects. Their NWLON provides a critical federal backbone for long-term monitoring of water levels and other oceanographic and meteorological data along our coasts. With over 200 stations, some dating back over 150 years, the network provides the foundation of the Nation's coastal vertical reference frameworks, official sea level trends, and a suite of quality assured operational data products. As you can see from the snapshot, NOS contributions in the maritime domain are essential information needed for efficient maritime commerce and innovative

technology research and development, and for maintaining the United States' competitive edge.

NOAA's navigation services are actively involved in achieving many of the Administration's priorities in the maritime world, ensuring top-level scientific expertise is integrated into various regulatory policy and programmatic actions to support U.S. maritime dominance. NOS expertise and capabilities are crucial to the execution and success of multiple executive orders. We are leading or co-leading efforts with federal partners for E.O. 14285, Unleashing America's Offshore Critical Minerals and Resources, and E.O. 14269, Restoring America's Maritime Dominance. Additionally, NOAA has been working diligently to ensure all of our relative products and services comply with both the Restoring Names that Honor American Greatness executive order and the Honoring the American History of the Great Lakes, Renaming Lake Ontario as Lake America executive order.

One key NOAA priority I'd like to highlight from our NOAA Administrator, Dr. Jacobs, is the modernizing of our modeling enterprise. With Dr. Jacobs' support, our primary goal is to standardize and modernize NOS's physical oceanography modeling systems by selecting an optimal set of core model codes. This will help ensure the program is positioned to leverage advances in high performing computing, cloud environments, and machine learning or AI prediction methodologies over the next decade.

As I mentioned earlier, we implemented the new STOFS Pacific model this summer and are near completion of the Northeast Coast Operational Forecast System, spanning the coast from Maine to Virginia, which will be our first implementation in support of NOS's model consolidation vision. Modernization of these modeling systems is a multi-phase strategy, which began this year with a public request for information. Our users provided important and insightful feedback and input towards our modernization goals. We will next conduct a formal evaluation and design a roadmap for investments before starting transition to the modernized state in FY28.

Of course, we cannot properly modernize our models without optimizing our ocean observations, as they are the bedrock for tracking changes of our ocean over time. Observations are integrated daily into weather, marine, climate, and ocean prediction models, which help us to understand our evolving ocean and deliver benefits to all users of NOAA products and services, even those inland. For example, NOAA and the U.S. Navy jointly collect the majority of the world's marine observations that are used for weather forecasting, trans-oceanic shipping, and national security. Marine observation capabilities rely on NOAA's sensors in the water and along our Nation's coast, but also on NOAA's ability to transmit the data collected via NOAA satellites and commercial satellites, and then on to operational centers. NOAA, Navy, and the US Coast Guard

collect Arctic sea ice formation and melting, and other high-latitude observations as interest in the region increases. These observations rely on a combination of satellite, ocean, ice-tethered, and international data sources, with NOAA satellites often providing the most consistent wide area coverage in a data-sparse region. To effectively gather essential oceanographic data, we must continually modernize our observation strategies to leverage modern sensor technologies while enhancing our data management and delivery systems.

Finally, I'd like to highlight that there have been many requests by congressional staff to be briefed on our mission areas and capabilities as they look to support our efforts across the U.S. We have provided briefings on and answer questions related to our surveying priorities, our National Spatial Reference System modernization and more. We appreciate the interest in our foundational programs.

So in conclusion, for my part, as you will hear from our directors, we at the Ocean Service are committed to continuity and steady provision of foundational coastal and ocean data and decision tools that enable safety of life and property. With that, I'd like to turn it over to Laura Rear McLaughlin, NGS Deputy Director. I look forward to the discussions today and tomorrow, including from our distinguished congressional and federal partner guests, our HSRP members, and the public. Laura, over to you.

Mr. Nathan Wardwell: Laura, sorry to interrupt. When I started, we do have a little bit of extra time and so, if questions come up after the presentations happen, I'd like to offer, you know, to the panelists to ask those questions before in case you forget, right? You know, and then we'll have more time for discussion at the end. So just throwing that out there in case there's some opportunity for a little bit discussion between the presentations.

Ms. Laura Rear McLaughlin: All right, great. I have some slides. There we go, all right. So thank you. As I mentioned earlier, I am the NGS Deputy Director. I guess Marian didn't want to talk twice, so I get to fill in the role here. But thanks for having me here today. Next slide, please.

Thank you. So today we'll talk about the NSRS modernization, which you heard Rachael talk about a little bit. We'll talk about some of our other work as well, including Foundation Cores, Gravity, VDatum, and then our coastal mapping program as well. Next slide, please. Thanks.

So why are we modernizing the NSRS? That's the National Spatial Reference System. So the last version, NAD83 and NAVD88 were defined before GPS technology, and they relied on physical benchmarks in the ground. Plate tectonics really drives why we're doing this update. And the modernized NSRS accounts for that crustal motion. It also

accounts for deformation, earthquakes, subsidence, and other types of crustal motion as well. So advances in space geodesy-- the GNSS satellites-- have helped us figure out where the center of Earth is and helps us reduce systematic errors across the modeling as well. And so we're able to put all of that together and improve the accuracy, access, and alignment of our positioning systems. There will be changes of coordinates throughout the U.S. by up to one to two meters. We are now compatible with the ITRF systems as well, the International Terrestrial Reference Frames. Okay, next slide, please.

So just to give you an example of how much work went into this, this is about 20 years in the making, which you heard Rachael mention. I would say hundreds of disciplined NGS staff worked on this. Some of them have long since retired. Unfortunately, some have since passed away actually. We've collected about 16 million square kilometer miles of airborne gravity. And we've created new scientific tools to account for dynamic Earth. And again, about 20 years of effort to do this. And through all of that, we've had really only one dedicated FTE that was dedicated to modernization itself. Everybody else has been sort of doing this alongside, I would say, all of their other work, although really focused on maintaining and building this new frame system. Okay, next slide, please.

Thank you. So what happened? We updated all coordinates. We are replacing existing datums with new datums. Again, we're using GNSS as the national framework and a gravity-based height system. Why it took so long, it took about 17 years to fly all of that gravity. All of our products and services are being updated, and we're making everything compatible within that new framework. And again, we are looking forward to this more accurate, more reliable, more accessible, and then compatible with GNSS reference system. Next slide, please.

So where are we in the timeline? So I would say through 2025, the last 20 years or so, we've been doing all the research to advance this, the new model. And now we're in the testing phase. So we've released our beta tools out there, as Rachael said earlier, last week, September 15th. I guess that's now 2 weeks ago. All of our beta tools are out on the website for testing, and we are hoping that you will get out there and test, because without your input, it's really going to be impossible to update anything that is incorrect as we have released these products. We want you to spend the next 6 months really testing, assessing your readiness, planning for the implementation, updating your software systems. And we'll be out there helping with some training as well. As we talked about, there are upcoming webinars as well. And then in the next 6 months to a year, all of these products will be finalized and will be operational on the new system. And that's when folks will start adopting the new system. Okay, next slide, please.

So as I mentioned, our beta website is up and running. There's a link to the beta website there if you want to grab a screenshot there, the QR code. But all of our tools have been updated, and all of our models, actually, are finalized. So NAPGD 2022, which is the vertical framework, and then our horizontal frameworks-- NATRF, PATRF, CATRF, all of the A references. And they're all out there as well. They are finalized as well as the state plane coordinates as well. So especially where we just were last week in Alaska, everyone is getting new state plane coordinates. And we've really tried to flatten the distortion, flatten the map and lower the distortion across the U.S. Okay, next slide.

Again, some of our tools out there, the data delivery system, Opus Static is out there, and then the NCAT has been updated as well, the coordinate conversion transformation tool.

Okay, so as I mentioned earlier, it's really your turn now. So really test your data, use your workflows, tell us what you find. We really need that testing to happen to really bring back the feedback to NGS so that we can fix whatever is not working for you. Again, we're taking feedback at NGS.feedback@noaa.gov. And there are live people reading those emails, so please do send them in. You won't get an AI chat box, but you will get a live person checking that inbox. And our scientists are going to go and really adjust anything that's major that we see that we haven't fixed already, but we think we've got it all. We know, actually, we know there's some things we need to fix, but we hope that there's not too much that we need to fix. So please, please, please send us your feedback.

Okay, so in order to gather more feedback, we will be doing some conference presentations. And these are the ones that we have planned for the rest of 26, which is today and tomorrow. And then FY27, so including things like the NSPS fall meeting, which is out in Mount Rushmore. Tim Burch is here somewhere. There we go, raise your hand. So he will help us kick off the mark dedication there for the 250th year, but also celebrating NGS's successes as well.

We'll be at some other conferences. You can read them. I'm not going to read them all. But AGU, most of our scientists will be at this winter really explaining all of the science behind the new datums. Dan Roman's in the back there, so he's really leading the science there. And coastal geo tools, things like that as well. So really taking the opportunity to get the word out this year and hoping that we get folks out there testing our new products and services. All right, next slide.

Just change course just a little bit and talk more about some of our data networks. The CORS system is really what is helping drive some of the reference frame systems as

well. So CORS is our foundational network of continuously operating reference stations. The stations within the NOAA CORS network are brought in to NGS. And they're really independently owned and operated. What we're doing is we're moving to foundation CORS as our backbone. So there'll be specific stations that are part of the NGS backbone that are owned and operated specifically by NGS.

The CORS stations are really the backbone some of the new reference systems as well, because they actually are part of the, they have a CORS coordinate function now. So we know that, as I mentioned earlier, the plates are moving. And in order to account for that, the CORS really do play a role in that picture. So they created a CORS coordinate function that's part of the reference systems. Go ahead, next slide.

Okay. So we're maintaining, as I mentioned, the geopotential datum, that vertical datum, so NAPGD 2022. It says “soon to be published,” but it was published. So next steps are to operationalize and maintain that, those products related to the new geoid. We're looking at reducing uncertainty by flying gravity, airborne gravity. We're going to continue to collect gravity measurements. As a matter of fact, there's three stations I know of in Alaska that were collecting gravity in real time. And that is really to help maintain that geoid bottom model. Okay, go ahead, next slide.

And right, so as I mentioned, we're looking at reducing uncertainty and validating the dynamic aspects of NAPGD 2022, collecting ground-based measurements where uncertainty in our models are high, and then continuously collecting those data over time as well, and for future releases of the geoid model. Okay, next slide. Okay, sorry.

We are working with NGA. And we're flying airborne gravity in 2027 around some areas of Canada, northwestern Canadian data, and then continuing in the central Canadian areas as well. And then 2028 and beyond, we will be flying some international projects as defined by NGA, our partner. And all of that data will continue to be used to update our geoid as we move forward. All right, next slide.

Really exciting, and sorry that cuts off a little bit, but VDatum in Alaska and the Arctic domain is being published at the end of FY20, er Calendar Year 26. We really worked with the community and the modelers and other stakeholders to really figure out what their needs were. We are not done. There will be a second update in 2029 as more data are collected. I know that there's about 30 different water level stations that are going to be added to the model in the next 3 years or so. So we're looking forward to that update as well. And here’s that slide with the stations that are going to be updated. So 33 new stations, and actually a little bit more than that. So there will be seven-- about 43 stations are going to be added. And then we added geodetic control as well from those stations. So line, so areas, islands that were not previously connected to the vertical are

now going to be connected as well. And that work happened this past summer. Go ahead.

And then just for, the next priority is for VDatum. We're looking at a Pacific domain, and then extending the Atlantic and Gulf domain as well. Go ahead.

All right, switching gears to our Remote Sensing Division and our Coastal Mapping Program. And then a few more slides here, but I can go quickly because I only have a minute left. But the Coastal Mapping Program really is to conduct remote sensing surveys of coastal regions of the U.S. in order to support safe maritime navigation, define territorial limits, and aid in coastal resource management. We collect from a variety of platforms, including LiDAR, aerial photography, and high-resolution commercial satellite imagery. So next slide.

In 2025-26, we collected 11,000 miles of shoreline. Fifty-eight ports were updated with new shoreline. Fifty new ports had change analysis completed. You can see all of this, all of the stats there ahead of you. But we really are out there flying shoreline as much as we can. In 26 we did 9,000 miles of shoreline; 48 ports were done with new shoreline as well. And all of this stuff gets added to the nautical charts, which Captain will talk about-- sorry, Rear Admiral-- will talk about as well. Next slide, please. Oh, I'm out of time. All right.

So 26, we completed gap filling/cleanup for Puerto Rico and the Northeast region as well. We collected data there as well. Next slide.

Okay, Typhoon Merbok, we supported as well. And I won't go through all of the bullet points. But we did collect about 8,300 square miles of topobathy LiDAR in Alaska. Next slide.

And then these are really just the shoreline mapping contracts for 26 that we collected. So these next couple of slides were just talking about how much we've collected. And we did get a supplement of about $80 million to help with this data collection. And so we collected data in Florida. And then next slide.

We collected data to support Hurricane Francine. And then next slide. And then we supported shoreline collection for Hurricanes Helene, Milton, Debby, and Idalia. And then next slide. I think that's it. Oh, next slide, sorry.

We did some work on the Mississippi River as well, some of the riverine inside passageways as well. We needed some support with topobathy LiDAR to support the water model. And I think that's it. We just did some Helene support as well. So thank you for your time.

Mr. Nathan Wardwell: Awesome. I had a comment or question. I don't know if anybody, I might ask. I guess since I'm Chair, I can go ahead and do that. That was a ton of work that NGS is doing, and amazing. Thank you for the briefing. It's really exciting for NSRS to get over the hump. And I'll point out with statewide coverage for VDatum coming along here at the end of the calendar year, that's actually ahead of schedule then as identified in the Alaska Coastal Mapping Implementation Plan. So right, that's a great thing. You had a slide showing the FCORS plan. And, I was, we had a chance when you were in Alaska for the Geo Summit to meet with some stakeholders that are working on-- in the State of Alaska-- that are working on building out a real-time positioning network for filling gaps. And we had some discussions about the FCOR plans and build out. I was curious, it looked like some of the proposed FCOR, new FCOR locations are very close to existing FCOR locations. Do you have any, can you talk about that? Like, instead of like filling existing gaps in the state, can you just talk to the reason for picking those locations next to existing?

Ms. Laura Rear McLaughlin: Thank you for your question. I think, and I'm going to let Dan Roman speak after me probably. He probably knows more because I've only been here for 3 months. But I think some of those are, owned and operated by, could be owned and operated by other people that we're going to adopt. Dan's shaking his head "yes." But I know we did have that conversation with the Acorn group about, you know, making sure that we're not overlapping in different areas. So I do want to go back and take a look at the Alaska build-out plan. But Dan, do you want to?

Mr. Nathan Wardwell: Well, I mean, we've had, you know, like the State of Alaska is massive. When we talk about gaps in the State of Alaska and you talk about gaps in other locations, it's kind of different, you know. I mean, I did a presentation on water levels at the Geo Summit last week and somebody asked a question like, well, how far will these-- they asked the gap question, right? And, you know, when I go to national conferences, like somebody is asking for a tide station every, you know, intersection, every hundred meters or every five, or a half a kilometer or something. And it's like we're talking about gaps that are thousands of kilometers long, right? And so I look at that map and we see Barrow or Utqiagvic-- formerly Barrow-- and Interior Alaska and Southeast, I guess it's actually Utqiagvik and Interior Alaska. And then there are some large regions. And so it also kind of comes back to the mission of FCORS, right? Like that might very well be aligned with the mission of FCORS, but understanding that would help.

Dr. Dan Roman: Thank you for the question. Can everybody hear me? I want to make sure they hear me online. Okay. Yes, mission for Foundation CORS, a large part of it is to provide the backbone, as Laura said. So what we're looking for are motions for the

entire plate. So what we have distributed-wise on the plate of North America is very saturated. The other thing it's, therefore, and the reason you see them in clusters is to be co-located with other space-based techniques. Think of the big radio astronomy dishes, the VOPI that look at quasars. Those figure out how the Earth is wobbling. So putting a GNSS or foundation CORS next to one of them links those two techniques. And there's satellite laser ranging, there's different techniques to give you different aspects of how the Earth is oriented.

So by co-locating them next to other techniques, which the other techniques tend to be clustered in certain regions, then you gain the benefit of tying these different techniques together. But in addition, we want to distribute them for a spatial distribution, which is I think what you're seeing with some of the yellow ones in there. And the intent with those is, again, if all the cooperative-- we have a huge public-private partnership, which is the NOAA CORS network. Most of those are not owned by us. They're owned by a lot of those that are around this table-- state, other groups. But we tie them to the foundation CORS. The foundation CORS are tied into the ITRF, the International Terrestrial Reference Frame. And then we take all the CORS and we tie them into that.

And then further densifying that would be like real-time networks where we pull them in. We really start to get closer and closer resolution. So we would tie into any RTNs, any of the additional CORS that are co-located in Alaska to provide that denser network of control that you're looking for. So the foundation CORS are that backbone. They tie into the global, but they also tie some other techniques together. And as indicated by some of the coloring in there, a lot of these are targets of opportunity, if you will. They already exist. The National Park Service has some. Other groups may have them already. And why go and build a new one when there's a perfectly useful one that's right there that's in the right spot? So then we work with the other, generally though these are federal, on federal land, maintained by federal agencies so that we have some control over them. Because the intent of the foundation CORS as a fallback position is if all the other CORS went away-- the NOAA CORS network disappeared-- that you would still have a foundation CORS within 800 kilometers. And this gets to some of the concern that you have about some of the distribution-- that as long as they're within 800 kilometers, you could set up a master station, you could do your RTN type survey, and you would still get the centimeter or so level of precision and accuracy out of it.

But the goal is to try and keep the NOAA CORS network-- that broader network, this public-private partnership-- to keep that robust and keep that vitalized. Because that is how we're really going to implement this modernized NSRS. It's not going to be through the foundation CORS. It's going to be in part through the CORS, but it's also primarily going to be through a lot of these RTNs. So pulling all of that in together, be it in a port

area where there's shipping coming in or in the middle of the country, in the middle of Alaska in Fairbanks. All of those, that information needs to be consistent and just get progressively more densified so that you have the control that you're looking for in these regions. So does that help clarify some of your concerns?

Mr. Nathan Wardwell: Yeah, yeah, I mean, definitely. I appreciate it. I mean, this map is very helpful because some of the, you know, stakeholders in Alaska are like, well, what are the FCORS plans? They don't want to go out and build a CORS or an RTN right next to an FCORS, right? And so, like, we want to make sure, you know, they have a limited budget, we want to make sure those budgets are used efficiently. And so this has been very, seeing this map is very helpful. I appreciate it.

Dr. Dan Roman: Certainly.

Captain Carolyn Kurtz: Nicole, do you want to make your comment from the chat or would you? I'm happy to read it as well.

Dr. Nicole Elko: I was just sending my comment of how Impressed I was at how fast it all came together. Thank you for all of your hard work on this.

Dr. Qassim Abdullah: Do we have time, Nathan?

Mr. Nathan Wardwell: Yeah, how about one more question and we'll go to the Rear Admiral.

Dr. Qassim Abdullah: Thank you very much. Coming up with a better version of the modernization does bring a really proud moment, not just for NOAA, for all of us in this Nation, definitely. And because it came in a very crucial moment for our industry, our technology mapping, whether LiDAR, bathy LiDAR, multi-beam, getting very accurate. In LiDAR, we getting sub-centimeter accuracy, vertical absolute accuracy for mobile MyView. So but what we really need, you know, if we can request from Laura and Dr. Marian is support to communicate some of the aspects to our surveyors. Tim Burch here, the Executive Director, he's giving full attention to that. And the reason I mention that, in our new ASPRS security standard, now we're requiring the contractor to report their absolute accuracy beside the LiDAR accuracy, add it to it, factor it in. And to my surprise, 99% of surveyors, they don't know how to come up with it. They trust the manufacturer reporting. The manufacturer reporting is very misleading, giving them a precision .002, and they run with it. When we face them with the requirement, “Give me the absolute accuracy to the new NGS data,” for example, and elevation, they don't know how to come up with it. So I'm willing to work with NGS to prepare something to educate these surveyors how to come up with, if they use RTK-based survey, how much that absolute accuracy, not in the sense of precision. Thank you, that's all, thank you.

Ms. Rachael Dempsey: Thanks, Qassim. And we're happy to work with you on that as well.

Mr. Nathan Wardwell: Yeah, thank you. Rear Admiral, pass it on to you.

Rear Admiral Chris van Westendorp: Okay. I would love to talk about foundation CORS, but that's just not in my wheelhouse. Okay. There we go. Okay.

Mr. Nathan Wardwell: We'll have some breaks and we can grab some coffee, talk more about it.

Rear Admiral Chris van Westendorp: Good morning, everybody. Let's see. I think I have a new set of slides. There we go. Admiral Chris van Westendorp. I'm happy to be here, as I stated before, and to do this presentation on behalf of my program office, the Office of Coast Survey. Next slide, please.

Thank you to the panel, again, for being here. I wanted to just show this brief outline. The images on the screen here I would say perfectly capture where Coast Survey is right now. To the lower left, honoring our rich maritime heritage while to upper right, rapidly building our future. You can see the NOAA ship *Hassler* proudly representing us during the Sail 250 parade in New York City. And on the top right, a look at our future, celebrating the beam signing for our new Center of Excellence for Operational Ocean and Great Lakes Mapping in New Hampshire alongside some of our partners at Gilbane Construction, the Hill, and UNH Leadership.

I'm excited to share a comprehensive update on how Coast Survey is evolving to meet dynamic national demand. We're going to cover executing Administration priorities, how our core missions directly support recent executive orders from ensuring maritime dominance and safety to mapping for marine critical minerals and supporting the blue economy. We're going to cover groundbreaking technological and modeling wins, where we'll walk through our recent technological success. This includes major breakthroughs in coastal modeling, AI integration like Neurocast and OCSMesh, and dramatically speeding up our ping- to-chart data throughput, and accelerating mapping operations, and mapping plans and update on our 2026 hydrographic survey plans. I'm going to highlight a few key campaigns ranging from our Arctic port access routes in Alaska to multi-lake initiatives in the Great Lakes as we actively drive toward our NOMEC milestones and close the remaining mapping gap. And finally, workforce and partnerships. I'll wrap up with crucial updates on our staffing, including key leadership transitions in our post-hiring freeze momentum that Rachael referred to earlier, alongside some highlights from my recent engagement, strengthening our vital academic, international, and interagency partnerships. Next slide.

So this Administration has been very interested in areas that directly overlap with the work that we do in Coast Survey, surveying for critical minerals to updating charting products to reflect new names. Our staff, physical scientists, and cartographers have been actively working on these high-priority efforts. And in some of the coming slides I'll speak specifically to marine critical minerals, some outcomes to that effort, and the partnerships involved. NOAA's mandates lend themselves to supporting restoring maritime dominance. The Hydrographic Services Improvement Act and the Coast and Geodetic Survey Act, the Ocean and Coastal Mapping Integration Act call on NOAA to support the maritime transportation sector and provide our core services: surveying, charting, tides, currents, shoreline mapping and so forth. You may recall Captain Sam Greenaway, former Chief of the Hydrographic Surveys Division. He has spent the last 6 months at the Office of Management and Budget supporting the shipbuilding elements of the maritime dominance executive order, helping to ensure NOAA's fleet and shipbuilding needs are at the forefront.

For the most recent of the executive orders honoring the American history of the Great Lakes, we anticipate completing the 50 plus chart updates and more than 100 Coast Pilot updates by the end of next month. Next slide, please.

So for the current baseline and our national progress, as of this year's annual report, in January, 56% of the U.S. ocean, coastal, and Great Lakes waters have been mapped to modern standards, which leaves 44%, or about 1.72 million square nautical miles still unmapped. We definitely have some work to do.

That remaining area is expansive, but we do see steady, measurable progress with each field season. In our latest reporting cycle alone, the ocean and coastal mapping community added 70,700 square nautical miles of new bathymetric data to national repositories. And over half of those gains came from deep water expeditions in Hawaii and the Pacific remote islands, complemented by high priority multi-beam and coastal LiDAR surveys across Alaska, the Great Lakes and the Atlantic and Gulf Coasts.

This momentum ultimately keeps us directly aligned, though, if you do the napkin math, likely falling short with our National Strategy for Ocean Mapping Exploration and Characterization, or NOMEC, milestones, which are to fully map all U.S. waters deeper than 40 meters by 2030 and capturing all shallow coastal waters by 2040. We will have a bit of a discussion on that tomorrow during our mapping panel. Closing the remaining 44% requires us to innovate. And we're actively pairing NOAA fleet assets with uncrewed surface vessels, autonomous systems, and interagency partners. Using our “Map once, use many times” framework, every square mile of data we collect does multiple duties, delivering authoritative navigation safety information while advancing

storm surge modeling, habitat management, and marine critical mineral assessments. Next slide.

And finally, I'm pleased to present our 2026 survey season plans. This year, we have about 35 projects planned, working in all regions of the U.S., covering approximately 100,000 linear nautical miles, about typical for a survey season. This will be divided across five NOAA ships executing over 700 days at sea and 12 contracted projects, half of which have used uncrewed systems. We're on track to execute all of our contracting funds this year and fill up our NOAA ship and small boat schedules to maximize time on the water. You can't have a good slide these days without a QR code, so we've got a QR code to our story map here. Please do, encourage you to click on that, where you can zoom in on every project and see the purpose, progress, and more. The story map viewers can keep track of our acquisition progress for any particular project by seeing project areas get filled in. So that's the overarching plan. I want to quickly highlight a few projects within that we're excited to lead. Next slide.

So some highlights here from Alaska. The NOAA ship *Fairweather* is driving key survey operations for the Arctic Port Access Route Study, building directly on progress made in 2025 to secure safe maritime transit corridors as sea ice coverage continues to decline. Coordinating with the US Coast Guard, these surveys evaluate new vessel routes that ultimately will be submitted to the International Maritime Organization, or IMO, for official recognition and charting. This multi-year effort to establish newly accessible and efficient maritime traffic routes as ice coverage is declining in the Chukchi and Beaufort Seas, safety zones, and use areas in the US Arctic waters due to reduced sea ice.

Through our Coast Survey contracting partners, we have work in Southern Norton Sound, which addresses vast data gaps where bathymetry has not been updated since the 1830s in some cases or was never collected at all. This contract survey provides modern data to support fuel and goods delivery for remote coastal communities, including Nome, Unalakleet, and Stebbins, and improves USGS coastal resiliency in tidal models following severe typhoon impacts. In partnership with the USGS, we are also sampling in this area in support of marine critical minerals interests in heavy mineral sands.

In Prince William Sound, the *Fairweather* is partnering with the USGS Coastal Hazards Program to map high-risk fjords like Port Wells and Barry Arm. High-resolution bathy of unstable submarine slopes and retreating ice walls is directly improving tsunami modeling for coastal communities like Whittier. *Fairweather*'s also mapping Northeast Kodiak, supporting transit near the Coast Guard base there, and updating Southeast Alaska waterways near Revillagegido, securing key inside passage routes traversed by over one million cruise passengers in the Metlakatla Native American community. All

Alaska operations directly do advance towards those NOMEC targets that I referred to earlier. Next slide, please.

Now on to our interior Great Lakes. This year, we've executed a major survey campaign across the Great Lakes, spanning Erie, Huron, Michigan, and America to replace legacy chart data and support critical maritime commerce. Major surveys in the Great Lakes included the NOAA ship *Thomas Jefferson* spending over 2 months in Erie and 2 months in Lake America. And our NRT and IDIQ contract partners also conducted multiple surveys in the region, all of which you can see on the image here. In key high traffic areas like Western Lake Erie and Southwestern Lake Michigan, much of the current depth data predates the 1940s and 1950s. Given that Western Lake Erie is the shallowest of the Great Lakes and heavily trafficked by ferries and commercial vessels, acquiring modern hydrographic data here is a top navigation safety priority.

For the Port of Milwaukee, surveys along the southwestern shoreline of Lake Michigan directly support approaches to the port, a key hub driving $145 million in trade that serves as the northern gateway linking the Great Lakes to the inland river system and Gulf Coast.

In Lake Huron, survey coverage includes shipping channels serving major carbonate quarries such as Calcite Quarry, the largest limestone quarry in the world. And that supports a $9.9 billion U.S. limestone market essential for construction, water treatment, and national defense infrastructure.

For the Thunder Bay 25th anniversary, they are celebrating 25 years of that sanctuary. And we are collaborating with the Office of National Marine Sanctuaries and the Great Lakes Environmental Research Lab to resurvey Shipwreck Alley. This replaces 1970s vintage data to support high-resolution habitat analysis, environmental modeling, and maritime heritage. Targeted surveys in Green Bay and Braddock Bay directly feed into the Great Lakes Restoration Initiative Habitat Mapping Program while contributing to the broader Lake Bed 2030 Initiative. Next slide.

So speaking of critical minerals, while our core mission always remains safety of navigation, the high-resolution bathy data we collect for nautical charts is inherently multi-use and directly serves tsunami modeling, habitat mapping, and critical minerals identification. In support of Executive Order 14285, Coast Survey has significantly expanded offshore mapping across federal waters to evaluate strategic marine mineral potential and safeguard domestic supply chains.

Across all deepwater mineral operations, NOAA has surveyed over 54,000 square nautical miles of ocean floor. Highlights include mapping over 35,000 square nautical miles off American Samoa to characterize deep sea polymetallic nodule deposits,

employing an advanced fleet combination of hydrographic ships, autonomous surface vehicles, and uncrewed underwater vehicles. Additional deep water projects were executed across the Mariana Islands and the Pacific Remote Islands area. In southern Norton Sound, where we've been filling mapping gaps over the past 7 years, nearshore operations delivered both essential bathy and physical samples to evaluate heavy mineral sands, supporting USGS modeling while strengthening coastal resilience for remote Arctic communities. And on the interagency, conducted in close partnership with the Marine Minerals Administration and USGS, these mutually beneficial projects allow us to modernize national ENCs while simultaneously informing federal assessments of strategic ocean mineral prospectivity. Next slide.

Over the past 5 years, NOAA's Coast Survey has significantly accelerated its hydrographic data processing and product delivery, reducing total throughput time from over a year to only 2 and a half months. By adjusting sonar data faster and modernizing mapping formats, Coast Survey continues to improve navigation safety, coastal resilience, and marine economy support. Key advancements have included faster data processing and delivery, with data processing speed increased by 65% and delivery by 75%, cutting end-to-end timeline for navigation-ready data to that 2 and a half month metric.

Rescaled ENCs, the transition of ENCs to a regular grid is 90% complete and on track to finish by late 2026, 10 years ahead of schedule with over 750 new ENCs published so far this year. And on the National Bathymetric Source expansion, following the Southeast Alaska rollout last year, NBS coverage has expanded to California this year. And it's available via NowCoast in the blue topo format, provides a unified high-accuracy bathymetric surface to support precision navigation, coastal planning, and S-100 products.

On the modeling side, we launched OCSMesh, an open source Python tool that automates complex creek to ocean mesh generation. By preserving true underwater topography, we can now generate and deploy localized flood models into our operational systems in under 2 hours during emergency response.

In Alaska, we operationalized a coupled ocean wave model revealing that six-knot tidal currents in narrow passes act as a tidal gate, regularly amplifying wave heights by over 50%. Because these hazardous sea states follow predictable tidal cycles, we are translating this physics directly into updated U.S. coast pilot guidance to safeguard mariners and Alaska's $4 billion commercial fishery. We developed the Coastal Modeling Vertical Datum Package, an open source tool that embeds NOAA's authoritative VDatum directly into cloud-based and automated modeling pipelines, matching VDatum precision within one and a half centimeters without relying on

external software. And we are integrating Neurocast, a deep learning AI system that corrects last mile forecast biases in our operational models to deliver high fidelity S-104 water level data directly to a ship's bridge. This extra precision drives massive economic value where just one additional foot of safe draft allows commercial vessels to carry up to $2 million in additional cargo per transit. Next slide.

It has been an exciting year for me to get to know our stakeholders and talk about the amazing work being done in Coast Survey. A few highlights here. So we have the Center of Excellence construction milestone at UNH. In July, I had the honor of joining Senator Jeanne Shaheen and UNH leadership for the official beam signing ceremony of our new Center of Excellence in Durham, New Hampshire. Backed by over $25 million in federal support from NOAA and NIST, this 70,500 square foot facility is scheduled to open its doors in Fall of 2027. With 35,000 square feet of high bay lab, it will serve as a national hub, co-locating industry partners, advancing uncrewed systems and training the next generation of hydrographic professionals.

In Florida, we are expanding our academic partnerships through a 5-year, $8.5 million cooperative agreement renewal with the University of South Florida's COMIT, or Center for Ocean Mapping and Integrative Technologies program. This next chapter pairs USF's College of Marine Science with their College of Engineering and the new Bellini College of Artificial Intelligence to apply AI and machine learning directly to bathymetric and topographic data processing. Their operational focus is on testing low-cost mapping technologies to modernize charting products, refine storm surge forecasts, and bolster coastal resilience across vulnerable shorelines.

And Coast Survey has been a big part of leading intergovernmental reform priorities at the International Hydrographic Organization Assembly this year, as well as our other IHO activities. We solidified U.S. leadership at the IHO during assembly. And in my capacity as U.S. National Hydrographer, the Coast Survey staff and I orchestrated a complex interagency effort involving Departments of Commerce, State, and War to champion significant organizational reforms. Key accomplishments have included steering the development and adoption of the IHO Strategic Plan for 27 to 32 and establishing robust performance indicators to ensure global accountability. Furthermore, Coast Survey championed critical governance improvements, including cost-neutral budget restructuring, eliminating redundant programming, implementing whistleblower protections, and modernizing staff regulations. By successfully fostering consensus among over 100 member states, the U.S. strengthened international hydrographic cooperation, ensuring the organization remains aligned with core priorities while delivering measurable, transparent results for the global hydrographic community. Next slide.

Some staff updates: So Captain Michael Gonsalves has reported to Coast Survey as the Chief of the Hydrographic Surveys Division, relieving Captain Greenaway in April of this year. Sam's next permanent assignment after his detail at OMB is as OMAO's Director of Marine Operations. We're very excited to see him move to that role. Matt Kroll has been serving double duty as Acting Chief and Deputy Chief of the Navigation Services Divisions after Captain Jay Lomnicky retired in June of 2026. And we are very pleased to have successfully rehired Briana Hillstrom to the Deputy Director of the Center of Excellence for Ocean and Great Lakes Mapping. Her first day back on the job was this past Monday, and we have some additional staffing updates on the next slide.

Rachael referred to this earlier, but the hiring freeze has been lifted and Coast Survey is moving forward full steam ahead on staffing up to meet our mission requirements. Right now, we have 12 positions that are in various stages of the hiring process. And I can say in the last 9 months, we have brought on five federal employees supporting the navigation response teams, nautical cartography, and the COE. These hires will build back some capacity we had lost, reduce stress on our current workforce, and allow Coast Survey to lean more into automation and new technologies for advancing our mission. Next slide.

And looking ahead to the new fiscal year, we have many exciting developments that I can preview here for you. We are nearly complete in developing the statewide mapping plans that identify the highest priority survey areas using our hydrographic health model that estimates the remaining effort in days at sea and the ideal vessel type, depending on survey location.

The 28 call for proposals for the Brennan Ocean Mapping Fund is now open with a deadline of submission in a couple weeks on October 12th. This unique opportunity allows NOAA and other parties to contribute 70% and 30% of funding, respectively, for areas of mutual interest.

For testing and transitioning S-100 products, we are rolling out the S-100 interoperable coverage surface for Charleston, South Carolina, followed closely by L.A./Long Beach and New York starting in late this year, early 2027. An operational test bed is expected by the end of 26. The service integrates S-102 bathymetric services and water level S-104 data referenced to mean lower low water chart data. By highlighting overlapping coverage, it enhances situational awareness, water level adjustments, and decision-making for ECDIS and portable pilot unit systems. Future data sets will be hosted on the Amazon web service S3 open data platform for automated machine-to-machine discovery and download. S-102, 104, and 111 data for other regions are currently accessible via NowCoast. And as with any transition,

implementation involves overcoming hurdles related to data validation, dual distribution, production pathways, and underlying code that we are working through.

Coast Survey will soon receive new in-house equipment for our NRTs. We successfully entered a contract that simplifies future small boat acquisition when needed, with a purchase order current for two new vessels and trailers to go to our Gulfport NRT and another for one of our East Coast teams, with delivery expected in 28.

We will be refreshing our multi-beam sonars. And next month the NRTs will be trained on our newly acquired Norbit SHARK or Swift Hydrographic Acquisition Response Kit. These updated systems can be shipped and put on a vessel of opportunity to support emergency response activities, another tool to have in our response and data acquisition toolkit. The storms in Hawaii this year have certainly brought that to light. So we're excited to get that kit. In October, we have a kickoff meeting to create a new Coast Survey strategic plan, and we would love to incorporate the panel's input on where our navigation products and services should be going in the future. And we remain committed to supporting the Administration priorities of mapping, increasing automation and supporting maritime dominance. That was a lot. And I think that's it. (applause) Happy to take any questions.

Mr. Nathan Wardwell: The regional mapping plans, can you elaborate on that a little bit? Are those state-specific, regional-specific, or yeah?

Rear Admiral Chris van Westendorp: Yeah, so it's kind of part of our Hydro Health 2.0 expansion. But yeah, we're able to break down Hydro Health priorities state by state and not just region by region. So we can address more local and regional stakeholders in that regard. So we're excited about that.

Mr. Nathan Wardwell: Does that include like revisions to the Hydro Health model or is it implementing the model that has been used historically?

Rear Admiral Chris van Westendorp: So we have been reviewing the Hydro Health model. And Captain Gonsalves is here. He can talk a bit more about that in sidebars or as part of the mapping panel tomorrow. But we are rolling out a version 2.0, and the state by state will be a part of that.

Mr. Nathan Wardwell: All right, well. Oh, yes, please. Deanne.

Ms. Deanne Hargrave: A quick one, very cool to see the SHARK. I'm curious, what are the, kind of the general high-level vessel requirements for that system for, you know, I'm assuming it's third-party vessels to receive it, to contribute to that effort.

Rear Admiral Chris van Westendorp: Yes, at a very high level, when we talk about vessels of opportunity, first, like, obviously, does it float, and can it propel itself? But if you're talking about like specific specifications, as far as like freeboard and draft and that kind of thing, it's going to be a pretty flexible system. And we have worked with several partners, academic partners and interagency partners to start to examine what would be the kinds of flexibilities and the kinds of mounts that we would need to make sure that it can work. But we have been taking a look at a wide variety of platforms.

Easy crowd. Okay. Yeah.

Mr. Nathan Wardwell: I might throw another one out there just real quick. So last week at Geo Summit, there was a ton of conversation around AI. I'll open it up, but you did mention it. There was a graphic with a really nice model. I wasn't sure what that model was showing. And then you, during that slide, you mentioned the AI model. Can you elaborate a little bit there? That might be covered more in a session later, and if so, that's fine.

Rear Admiral Chris van Westendorp: I'm not going to pretend that I can go into the in-depth detail on that.

Mr. Nathan Wardwell: If you do, it'll go over my head anyways.

Rear Admiral Chris van Westendorp: I will say that our modeling team, and we do have a few representatives here, and then we're also going to have the modeling panel today that can talk a bit more about that. It has been kind of an interesting and exciting time to look at what AI can do. I think we can all appreciate there's a lot that AI has already been demonstrated to do to increase efficiency. But I think at the moment, it's the humans that are able to do the kind of quality assurance, quality control at the very least. Garbage in is garbage out, as we say, right? So as far as the specifics on the AI models, I'm going to defer to our modelers and the modeling panel. I think that's later today or tomorrow. But yeah.

Mr. Nathan Wardwell: All right, thank you. Oh, Qassim.

Dr. Qassim Abdullah: Yeah, thank you very much. Very exciting activity. And I'm really excited about your support of University of Florida or something on AI. This is the future, definitely. And about The Last Mile too, I mean, I'm excited about that because we can connect it to what we've been giving attention in this panel for a few years now, the precision navigation, you know? We cannot guarantee a few hundred thousand route for the captain, but The Last Mile is an important one, you know, to have the right model for it. Thank you for that, thank you.

Rear Admiral Chris van Westendorp: Thank you for the comment.

Mr. Nathan Wardwell: All right, sounds good. Maybe hand it over to Captain Andy Armstrong now.

Captain Andy Armstrong: Thank you, Nathan. So today I'm speaking in part on behalf of Dr. Larry Mayer, the UNH Co-director of the Center. And Larry regrets that he's not able to be here. Frankly, I do too. So I'll do my best to tell you a little bit about some of the deep sea mineral work that the Center has been doing as a, in a sense on the sidelines of the main projects that have been going on. So next slide, please.

So just to begin with here, this is the U.S. Geological Survey map of prospective mineral areas here. And as I go through this, we'll see a little star there where we're talking about the particular project. So you can see that these things are spread all over the globe, but pretty highly concentrated in the Equatorial Pacific. Okay, so next slide.

So Larry just finished a cruise, an Ocean Exploration Cooperative Institute-funded cruise

in the Marianas to look at deep sea habitat, including the potential for deep sea minerals. So unfortunately, they were planning to do 16 sites, but a couple of typhoons got in the way. So they had to divert to the south and do a couple there. So not a lot to report in that project. I'm sure they'll be working on rescheduling that in the future. Okay, next slide.

Okay, so now we're going to move to the East Coast of the United States. So these are not deep sea minerals, but heavy mineral sands. Next slide.

So this was also another OE-funded, incidentally, the UNH team is funded not only by Coast Survey, but also by Ocean Exploration. And so many of our projects overlap and support each other. So this was an uncrewed system survey of heavy mineral sand sites off the coast of Virginia. And our role was to do the bathymetry and backscatter for the project. You see there, this was hosted by the University of Delaware, you see there the DriX uncrewed system and our remote operating center set up at the University of Delaware in Lewes, Delaware. So that was bathymetry and backscatter. Yet to come are sub-bottom profiler and magnetometer surveys, both of which are critically important in these heavy mineral sand surveys. Next slide, please.

Back to the Pacific here, down by American Samoa on the bottom of the chart there, another Ocean Exploration and Coast Survey-led operation with one of our private sector partners, NV5. Next slide.

And so this was deep-water areas in the, U.S. EEZ of American Samoa. And the work that our partners did included, well, it's kind of hidden there, but deep water bathymetry, 12- kilohertz bathymetry, and backscatter, and high-resolution synthetic aperture sonar

and multi-beam bathymetry from the Hugin autonomous underwater vehicle. The system seems to be scrambling our slides here. And also some video of the seabed at those sites. And to come yet are some bathymetry and backscatter to be collected by the *Okeanos Explorer*. Next slide.

And so the role at the center here is, for the most part, not to go out and do the mapping for this deep water minerals, but address some scientific questions associated with this, and particularly, can we, with any confidence, identify the presence or the absence or the density of seafloor nodules from surface vessel surveys? And so as we'll see later, you can't simply take a ship out in 5,000 meters of water, run a survey, and find out whether there's nodules on the seafloor. It takes considerably more. But we hope using some of these surveys that have been recently collected to do some acoustic response research to see if we can get a better idea from the surface vessel surveys whether or not we can tell whether these nodules are here. And so we'll be doing empirical studies of the data we have. And we'll be looking at that the backscatter frequency response, the backscatter angular response, and then some higher order statistics response of the backscatter, in addition to working with some other NOAA-funded operations that are being done by Mitre and actually modeling nodule response and synthetic aperture sonar. So let's go to the next slide, please.

So this was the survey in the American Samoa area. This was a really nice survey conducted from the surface with multi-beam and backscatter. And as you can see from the multi-beam, the seafloor is mostly flat but full of irregularities and in the backscatter you see there's a very big mix of backscatter intensity. And so what does that necessarily mean in terms of nodules? Next slide. So we'll look at these couple areas in particular. Okay, next slide.

And so as it turned out, it was a little bit rough out there during the survey. And there's some, particularly some bubble sweep-down noise. That's fairly easily cleaned up in the bathymetry. You see an expanded piece there, and you can see all those little bumpy places on the seafloor. That’s, it doesn't really, I mean, the big red ones are pieces of the seafloor, but the little dots there are, particularly the ones that seem to be in north-south lines, are a result of bubbles interfering with the bathymetry. We can kind of clean that up in the bathymetry and that's fine. Next slide.

In the backscatter though, it's much more problematic. And here on the left, you see the backscatter pre-cleaning and on the right a blow up of a piece of area there and you see that, as the ship is moving north and south there and in the image, we're losing the backscatter response. And when we do that, we really can't do any analysis of them particularly of the higher-order statistics in the backscatter. So what we're doing is separating out this set of backscatter to those areas that have the better backscatter

and simply not looking at those areas where the where the signal is interrupted. Next slide.

So what you see here is a set of lines. For this project there were a set of lines and individual sites where we were going to, where the contractor was going to do high resolution AUV surveys. And on the left and upper part there you see the backscatter from those individual target sites aligned according to their line-by-line operation here. So you can see in there at those target sites, there's a real mix of low backscatter response where it's dark and high backscatter response where the image is bright. Next slide.

And so what we've done here through some analysis is reorder all of those sites. From on the left upper low backscatter response to the right lower highest backscatter response. So we've unsorted them by line and put them all together here according to backscatter response. Next slide.

And then looked at the AUV imagery data to try to match up the number of, you know, the degree of nodule presence relative to the particular area. And you see that. Next slide.

You see that there's certainly more backscatter, in the higher backscatter response there's certainly more nodule presence. But if you look in details, you'll see similar high backscatter response blocks next to each other with very different amounts of nodules. So it's not, it's certainly not a guaranteed way to do that. We're still working on this project and so those squares that don't have circles and numbers in them yet are in progress. They don't necessarily mean that there's nothing there. Okay, next slide.

So and then finally here, this was another *RV Nautilus* cruise just very recently conducted around Wake in the U.S, EEZ. And next slide.

And the sea floor there was incredibly rich in nodules. These nodules are about the size of grapefruits or melons, cantaloupes maybe. And these nodule sizes range from pea size to these, but this was a particularly rich area. We don't have this data yet. But *Nautilus* will be sending that to us, and we hope to continue this analysis of this area and other areas in that same region that had no nodules. And so another effort to try to understand how we can make sense of the surface recorded data. And so what we're doing here in some of these areas is not just the plain backscatter response, but we're looking at the higher order statistics of the backscatter response. After the data, the backscatter has been normalized for angle and frequency responses. And so there's some very subtle differences in the distribution of backscatter intensity that maybe can be related to the actual density of nodules. So I think that concludes my presentation. Thank you.

Mr. Nathan Wardwell: Thank you, Andy. And it looks like Tuba is jumping to the mic here. So go right ahead.

Dr. Tuba Özkan-Haller: Andy, you may have mentioned this and perhaps I missed it, I apologize. When you had the slide where you had sorted the backscatter images and then with the circles, you know. So can you let me know again how you do the ground truthing for that?

Capt. Andrew Armstrong: I'm sorry, how?

Dr. Tuba Özkan-Haller: How you do the ground truthing.

Capt. Andrew Armstrong: So the ground truthing for this was video.

Dr. Tuba Özkan-Haller: Okay, okay, so just kind of qualitative in a sense?

Capt. Andrew Armstrong: Yes, very much. So there were not any physical samples taken in this particular area. It was video.

Dr. Tuba Özkan-Haller: Yeah, thank you, thank you so much. It's systematic work. Really impressive. Thank you.

Mr. Nathan Wardwell: Yes, Qassim, go ahead.

Dr. Qassim Abdullah: Yeah, thank you, Andy. As, I know your map shows based on USGS expectation. Do you have any coordination with the USGS? Because USGS are big on this from the presidential, you know, what happened a few years ago. So they're focusing a lot on the rare minerals. So I'm just wondering if you have any.

Captain Andy Armstrong: Absolutely. This whole project is a joint NOAA and DOI project. Maybe the Admiral will want to address that.

Rear Admiral Chris van Westendorp: Yeah, absolutely. I mean, we couldn't do this without a cooperative with USGS and MMA. And everyone is communicating with each other in a very open way, I would say, to make sure that we're not duplicating effort with all of the various tools and platforms that are out there that could do this work, and just coordinating it and making sure that the right tool is being used at the right time, in the right place. But yes, short answer, yes, we are absolutely coordinating with USGS.

Mr. Chris DiVeglio (no mic): I may have to repeat my question. I'm just curious. Are bottom currents being measured in these areas? With the thought that, you know, bottom currents may have an important role in the formation of nodules. In my experience, in some of these areas that you have (inaudible).

Captain Andy Armstrong: I don’t know. I don’t have a definitive answer for that. I don't know.

Mr. Nathan Wardwell: Okay, well, thank you very much, Andy. That was great to see. Hand it over to Dr. Marian Westley now.

Dr. Marian Westley: Great, thank you so much. So I'm going to give you an update on work we've been doing in CO-OPS, the Center for Operational Oceanographic Products and Services, and a little bit of an outlook. Next slide, please.

So I'm just going to touch on, briefly, our executive order compliance. I'm going to spend probably a fair amount of time on the NWLON. This is our critical and enduring foundational infrastructure for observations. I'll touch on the PORTS program. Chris DiVeglio is here in the room, our PORTS Program Manager, so you'll hear more about PORTS later today.

So I'm going to also talk about our Continuous Operational Real-time Monitoring System. And Qassim, this is for you. And I'll give you the context there. I'm going to introduce CORA. I think my deputy at our last meeting talked about CORA. We've made some progress with CORA. So I'll give you some updates there. I'm going to give you an update on where we are with the National Tidal Datum Epoch update and also the IGLD update, and tell you a little bit about how CO-OPS is really embracing the National Spatial Reference System. One of the beauties about being double-hatted is I get to kind of shortcut some of the communication because, you know, Marian NGS just talks to Marian CO-OPS. And I run up and down the stairs in between my two offices. And so it's helped me really accelerate the implementation of NSRS in CO-OPS. And that's been a great privilege. I'm going to give you some announcements about some very recent disaster supplemental funding that we've been able to really focus on our PORTS program. And I'm going to end with an update on IGLD and the Low Water Datum. And Eric, this is for you.

All right, so let's get into it. So for executive orders, next slide, please. We're a little probably less affected or engaged by executive orders than OCS is. But certainly we're paying a lot of attention, particularly to restoring America's maritime dominance. A lot of our drivers for observing systems come to supporting the maritime sector. So, Anuj, I took your 0.4 book to heart. I’m really thinking about how we support maritime.

We very much apply gold standard science standards to everything that we put out there. And we're very focused, so under that EO is improving the use, interpretation, and communication of scientific data. We have had for a long time a very solid commitment to making our data fully accessible, not just through our website, but also through APIs and machine readable format. So I feel like a lot of my service to the

community is to enable people to build cool things with my data that I couldn't even possibly imagine. So we do have that commitment. And I think our API server now outstrips our website in terms of hits and access.

We have changed names as appropriate. And so that's both for the Gulf and for Lake America. And then ensuring commercial cost-effective solutions to federal contracts. We run a very tight ship in CO-OPS, and one of our strategic hires this year was our contracting officer. So that's been, again, very easy for us to comply. Next slide, please.

So we've been doing a lot of great NWLON rebuilds in the last few years. This is largely funded by bipartisan infrastructure funds, but also just our general commitment to sustaining the NWLON, making it as enduring as efficient as possible. So this is my team doing the Baltimore rebuild. Back in December, it was unseasonably cold for Baltimore. We don't usually have harsh winters around here, but they were out there in very, very cold weather. We went to visit and brought them all hot cocoa. This is the front. This NWLON station was really key to our response to the Francis Scott Key Bridge disaster. It had been temporarily relocated to a Navy pier, while the Army Corps of Engineers, who owns this pier, was doing a pier rebuild. So it spent a few years on the Navy pier. We just moved it back to the Army Corps of Engineers pier. It is a full microwave station.

So we've been slowly shifting most of our NWLONS from acoustic to microwave. So this one has already completed that transition. It has a full MET package. And it's been great to be co-located with the Army Corps of Engineers because we're actually in their boat slip, and they run bubblers there to keep it ice free in the winter, and that helps us a lot. So it's been a great partnership to work with them. They also really supported our team while they were there in that very cold, nasty weather. Another very cold one. Next slide, please.

We also rebuilt the DC pier. That's here in the Potomac River. Again, it was unseasonably cold. We brought our political leadership to go see it in the middle of an ice storm. But my team, you know, they work in any weather, so they were able to do that. Now, again, we are upgrading this station to go from acoustic to microwave. So you can see he's reinserting the acoustic fiber. And we will do a comparison for a set amount of time, and then we'll retire the acoustic station. This will be fully microwave. This station, again, was critical to the response to the DC air crash. This is on a police pier in the Potomac. And this is where the local firefighters were determining how cold the water was when they went into the water right away. So again, we've just rebuilt this pier, very excited to see that. And then next slide, please.

This is New Canal, Louisiana. This was a disaster response-funded rebuild. So we have raised this platform to make it able to withstand harsher weather, higher waves. And, again, completely rebuilt this pier, this station, and working on that conversion to microwave water level. Again, for those of you who are not familiar, microwave water level sensors tend to be much more resilient, less maintenance, and they're not affected by air temperature, which our acoustic sensors are. So we've been just trying to evolve everything to microwave as we can. And so this, next slide, please.

This is very exciting. This is installation of a GNSS sensor on our station down in the Florida Keys. So this is a major GLOSS initiative.

So the GLOSS is the global sea level system that's a UNESCO international program. So GLOSS has a requirement that you are monitoring vertical land motion near your core tide gauges. So again, as funds allow, we're installing GNSS sensors close to tide gauges where we can. The other real benefit of doing this is then we have that immediate tie to the National Spatial Reference System. So in the long run, we're really looking at installing GNSS as a tool to reduce the amount of manual leveling that my field teams have to do and also just modernize. We are a geospatial network in tide gauges. We want to connect that to the NSRS as efficiently as possible. So super excited to see these GNSS installs going in by our tide gauges as we can. Moving on to the next slide.

This is Montauk. So another requirement that we have to be very sensitive to is some of our tide gauges are in beautiful places. So they can't be, you know, just nasty, hardened hardware. They also have to be beautiful and aesthetically pleasing. So this is one of our more aesthetically pleasing tide gauges that we rebuilt in Montauk. And, again, we work very closely with local stakeholders to make sure that the look and feel of our tide gauge doesn't detract from the tourism value of some of these, you know, beautiful places. So next slide, please.

This one I'm very excited about. We're going to do a ribbon cutting in November. This is Bob Hall Pier. I think this pier was eliminated by some hurricane. I forget which one. But it's been in the process of being rebuilt for about 5 years. And it's finally rebuilt, and we've just reinstalled our tide gauge there. And so one of the things that's very exciting about this installation for us is we've been experimenting for a number of years on using microwave water level sensors for observing waves. Now, most of our tide gauges are not in very interesting wave environments, kind of by design. They're in ports and harbors. But this is an open, exposed pier. So this is a great place to actually install an operational wave sensing capability using microwave water level. So we're excited to see where that brings us.

And then the other thing you can see in this picture is this is our brand new-- our Gulf Coast team was able to buy a new boat that took a while to build-- and so this is their new boat. They're getting to put it through its paces in this install. So moving on.

So again one of my big priorities is to complete our upgrade to microwave water level from the old acoustic sensor. So we're doing a bunch of these comparison projects this year. And I hope to be able to kind of really wrap this up very soon. And so in the Southeast/Great Lakes team, so my Southeast/Great Lakes team spends the winter doing the Southeast and the summer doing the Great Lakes. So they build Baltimore in the winter, and then in the summer they're doing Great Lakes. So we've put a microwave in Lake Erie. So, again, we're really testing, can we use a microwave sensor inside a Great Lakes observing system sump? And, you know, it's a special sensor that's not going to reflect everywhere and make too much noise. But, again, these sensors tend to be floats, and we'd like to upgrade that to microwave as we can. We've upgraded, doing a microwave in Bar Harbor, Maine, Lewes, Delaware, and also Port Isabel, Texas. Again, so we do two sensors together for quite a while until we're convinced that we can transition the long-term time series to the new technology. So that's our microwave water level upgrades. I think that's everything I have on the NWLON.

So for PORTS, you're going to get a longer update this afternoon from Chris DiVeglio, our PORTS Program Manager. But we are very pleased to announce our brand new PORTS in Boston. So that was established in February of 2026. And it's a new met station and a side-looking current meter. And we're also planning an air gap station on the Tobin Memorial Bridge. So again, it takes a long time to stand up a whole new PORTS station, so we're very excited to have Boston as our newest 41st, correct? PORTS station, and Seattle will be 42nd in FY27. We've done numerous enhancements. We've been very active in the lower Mississippi River, supported by our outgoing HSRP member, Sean Duffy. And our incoming HSRP member, Jeanne Ferrer, has been very, very helpful in getting us access and permits of all the things we need to do those upgrades.

So we've installed a new dual air gap, completely redundant system on the I-10 Bridge and Hale Boggs Bridge. In Jacksonville, we've replaced, er, relocated a remounted current meter. Again, Jacksonville, major hazard to navigation there is current, so we're always upgrading current meters for them. Here in the upper Chesapeake Bay, we've put a new met station near Baltimore on one of the offshore platforms there. In L.A./Long Beach, and I forgot to say, it was my opening slide, that is our newest station in Long Beach. There’s a picture of me with Kim Holtz. I was in San Diego for the Esri meeting, and I thought, “Well, I'm already here. I'm going to drop in on L.A. and Long

Beach, because those have been key PORTS partners for us for years." And I got to spend some time with Kim. I got a ride in the new boat that she's built for her team, and great new survey vessel, and really admire that beautiful new station that they built on the fireboat pier, I believe, in Long Beach. So that one, I think, has just become operational. There's a new PORTS sensor there.

And then in Tampa Bay and Corpus Christi, we've installed new salinity meters. Again, because a lot of these places that are very estuarine, salinity is a major issue for navigation. How much your boat either sinks or rides in the water depends on salinity, so we often have a call for salinity meters. Next slide, please.

So Qassim and I had a great conversation at Geo Week about, you guys have been asking us for a long time about digital twins. And I was like, "What is a digital twin? How would I use a digital twin?" And it turns out that CO-OPS has always had a sort of quasi digital twin-type capability. Ever since we started the PORTS program, we've stood up a 24-hour watch system. So these gentlemen are now co-located with us in our building here in Silver Spring. And they are watching not just our port sensors, but all of our sensors, 24 hours a day, and the operational forecast systems that we run. And so the majority of repairs or troubleshooting to all of our stations can actually be done remotely. So these gentlemen are watching everything in real time. When they see something go out of tolerance or off prediction, they can turn off a primary sensor, turn on the backup sensor; they can make some phone calls. Most of our troubleshooting can be done remotely through the internet or through cell phone services via my engineers. So this is, Qassim, this is my quasi proto-digital twin of our entire observing network. It's all run out of a nerve center in Silver Spring. And our entire system is monitored by these gentlemen. So that's my answer to our conversation. All right, next slide please.

CORA is a coastal ocean reanalysis. I think this is the first time NOAA has done something like this. This is a 40-year model reanalysis where you start with your observed tides, tide stations, and then you run an ocean model and a wave model for 40 years, so that you can build a long-term time series at places where you don't actually have observations. So this picture really shows you for, I think this is around Charleston, the tide gauge is that star. And then the CORA grid, you're going to have now 40 years of data showing all of the water level at those locations through your grid. Now, we've made all of these data available through the NODD, the NOAA Open Data Dissemination Program. We in CO-OPS are starting to build this data into how we do tidal outlooks and high-tide flooding outlooks. But we're also hoping that by making this data fully publicly available to everybody, it'll spur a whole growth of products and services that, again, I'm constantly surprised by people who do amazing, beautiful things with my data that I couldn't possibly think of. So by putting this data out there in

the public domain, we hope it will trigger some real other uses. We completed the Gulf Coast and the East Coast first. We just finished the West Coast station. And we're just starting to build with the new Alaska VDatum grid one for the whole Pacific domain. So those are what's coming. Next slide, please.

So the Tidal Datum Epoch update. Again, the tidal cycle on this planet is 18.6 years. So every 25 years or so we have to update all of your Tidal Datums to acknowledge that we have this longer term tidal cycle. So we are just completing that now, and we're waiting for the NSRS to do its rollout, and then we'll roll out the NTDE on the NSRS. Instead of doing a transition from NAVD88 to the NSRS, we're just going to do all in one. So we expect to release the NTDE by 2029, hopefully a little sooner, if we can. Next slide, please.

And then IGLD, oh, so again, this is just, it's been terrific to be double-hatted because it's allowed me to really accelerate our uptake of the NSRS. Next slide, please, in CO-OPS.

So some CID dashboard updates. I don't know if you're aware but we were doing, we'd stood up a Coastal Inundation Dashboard for both storms last week. So we had Lola, Nolo, Nolo in Hawaii and the nor'easter on the East Coast. So we've been, we've had some tutorials, some quick starts. We've been really focused on these kind of multi-view dashboards for people because people want to look at multiple stations at the same time. So those are some of the upgrades we've been doing. Next slide, please.

These are, we got a very late arriving opportunity to spend some disaster supplemental funds to enhance our PORTS program. So we have allocated this money to infrastructure. So IDIQ contracts supporting NWLON gauges in those ports that were affected by disasters. We're also doing some modernization. So we are replacing our East Coast vessel with something safer and more appropriate for the kind of emergency response we've been engaged with in our ports. We're expanding our cloud capability, because that's something every time there's a storm coming into a port, and we need to really upgrade our cloud delivery of data in real time. We're doing some innovation in how we allow people to visualize our data through using a tool we built called OceansMap. We're adding some contract labor to our engineering teams that support all the ports. And then one of the things is very nerdy, but we're very excited about, we're buying an asset management system. So we've been really struggling over the years to kind of keep good modern tabs on all of our assets. So we're migrating to modernize asset management system. So that's all an incredible opportunity we had to spend some disaster response funds, really enabling the entire PORTS program to be more resilient and robust. Final slides, please.

I think we're going to close with IGLD. So again, the IGLD, we've been working very closely with NGS to perform the update of the IGLD on NAPGD 2022. So this will not be a datum that will require conversion to the NSRS. It was being built from the beginning on the NSRS. And again, we're expecting to roll this out probably in 2028. Next slide, please.

And the Low Water Datum. We will update the existing Low Water Datum to the new reference system in the IGLD. A bigger conversation that we've had with our Canadian counterparts in the coordinating committee is, shall we redefine what we mean by Low Water Datum? Low Water Datum was defined very early in the last century as that reference level below which water levels seldom fall. And so what does that really mean? So if we call “seldom” 5%, that's one calculation. But again, we will upgrade the current assumptions about Low Water Datum to the new IGLD. And we're doing the science to really make a determination, should we be rethinking the whole notion of the Low Water Datum? Again, it's an interesting academic question, but this is what the chart datum is based on. So that will be critical. I think that's it for me. So it's been a very full, busy year maintaining our critical and enduring observing systems for the Nation.

Mr. Nathan Wardwell: Thank you, Marian. On the agenda here it says, Rachael, you're leading a facilitation of the Q and A. But do you want to lead that, or do you?

Ms. Rachael Dempsey: Well, we would be happy just to take questions. We don't need to do anything fancy.

Mr. Nathan Wardwell: Yeah. Tuba, yes, please go ahead.

Dr. Tuba Özkan-Haller: Not so much a question, but just, Marian, that was an amazing update. You all are doing tons of work. This goes for everybody else as well, but thank you.

Nathan Wardwell: Anuj.

Captain Anuj Chopra {mic far away}: Amazing presentation. Hopefully you got this. Marian, especially regarding the PORTS program, knowing that it's run so long, do you have a gradation on which parts of the equipment need to be replaced on a higher priority? Like you're doing some, as in converting from microwave for the other programs. Is it something specific in PORTS? And what's the ask like? You know, trying to understand, we have 41 ports where we have it implemented. How many of them need, and what does that mean, like quantifiable numbers? Thank you.

Dr. Marian Westley: So the great thing for us about the PORTS program is it's kind of a limitless need, and it has for a long time really driven our ability to innovate and do new

things and take new risks. For example, the microwave sensor that has now become our standard for the NWLON, that came out of air gaps. We were looking at, you know, what sensor would you hang under a bridge to measure air gap? Should it be laser? Should it be this? Should it be that? And microwave radar was the answer. And so we were testing those, I think in the Crescent City Connection Bridge in New Orleans was where we started this research. We were testing them and then we looked at them and we're like, “Oh that would make a really good tide gauge.” So again the PORTS program really drives our innovation. We've changed some standards in PORTS. We learned a lot about bridges. And so we've made the standard, so two things, one, if an air gap sensor goes out, that stops traffic. So and we also know that bridges really flex a lot under load. And kind of like that quote, you know, “You've seen one port, you've seen one port,” “You've seen one bridge, you've seen one bridge.” And so we have a new standard that we rolled out, I think I mentioned this when we were all in Detroit together, where every air gap system should be, so going forward will be, and backwards, hopefully, we can upgrade to dual, completely redundant systems, and we tell you the air gap where the sensor is. We don't want to get into the business of, “I put the sensor over here, and I calculate the air gap over here.”

And so those are things we really learned from, you know, running the PORTS program, is what does it take to be real-time all the time? NWLON was not real-time before PORTS. NWLON became real-time because it's part of the PORTS program. And that concept that, you know, we originally built all these systems to do the 18.6 Tidal Datum Epoch update and

tell you where the shoreline is, that's not a real-time question. But as soon as you get navigation, then you have to be real-time, and you have to be responsive. So again, I would say, hopefully Chris will have some better numbers for you of kind of what's in the pipeline. I think the PORTS program will never stop expanding. And we need to learn how to manage it in a way that it kind of floats all of our boats. And so we're doing some, implementing program management improvements to try and make it kind of support us all. So that was a great thing about the disaster response funding that came in for PORTS. But it's floating all of NWLON with it because we're able to make these key investments in things like, you know, software, AWS, all of the things that all of our systems depend on. But PORTS is often the pointy end of the spear. You see that first. But all of our systems use those tools.

Captain Anuj Chopra {mic far away}: I believe you want to use PORTS when you are deciding or ask, we want to get more quantifiable data. That's where I was coming from. So I am a big supporter of this program. And from the commercial side it is the need of

the day. It is going to increase the capacity of our ports with the existing infrastructure. It makes them more efficient so thank you, thank you for what you do.

Mr. Nathan Wardwell: Yeah, Qassim, please go ahead.

Dr. Qassim Abdullah: Thank you, Marian. I think the strategy of, you know, coexisting GNSS with the tidal gauge is a great strategy. And my question: Can you give us a rough idea, it could be the question later for Chris, of the cost of building or establishing a GNSS station versus tidal gauge, roughly, I mean, or relatively. I mean, is one more expensive than others or something like that? Thank you.

Dr. Marian Westley: You know, I'm not on top of those numbers exactly, but for us at Tide Gauge, once you've already built that infrastructure, it's not that hard to add another sensor to it. So you'll see the majority of our tide gauges carry a lot of met packages because we've already built the structure and we've already built the data pipeline. So those are the things that are critical. We're working a lot with NGS because they have great engineers for installing GNSS sensors to make sure when we build a GNSS permanent receiver, that we're building it to standards that would make sense to them. Though, of course, they're not as interested in the exact shoreline that we are. And also, those places are geodetically fairly unstable, so it wouldn't be great reference core sites. But I think it's fairly inexpensive to do the installation once you have the infrastructure in place. What's difficult in any of these systems is the base infrastructure.

Dr. Qassim Abdullah: Thank you.

Mr. Eric Peace: Yeah, Marian, it's one of the things I think is a grave concern to me, and I don't know how big of a concern or risk it is. But I do think that there's a problem with putting this physical equipment on land easements or things that are not owned by the federal government. And I'm just curious if you've seen additional ones, because we lost some NWLON stations up on the Great Lakes because somebody bought the property and no longer wanted the piece of equipment on that property. So is that a big risk? Or is it just a handful of places, or do we have these things on a lot of easements where they could just eliminate it?

Dr. Marian Westley: I don't think that's been a big risk in CO-OPS because we tend to be built on, say, an Army Corps of Engineers pier or a city pier. And we tend to have pretty good relationships. We're directly supporting somebody's navigation needs or their data needs. So I think the Great Lakes one is the only one I'm aware of where we just couldn't negotiate our way around that one and we lost that station completely.

Mr. Eric Peace: Thank you.

Dr. Marian Westley: But that's a critical issue for the foundation CORS, that they, again, if you, any piece of infrastructure where the meaning of that observing system only becomes apparent after, say, 20, 30 years, you have to build them in places where you're not going to have to move them or relocate them. That's a big issue for foundation CORS. And I understand that's one reason NGS is really working with, say, National Parks or other federal systems or the Navy or airports or places where we have a long-term commitment to another federal partner.

Mr. Nathan Wardwell: I was curious, we've talked a lot about geodetic workforce crisis over the past few years, and it didn't come up at all in this panel discussion here. Is it solved?

Ms. Rachael Dempsey: Marian, can I jump in, please?

Dr. Marian Westley: Please do.

Ms. Rachael Dempsey: Okay. No.

Mr. Nathan Wardwell: Okay.

Ms. Rachael Dempsey: And as a matter of fact, you know, we have been working really hard. Many of you are familiar with the geodetic grants that we provide to a few of our university partners too. We have managed to keep those alive and active, which is a big deal for us. Unfortunately, it is not solved. And we are, you know, continuing to try and maintain some relationships with the other agencies in order to continue to work together and try to, you know, advocate for increased attention to the geodesy crisis. Like many other things, we have had to, we're having to repair some of those synapses that have kind of faded away over the course of the last few years. So we need to continue to work on that. Our partners (and I don't know why I took off my glasses because I can't see), Tim (I'm very thankful for Tim being in the room), but Tim and other partners have been really key in helping us to continue to address, you know, young people, universities, industry, you name it, to continue to advocate for support.

Two things I do want to mention. I referred to Dr. Petty coming in. And for those of you who don't know, Dr. Petty was a political appointee over at DOI and USGS during the previous Administration of President Trump. And so he comes to NOAA now with a really well-versed understanding of geodesy, geospatial information, GIS, the whole nine yards. And we are really excited to have him onboard, especially as we roll out NSRS because we finally have someone that can spell GIS, that understands what geodesy is, and can talk to you all day about it, which we're very thankful for. And he wants to support us. He's a great partner.

The second thing is I had a really great opportunity last week in Alaska with Tim to go spend some time with some surveyors up in Alaska. And also, with the University of Alaska Fairbanks, I think was there, right, Tim? And, you know, talking to, UAF is, I think, a sub-grant recipient from one of our other universities that's a direct recipient. I can't remember which one it is. I think it's Oregon. I think it's Oregon. It's UAA? Okay. All right, sorry, it wasn't UAF; it was UAA.

Mr. Tim Burch: Michigan, I believe.

Ms. Rachael Dempsey: Okay, so we had two professors and a student, a freshman who was there as part of the NSPS gathering. And it was really awesome to talk to them, to share some of the partnerships that NGS is sharing with other universities, to talk about programs that are in progress on the East Coast, even in the high schools. And then I was really surprised they didn't know about our Day on the Hill, our geodesy event on the Hill with the surveyors. And so I hope that, Tim, I hope you had a good conversation with them and hopefully, hopefully they'll have a team come down to DC this year. So the point is, it is still there. We still have a problem. We still need to do more. I think I will say one more thing that there was a win. We lost so many geodesists in 2025 and so many important members of the NGS team in 2025. I think we lost a little over 30%. It was, there was no argument when the hiring opened that I was able to make them our number one priority for hiring. You heard us talk about the six geodesists that we've managed. We're scratching the surface. There's still much more to be done, but we certainly had support in getting those positions filled, which I think is a big deal. So lots more work to do. Please hold us accountable. I will have no problem with you calling me out on your report because there is a lot more work to be done. So I appreciate that question, Nathan.

Mr. Nathan Wardwell: Yeah, I mean, it's awesome to hear that you've been – the geospatial modeling grants are still in place and funding the universities. I mean, I have a small business. I recruit out of universities that-- we hired somebody out of Oregon State University recently, right? And at the Alaska Geospatial Summit last week, other industry members were talking about, there were some discussions about workforce and it's like, “What do you need?” And it's like, “Hey, we can train people, but making sure they have the fundamental understanding of reference frames is something they need to have coming out of these universities.” And that speaks to like, well, hey, there's value here, the geodetic, bringing awareness to the geodetic crisis and making sure that we have a training workforce to address our challenges. So happy to hear that's continuing.

Ms. Rachael Dempsey: Yeah.

Mr. Nathan Wardwell: Yes, Anuj.

Captain Anuj Chopra {mic off}: This is another one for Dr. Marian. You were saying you've got all this data now and you're really looking at how the industry uses it to make tools which would surprise you. We've got so many universities now having AI curriculum where they're looking for opportunities. Do you think there's an opportunity where NOAA supports or encourages universities which have this data, this data can be used in some sort of funding or support mechanism where it can be used and something comes out? The reason I bring that out is, in the commercial world, we use something called ethical hackers. You know, we make them challenge us. We try our best, but we have nothing else, nothing better. So we pay them $500 a day if they could break into the system. Why not have something like that, pull a little bit of crumb on them, give them that opportunity because they're agnostic to what the data is? Thank you. {Someone handed him a mic.} So it's just a thought process. If we can do something like that, I think might be an opportunity. I'm sure students are willing. Thank you.

Rear Chris Admiral van Westendorp: I'd love to weigh in on that one a little bit because I think we're all talking the same issue right now. It's not just using modern tools, but making sure that the future workforce is prepared and able to use them towards these kinds of things. One of the things that I've found has been a common theme in my first 8 months on the job here has been development of the future workforce and how are we getting the hook, right? One of the things that came up at the Joint Hydrographic Center Program Review up at UNH in July was, what are we doing to get more hydrographers and more GIS specialists and that kind of thing? When I heard, and then I went down to Charleston, South Carolina, and I met with the BEAMS program at College of Charleston. And they said, you know, we're starting to look at data science and data management science and that kind of thing. And then just last week I was at the committee, the maritime transportation system coordinating board meeting and they were talking about, you know, going to conferences and having whole, like, long like columns, right? Of booths, like, next to each other in a well-organized way, not looking for college, right? graduates or even high schoolers, but looking for, like, pre-K to five, right? Getting the hook at that young age to say, “Oh, you go out on a ship. Oh, wait, you play with data. You see what's under the ocean,” right? Like you're measuring mountains, right? Like, whatever it is. This is something that I think the panel could potentially help us think about and kind of give us a little bit of, help us with our compass, if you will, on how we can start to pursue that kind of workforce attraction recruitment and development.

Captain Anuj Chopra: Thank you. I can share. We tried this on the maritime side. There's actually an NGO up in the Northeast called NMEPA, North American Marine Environment Protection Association. And they created an education program right from kindergarten through 12, where we've tried to put attractive nuggets of the supply chain, maritime supply chain, in front of them so that we can attract them into that field. So maybe there's an opportunity there. I believe they do some work for NOAA or they have the Coast Guard and with NOAA training in various areas. So that's definitely an opportunity going forward onto that training element, education and outreach element.

Ms. Laura Rear McLaughlin: When we were meeting last week with the University of Anchorage, Alaska, we did talk about our (University of Alaska, Anchorage, who is one of our subgrantees), we did talk to them a little bit about their AI program because they do have one. Brian Mueller was with me and he's our Acting Remote Sensing Division Chief right now. He's in the back. But we did talk to them a little bit about how they're eager to get their hands on some of our data to do some AI work. And so I think we're going to just open up the data stream to them and let them play. And some of our remote sensing work, photogrammetry work, because I think some of that is ripe for at least some of the, maybe not generative AI, but even just processing data using AI. So there are conversations happening. And I think the universities are really eager for us to give them the data to play with.

Captain Anuj Chopra: Thank you, and congratulations on that. Admiral, I'm going to bring up one of our older meeting points. If you recall, we had a presentation on digitization of the new ships and the existing ships, trying to do some training and education on it. I was recently involved with a company where they were developing training videos for familiarization of industrial plants, and we came down to ships and construction. Today, with AI capability, you can produce a training video in about 45 minutes. What we used to take 3 and 4 weeks earlier. I would request if, under your leadership, we can revisit that program where you are looking at familiarization of new seafarers and technicians who go onboard ships and use this modern technology at a much, much cheaper price. I believe the price is 20% what it was earlier. It's dropped that much. And it's much faster and quicker using AI tools as they come in today, rather than how they were even 12 months ago. Thank you.

Rear Admiral Chris van Westendorp: Yeah, thank you for the recommendation. I appreciate that, Anuj. And love to learn more about it.

Mr. Nathan Wardwell: Yeah, Tuba, please go ahead.

Dr. Tuba Özkan-Haller: Thank you. I want to just add a little bit to this conversation from a university perspective. You all know I'm from Oregon State University. And a few

things were mentioned that I want to comment on. One is the use of data. So already within our curriculum, we have courses that are applied where we're essentially teaching students how to use data from the portals that NOAA already has: Tides and currents, for example, for coastal modeling perspectives, bathymetry, datum, all of that. So we're hoping to produce students that are capable of assessing and assembling all of the needed data from you all's sources. The second thing I heard was around GIS. And I just wanted to share a little story. So within my college the geography and geospatial science program has introduced something that's called a GIS certificate. So it's a certain number of credits students can take and they receive, you know, skills within the GIS framework and can put that on their resume. And within a few years of its introduction, and you know, OSU is a comprehensive university, 24,000 students on campus, it became the most popular certificate program within our university. So this is, there is interest from both sides, right? You all are interested in folks who understand and can use GIS tools, but the students also want to attain these skills and bring them to the marketplace. So there's a nice confluence there. Thank you.

Rear Admiral Chris van Westendorp: Thank you for saying that, Tuba. And I will use that as a perfect bridge. I will thank you and Oregon State University for allowing Dr. Chris Parrish to cross the country. And he will be part of the modeling panel this afternoon. For those who are not aware, he's going to be coming to take over as a Co-director at UNH JHCC COM.

Dr. Tuba Özkan-Haller: Yeah, it certainly is a loss for Oregon State University to have Chris leave. But I understand it's probably a win for the whole enterprise. But thank you for mentioning that.

Rear Admiral Chris van Westendorp: Thank you, and I'm sure that he'll have some thoughts on these topics this afternoon, as well, if they come up.

Dr. Qassim Abdullah: Yeah, thank you all for bringing this topic, which is dear to our heart. And Rachael, you don't need to apologize because we all understand the situation we were in in 2025 by let people go. But I'm glad you're starting over and bringing them back as much as you can. As we are in a situation, really, we need all hands on deck. You know, I mean, Tim is here and we all, you know, to many kids it's dry subject, you know, surveyor being thrown on the heat and snow to survey. We really need to attract them in a different way, like Chris said. You know, there's a lot of beautiful things happening: AI, laser, LiDAR, you know, bathy, multi-beam. That's what we need to introduce to them. It's not just throwing you in the field on surveying a road for DOT, for example. And one of the means is really just to be present in these hiring events and conferences and NGS and NOAA are doing a great job. Galen, where is Galen? Galen doing a great job coordinating all that on behalf of the NGS. Just to lend

hand, and these, just introduce them. What is the real need now? It's just a beautiful field, I tell you. I mean, these university undergraduate, if they know what we are doing, they will be very excited. Thank you.

Ms. Rachael Dempsey: Thank you, Qassim. You're absolutely right. We are so blessed with so many great partners who have helped us carry the baton on behalf of the geodesy workforce. We appreciate that deeply. Thank you.

Mr. Nathan Wardwell: We've got some more time here. Well, so I was curious. Marian, I heard a lot about growth, expansion, PORTS, and I heard a lot about rebuild of NWLONs. Is there thoughts of expanding NWLONS? There was, I mean, there was the NWLON gap analysis that was done, I think, by your team and Steve Gill, and a couple of iterations of that. And so could you elaborate a little bit on plans there for the NWLON network, whether it's maintaining it where it is or expanding it, and how that plays with the PORTS.

Dr. Marian Westley: So we really don't have funding to expand NWLON. So we're really working on making the NWLON that we have run more efficiently, be less costly to maintain, and be more survivable. So we try and, when we have the opportunity to rebuild, we'll use ASCE, the American Society of Civil Engineers, standards for coastal construction in that area. So we are raising stations when we can, because often, you know, the structure can withstand that giant wave but you'll, like, wash out all the electronics or whatever. So we're slowly kind of, as we can, as opportunities allow, kind of doing upgrades. But we don't have any kind of increase in funds to actual build in new places.

PORTS often will fill some of those gaps. And we do generally build all of our PORTS water level gauges to NWLON standards. So we could use them for tidal datums in the long run. Again, you know, I think the L.A./Long Beach one may be a little dodgy because we know L.A./Long Beach is going up and down all the time, Kim tells me, with oil pumping. So it might not be your most stable geodetically, mark, but most of our tide gauges that are being, or water level gauges that are built in PORTS are built to NWLON standard and could be used to supplement the NWLON in the future.

Mr. Nathan Wardwell: And I had, Rachael, you had mentioned in your opening remarks about leveraging modern sensor technologies. And then I saw a picture of a GNSS antenna at a tide gauge. And I think maybe Qassim's word is "digital twin." Mine might be "GNSS reflectometry." So can you talk a little bit about thoughts on GNSS IR from NOS's standpoint?

Ms. Rachael Dempsey: The short answer is I'm not prepared to answer the question. I can say more broadly though that, you know, radio frequency space in general, there's

opportunity and challenge here. So the radio frequency space continues to get more and more and more and more crowded. During my time in the Navy, you know, there was a point, I think that we sold off part of the spectrum to the civilian space. That was a challenge for the Department of War. But there are still frequency spaces that possibly aren't being used to their biggest advantage, or even, we don't know how to potentially do that right now. So what Marian and her team have discovered is a fantastic way to examine what is available in the IR spectrum. In other spectrums, we are looking at, for example- and this is a little bit outside of the realm of your question-- but IOOS has HF radars all around the coast. And we're looking at how we might be able to utilize that frequency spectrum in order to gather wave data. Right now, it's collecting current data. But can we use it to analyze wave data? We've got some test cases. There's about three sensors, I think, out on the West Coast that are testing that right now. From another perspective, we're using a variety of different frequency spectrums from satellite-based sensors. So at Geo Week last week, SAR was a big topic of conversation, particularly in Alaska because of the challenges with weather, right? We do have a lot of-- between NESDIS and between what is available through the Civil Applications Committee for civilian-based satellite sensors, there's certainly an awful lot of access that's out there that probably is not being used to its maximum potential. And so that's something that we can certainly build on. I've been working with Mike Ford, who is a Senior Scientist over at NESDIS, to try and make sure that NOAA and our federal partners know what is available through those civil applications committee resources, whether it's through unclassified access to intelligence community resources or whether it's through the commercial satellite capability contract that's owned by the National Reconnaissance Office. There's a lot of capabilities that are out there, many of which are available to us to do things for wildfires, harmful algal bloom forecasting, you name it. So there's quite a bit. I think I went a little bit to the side of what you were asking, but I hope it was at least in the ballpark.

Mr. Nathan Wardwell: That’s all right.

Ms. Rachael Dempsey: Yeah, no problem.

Dr. Marian Westley: So Nathan, so it's taken us in CO-OPS kind of a while to wrap our heads around how would we use GNSS in our, you know, core observing network. And our primary focus is on vertical land motion and sensor stability. So if you have an instrument that can see the structure that your sensor is built on slowly sinking into the mud then you might want to use that to understand what signal you're seeing of the water level, because water level is always relative, right? It’s relative to where the sensor is. So that's been our primary focus. We certainly wouldn't not think about using IR as well, and the reflected signal as we start kind of building out that network. But our

focus right now is figuring out where these will be useful for monitoring water level with vertical land motion, you know, collaborating closely with NGS and making sure we kind of understand. We're not geodesists in general, so just making sure we understand the signal that we're seeing and kind of what the time frequency of change that we're looking for. But again, we're really looking for that long-term trend. But since these are located in places where tide gauges are, I think it's a real opportunity for an enterprising graduate student to play around and really look at those signals and see how they match the tide gauge.

Mr. Nathan Wardwell: Well, how about a round of applause for our panelists? {applause} So that does, I think that's the last session before our break, so our planned break?

Ms. Rachael Dempsey: Yes, we've got lunch scheduled at 12:30. It goes to 1:45. So we can go ahead and break early, but come back at the same time so that we can make sure that we have, we're set up on time for our first session when we get back.

Mr. Nathan Wardwell: Okay, so go ahead and break now, make sure we're back at 1:45 for the start of the next session, which will be Laura Fontana and Laura Keeling with a, and what is that session is?

Ms. Rachael Dempsey: So after lunch, we have a session on 20 years of HSRP. So that will be with Mr. John Rayfield, who's part of the House Transportation Infrastructure Committee.

Mr. Nathan Wardwell: Okay, great. I'm looking forward to it. Okay, thank you very much, and I guess we break.

LUNCH BREAK

Mr. Nathan Wardwell: Great, so I think we're going to go ahead and get started. Welcome back, everybody. We're now going to get started on our 20 plus years of HSRP. John and Rachel, thank you very much for taking the time out of your busy schedules here today to join us and lead this great discussion. I'm really looking forward to it. I've followed HSRP and HSIA for many, many years. And so getting this history is going to be, I think, a great experience. So I'll hand it over to you, Rachel.

Dr. Rachel Fontana: Thank you. I'm excited to be here. The Hydrographic Survey Review Panel, but you know, we work for NOAA, so we like our acronyms, or HSRP, was established in the 2002 reauthorization of the Hydrographic Surveys Improvement Act. Again, acronyms, we're going to call it HSIA today, folks. With more than 20 years behind us (and if I'm doing the math right from 2002, we're going to go with almost 25 years here), we thought we would take the time to do a little retrospective tour of that piece of legislation, particularly HSRP, from a congressional perspective. We'll take a bit

of time to look at the origins of HSRP, what it took to pass HSIA, and then we'll look to spend a bit of time understanding the accomplishments and then what the next decade may hold.

We're thrilled to be joined today by Mr. John Rayfield, the Staff Director for the House Transportation and Infrastructure Committee, Subcommittee on Coast Guard and Maritime Transportation. He spent his career on Capitol Hill in the U.S. House of Representatives. I am going to need a lot of paper here because he has a very lengthy bio, which I'm not going to read all of. Okay, John says “no.” But he has spent many years in a variety of different congressional member offices and on a variety of different congressional committees. He spent many years on the U.S. House of Natural Resources Committee as staff, primarily handling issues on NOAA's National Ocean Service and NOAA's Office of Oceanic and Atmospheric Research. He did spend much of his time behind the scenes on the HSIA Act of 1998 and the reauthorization in 2002. So with that, we are very excited to have him here, because of that history and that historical knowledge he has. I'm excited to turn it over to John for a few moments to answer some questions we have and give us a little bit of the origin story. So with that, John, thank you for being here today. What can you tell us about the origin of HSRP? Did Congress envision HSRP primarily being a technical sounding board for NOAA and NOAA leadership, or were there hopes of a broader mandate?

Mr. John Rayfield: When I first read the question, I thought, “Where did that come from? Of course that's not what we meant.” And then I went back and read the law and that's exactly what it says. So that was not exactly what we meant. And what we actually intended you all to be was a guerrilla organization within NOAA that supported the program and brought some external support for funding and modernizing the program. I guess we should have been a lot less subtle when we actually wrote the provision. But if everybody will leave me their t-shirt sizes, I will get Che Guevera t-shirts to hand out at the next HRSP meeting. So yes, anything you all can do to support the program is very important.

Dr. Rachel Fontana: Thanks, John. All right, I have a couple more, and then be ready, because I'm going to then turn it over to you all to get any of your questions answered as well.

Mr. John Rayfield: And then I've got a little background on the Act, but we'll get back to that.

Dr. Rachel Fontana: Great, yeah. Well, with that in mind, when drafting the legislation, what were the key compromises that shaped the final legislation, or some history on it?

Mr. John Rayfield: So I'll give you that whole spiel then now, I guess. Okay. So in college, I was-- it is less unusual now than it was then-- I was an actual liberal arts major. I even double majored in English and history. So I am the least likely person in the world to have ended up being the lead staffer on legislation for a highly technical program. However, that's where we ended up. By 1995, the Office of the Coast Survey, really by 1990, early 1990s, the Coast Survey had been underfunded for years, and was not enthusiastic about moving towards electronic charting, and did not see any need to use hydrographic surveying data for anything other than making nautical charts. They were not enthusiastic about the Hydrographic Services Improvement Act. But the intent of the Act was to increase the amount of data being generated, smooth the path to electronic charts, make the data more widely available to habitat scientists, regulators, coastal planners, other people in NOAA and beyond who needed such data. I believe that the Coast Survey has come around on all of those things and is much more broad-minded than they were in 1994 or 5, when we started this whole process.

The basic deal that was cut was that the government would retain the in-house expertise so that they could maintain the liability for the data, but that the growth in the program, at least at that time, would largely come through contractors. As we note in the Coast Guard world, drug cartels do not have to get their capital budgets approved by DHS, OMB, and then funded by Congress. Coast Guard does have to do that. So sometimes you just need contractor input to get the capacity that you need because you're never going to get the capital funding. Whether you should or shouldn't is a different issue, but it's the world we live in. Capital funding is very, very hard. The Coast Guard, I got them $4.3 billion in shoreside funding and reconciliation. That only leaves them another $7 billion short of what they need. So it's just always difficult.

So really there were four things that led to the Act. First, technology changes. Electronic charts were coming, and we needed to figure out how we were going to implement the change to electronic charts. Second, the National Academy of Sciences did a study, I actually have it here, *Minding the Helm*, which was originally chaired by Admiral Herberger, but then he became Clinton's Maritime Administrator. And Martha Grabowski, some of you probably know her, she still does a lot of National Academy work, professor at Rensselaer, took it over. They made recommendations that we used as the basis for the bill, but I was a lowly clause five when this came out in 1995, which meant I was just the subcommittee ranking members designated staffer. We don't have those anymore. Thank heavens, because now I work for full committee, and they would be a real pain if we still had them. But anyway, General Herbert came in and told us it would take 444 years to map the EEZ at the rate we were going, and that NOAA had no annual charting plan, that they just came in every year and winged it. So the next year, the Merchant Marine Committee went away. That jurisdiction went to the Committee on

Natural Resources. I went over there as the Coastal and Ocean program staffer, and my full committee chairman was Don Young, who, represented Alaska, which includes about a third of the U.S. EEZ. So he was very interested in-- and was a former tugboat captain-- in setting the priorities for charting. Of course, he was particularly interested in Alaska priorities for charting and in bringing that number down in some meaningful way.

Third, after that National Academy report came out, there was an informal industry group that got together: Paul Bea with the Port Authority of New York and New Jersey, American Association of Port Authorities, American Association of Pilots, National Mining Association, and the indomitable Helen Brohl, who for many years ran CMTS, but, at that point, was with the National Association of Maritime Organizations. And they helped push the modernization through and get broader attention with a broader group of members.

And then finally, MAPS. John Bird's here somewhere. MAPS led the fight to privatize the entire program. That is not where we ended up. But they brought a lot of energy and attention to the discussion. And we did end up with growth through contractors but maintaining the in-house capabilities. I spoke to the panel in Anchorage at the Hotel Captain Cook in 2006. (You guys really need to talk to your event planners. See if you can upgrade where you go.) But anyway, at that time I know you faced tight budgets. You needed a new high latitude survey vessel. You had to adjust rapidly to changing technology, and you had to figure out how to cooperate with other NOAA programs and other federal programs. You still face tight budgets. I do understand there is a high survey vessel at some point in the process. It's going to be called the *Surveyor*. I actually have my hat from spending 3 days on the original *Surveyor* in 1990, I'll say 6, 7, something like that. We still want you to name a survey vessel for *Don Young,* but we'll talk about that later. The good news is you successfully implemented the electronic charting program, but now things are evolving. Technology is evolving even faster. And I went up with Admiral Curry and Kerry, and we saw them doing scanning on a historic shipwreck. And the University of Rhode Island guys had connected the scanning software and the modeling software so that as they were scanning it with the ROV, on another screen it was making the 3D model. Technology continues to evolve, and, hopefully, you all will be able to use that to have less people and less expensive platforms out on the water and be able to get more data and more data processed for the same price. But we're probably still 5 to 10 years off on that.

Dr. Rachel Fontana: Thanks, John. That was, I learned a lot.

Mr. John Rayfield: Possibly more than you ever wanted to know.

Dr. Rachel Fontana: No, no. I mean, as somebody who works in policy, I'm taking notes over here. I'm enjoying it. I'm also curious what's in that *Minding the Helm*.

Mr. John Rayfield: *Minding the Helm.* This was the National Academy report back in the day when the National Academy had enough money to print hard copy reports. They don't do that anymore. But, yes, it was marine navigation and piloting, so it covered a lot of territory. And then Larry Mayer followed up in '96 with his study of charting and coastal mapping, which, again, I think the Coast Survey has come around on that and no longer believes that hydrographic data should be used for charts and nothing else. And I think that second National Academy report helped get people there as well.

Dr. Rachel Fontana: Thank you. You touched on this a little bit. I'm going to delve in a little bit deeper on, you know, kind of the future, right? You talked about us needing to move towards the modeling and the tech, but what does a successful HSRP and implementation of HSIA, for that matter, look like to you from a congressional perspective? Any thoughts on what we can take to be more actionable to those?

Mr. John Rayfield: I think you need to continue to look at how to adopt the technologies that are out there. Like I said, we got through electronic charting. Now you have autonomous vehicles that are getting to the point that they can do some of the survey work. And you have Starlink and, I assume, other technologies that, hopefully, will allow you to get data off the vessel so that you don't have to have a hotel operation at sea, which is very expensive, keeping people out on ships that are processing data where we can put them in, you know, some strip mall in Kansas at much less expense to process the data. And then it will always be a fight for the budget. And then anything you all can do to promote integration with the other NOAA programs and with the other federal agencies.

Dr. Rachel Fontana: So as a follow on to that, did you, going back historically, intend for flexibility in HSIA and in HSRP for those emerging issues? Was that kind of what you were thinking at the time? Does HSIA allow for, to meet those increasing complex challenges?

Mr. John Rayfield: So no, we were focused on getting the backlog down and implementing electronic charting then. The good news is, however, we actually did write the statute in a broad enough fashion. So Section 303, the Hydrographic Services Improvement Act, which is the section that authorizes the panel, says you all have the authority to review anything under, I'm sorry, Section 305. You all have authority to review anything under Section 303, which is the functions of the Administrator. And that includes 303c, which states that the Secretary may use hydrographic data and services to support conservation and management of coastal and ocean resources. So I think we

did give you the authority to look at everything that you need between b, which lists a long list of the Administrator's functions and this. But if as you are deliberating and you find something that we need to go back and add in there, you know, people know where to find me to slip things under my door that I can pass on to my esteemed colleagues on the Natural Resources and Senate Commerce Committee.

Dr. Rachel Fontana: Thanks, but I don't know what door is yours, but okay. With that, I'm going to ask one more question and then open it up to the room in case there's any others. Twenty years from now, we'll definitely be here again, you and I. If we're invited back to talk about the successes of HSRP and HSIA, what would you hope you could say to this panel that the panel accomplished?

Mr. John Rayfield: I would hope that you have figured out how to ride the autonomy wave and use whatever autonomous assets are out there to the extent that they are cheaper and safer and more available for people. And I'd love to think you're going to get bigger budgets. But that's just not where things are going now for any federal domestic program. I hope you will be 20 years into using a new high latitude survey vessel and that you are more fully integrated with all of NOAA's other physical asset collection programs and that all of NOAA's other physical data collection programs are better integrated among themselves so that everybody can use whatever data they need for anything they need to use it for. And then I really hope that you all can figure out how to get federal agencies to work better together. I have to admit I haven't followed this. When I was doing it, there were multiple federal shorelines. So you had problems getting USGS and the Coast Survey to print a single map because they couldn't agree on where the shoreline was. There was actually a committee within the Department of Interior that looked at this. I mean it's a "Saturday Night Live" skit. You know, really, figure it out. But the other issue, which I deal with all the time, and NOAA is the best partner in this, but the Corps of Engineers and the Coast Guard and dealing with ATONs (aids to navigation)-- how the Coast Guard can be in every port in the United States and presumably every day see the Corps of Engineers out dredging a new channel and then when they finish, go, "Oh, like, wow. Do you want us to move the ATONs to the new channel? Well, that's a 2-year budget process." I just don't know. So there is a provision in this year's House-passed National Defense Authorization Act asking all three agencies to come and brief the relevant committees on working together for better aids to navigation. And then, me personally, and let me say that I am completely off the reservation with my committee and my members, and my boss (he's retiring at the end of the year), we need to look at how to move beyond electronic navigation to, ultimately, real-time vessel-based data. But we'll probably never get there. But certainly a reduction, if not an elimination of aids to navigation. And see how to get all of this integrated so that we're not still using 19th century buoys in the electronic

navigation age. I'll say that all of my members on both sides of my aisle, on both sides of the aisle, in a bipartisan manner, would shoot me for that. So let me state the committee's position is, “Do not move a single aid to navigation because my constituents will be angry.” But nonetheless, I would hope you all would collectively figure out, help the other agencies figure out how to get there and how to use the technology that we've got.

Dr. Rachel Fontana: Thanks, John. Those are, well, I have other questions, but before I do that, I'd really like to open it up to the room if you guys have any questions. I think I saw your hand first.

Dr. Tuba Özkan-Haller: Hello, hi, I'm Tuba. I hail from Oregon State University. And Mr. Rayfield, thank you for being here, and thank you for all of the work you've done throughout your career. I loved that you mentioned the National Academy reports. I work quite closely with the National Academies, myself having co-chaired a recent study. It's always great to hear that these studies actually have an impact on the real world. They are a lot of work, like an entire booklet you just showed. I'm curious if you can give us some examples of how the HSRP’s work, in particular, had impact, what kind of actions HSRP, you know, meeting reports or recommendations led to? Do you have any examples of that?

Mr. John Rayfield: And I don't have any concrete examples. And I should have looked all that up before I came because I went to the different job not long after it was created. But the biggest overall impact is just that it keeps the issues on the front burner. And parts of the problems that led to where we were in 94 and 95 was that there were other sexier things in NOAA that NOAA was concerned about. And there was no one continuously beating the drum for their, you know, fundamental historic mission, right? I mean, the Office of the Coast Survey is the oldest entity within the, within NOAA. So that's what we were trying to accomplish was to get some mechanism to keep the conversation going. And sorry, I should have looked at your recommendations and been ready for that question. But yeah.

Captain Anuj Chopra: Thank you so much, Mr. Rayfield. So I'm a mariner at heart. I sailed for 15 years, ran ships for 20 years. And where I'm coming to you is to put on your older hat when you're looking at the full infrastructure. I appreciate your comments on realizing or the realization that our infrastructure is constrained because of the capital needed to improve it. And how do we maximize our economic activity with the existing infrastructure, leveraging technology and NOAA's capabilities? What are your thoughts on that? Is that within the purview of HSRP? And how does that play in the Department of Commerce or the overall aim of this committee?

Mr. John Rayfield: It's certainly within your purview. Certainly, with Secretary Lutnick, I would think this plays into his larger concerns. You can only get so far leveraging technology, but I do think you can make some progress with the technology that's evolving there in terms of giving you ways to acquire data less expensively and distribute it less expensively. But the bigger infrastructure issues, I mean, it's a problem. We, the T and I Committee reported its part of the surface transportation bill, which is where we get to say what we think you ought to spend the money on. The Ways and Means Committee has yet to report their part of the bill, which is how you pay for it all. And it is a problem. So the House Committee on Transportation Infrastructure, which I'm on now, has the obvious things- a railroad subcommittee, an aviation subcommittee, a highway and transit subcommittee. There is what I call the bipolar subcommittee, which has the Corps of Engineers in dredging harbors and the Clean Water Act. So figure that out. Then we have an Odds and Ends subcommittee, which is just everything that's left over at the end of the day. It's public buildings, emergency management, economic development, the Kennedy Center, humorously enough, the Smithsonians, and the Capitol grounds, not the building, only the grounds. And then my subcommittee has Coast Guard, the civilian part of MARAD, and the Federal Maritime Administration. So the big subcommittees have trust funds that they get to spend money out of. I do not have a trust fund so I keep asking my full committee to give me a trust fund so people will care more about what I do. But where I deal with the infrastructure in the Coast Guard is they had fleet obsolescence for all of their surface fleet and the majority of their aircraft. And we have spent the last 20 years trying to deal with that. And they have sold their soul and not put any money into their shoreside physical infrastructure. And it is literally crumbling around them now. And how, yes, how we swing that pendulum back, I don't know, because I still have one entire class of-- we built the little cutters; we built the big cutters; we're in the process of building more icebreakers than anyone on Earth but Russia would ever need-- but we still have the medium-sized Coast Guard cutters, which are the 30 to 50 day at sea cutters to replace. And that's going to be a lot of money. And we've now spent so much time replacing the cutters that the helicopters have aged out. So in reconciliation we bought 40 new helicopters, which only leaves me needing another 105 new helicopters. So yes, I wish I had an answer on how we convince people that you've got to put money into physical assets. Though I do laugh. NOAA Corps officers may not laugh with me, but I spent 8 years on resources trying to recapitalize the NOAA fleet. So I say that was my practice for then spending 22 years on the Coast Guard subcommittee trying to recapitalize the Coast Guard fleet. But I cut my teeth on recapitalization on the NOAA fleet.

Captain Anuj Chopra: If I may add, one of our limitations on commerce is we are not able to maximize the throughput of our existing ports because of either lack of

technology or lack of precision navigation as used by other Western nations. Rotterdam is a classic example. There are so many examples which we know. My effort here or our effort here is how we can leverage HSRP and NOAA into that direction to maximize that economic activity so that we can capitalize what we have. What we don't have, we don't have. But what we have, at least capitalize and maximize that.

Mr. John Rayfield: I'm trying to think of how to answer that question without getting myself fired. So Rotterdam has an entirely different structure and worldview than do United States ports. Rotterdam works 24/7/365. American ports do not. Congress, who I work for, has made the decision, "Everybody gets a port." So granted, we're a much larger country and you do have to spread ports out more. But what HRSP can do to help with making U.S. ports more efficient is not the major problem in efficiency at U.S, ports. That's about as far as I can go on that one.

Dr. Rachel Fontana: Sorry, did somebody have a--

Dr. Tuba Özkan-Haller: Can you restate that last statement one more time? I'm trying to follow.

Mr. John Rayfield: I'm sorry.

Dr. Tuba Özkan-Haller: Can you restate what you just said about the efficiency and HSRP's purview?

Mr. John Rayfield: There are a lot of other factors that affect the efficiency at U.S. ports more than just efficiently bringing vessels in and out of those ports.

Mr. Nathan Wardwell: Hey, John, good to see you again. Thanks for the long history; I appreciate it. You started out mentioning HSRP. One of the ideas was a guerrilla team for external support for funding NOS. I love that. You also hit on a few things about how in the current environment needing to figure out how to collect data more efficiently and distribute data more efficiently. We, as a panel, will pull together a letter of recommendation for the Administrator. We have discussions about, referencing funding and funding requests in there. My question is really like any input you can provide us on how to be effective at supporting funding for NOS other than our current approaches.

Mr. John Rayfield: Right. Just make them aware of just how much the U.S. economy depends on waterborne transportation, and any part of it you can make more efficient has an impact across the board. And I think that is probably what will resonate the most with the Commerce Department. In different years, depending who's at the Commerce Department, I think the argument that this data also has a place in the larger world of oceanographic physical data and how that all relates together is your other big argument.

Mr. Nathan Wardwell: Thank you, that's very helpful. A little story: I was in Argentina recently and listening to a few different businesses provide briefings. And one of them was, it was a marketing company developing an AI tool to help their constituents, but they were incorporating environmental data, real-time environmental data to predict consumer behavior, right? And so it's well out, it seems well outside HSRP's purview, you know, but it kind of speaks to when you put in these real-time monitoring systems and stations for environmental data, you don't know what that's, what the data is going to be used for, right? You don't know exactly where the economic return and value will be, right? Whether or not, you know, it's pushing beyond like, "Hey, this is going directly for a chart development," or, "Oh, wow, look, this is going for a habitat restoration; this is going for consumer behavior prediction," right? And so, yeah, thank you for that time.

Captain Carolyn Kurtz: Hi, I'm Carolyn Kurtz, and I'm a lifelong professional mariner, deep sea mariner, and a recently retired harbor pilot. The hair on the back of my neck stood up a little bit when you talked about the reduction and elimination of physical aids to navigation. And so I don't know that I'm in the same category as a constituent that, you know, talks to their congressman and says, "You can't take my buoys away." This is something that NNAVSAC, which has been disbanded, addressed for many years. And as the Council, it was, pretty unanimous that the Coast Guard's initial plan to eliminate physical aids was untenable for mariners for many, many reasons. So what does that reduction and elimination look like as a practical matter for mariners that are still looking out the window of vessels to safely navigate.

Mr. John Rayfield: The Coast Guard made one big effort at it last year. They did not do the sort of preparation work that they should have in New England, which is where they came out with the plan, and it blew up in their face. So right now, it doesn't look like anything. We're going to have physical aids to navigation for many, many, many years but-- and that is my committee's position is that we should have physical aids to navigation for many, many, many years. It just seems to me that with the technology evolving as fast as it is, we ought to start thinking about how to at least reduce the number of those aids. It does not seem to anyone other than me that that is a good idea, to be clear.

Captain Carolyn Kurtz: No, I think there are probably some people on your side of things that think it's a fantastic idea. It's something that was discussed 10 or more years ago as like, this is the plan moving forward. And there was such an enormous outcry from the maritime community, from small boat users to big boat users, for very important and practical reasons.

Mr. John Rayfield: Right.

Captain Carolyn Kurtz: Just, like the technology's there really for larger autonomous vessels. And then that would be the time, in my opinion, to eliminate physical aids if the vessels being navigated in those waterways are autonomous. But I feel strongly that as long as there are humans involved, you still have to have those physical aids. So I'm just, you know, I imagine there will be a lengthy transition period and I would hope that there would be quite an extensive survey process from the professional mariners that use ports.

Mr. John Rayfield: We can only hope that after their experience in New England, the Coast Guard will, in the future, do extensive outreach with all of the user groups before they do anything suicidal.

Mr. Eric Peace: Hi, John, Eric Peace, we know each other. Going back to the ACE navigations, to follow up with what Carolyn was saying there, one of the things that tying back with those interagency cooperative agreements, you know, Army Corps of Engineers, Coast Guard, we have shoaling on annually basis on the Great Lakes. And that occurs during ice season before anything can come out and clear it out. So the way we mark those is through virtual aids to navigation, which is a very effective tool. And it's run out of Coast Guard headquarters or whatever through using their AIS signals. So I think there's possibilities to reduce. I think it could be done safely, but you have to pick and choose, and that's where probably--

Mr. John Rayfield: We're a long, long way away from that.

Mr. Eric Peace: Yeah, and the other piece of it is, too, the Coast Guard (and I know the Coast Guard) if you eliminate buoys, they'll eliminate 20 icebreakers just to say they don't need them anymore. And that's my biggest concern.

Mr. John Rayfield: And we are building a whole new category of small (not a moment too soon) replacements for the black hull fleet. So we've got to keep them for at least 25 years to justify these new aids to navigation vessels.

Mr. Eric Peace: Thank you, and thank you for everything you do for NOAA and the Coast Guard. I appreciate it.

Captain Anuj Chopra: I was just going to add to what Carolyn said that pleasure boat or leisure boats, the small boat owners, that number is exploding. And they're a major stakeholder and they like ATONS, physical ATONS. The electronic ones work for ships and commerce but-- so somehow we are forgetting them in our conversation. They're not equally represented. And that is one of the challenges which is there.

Mr. John Rayfield: There are more or less 13 million recreational boat users in the United States. Trust me, I have not forgotten them. And they will be the hardest of all the groups to ever figure out how to do that safely. Yeah, yeah.

Dr. Rachel Fontana: Yeah, we probably have time for one more question if anyone has one.

Dr. Tuba Özkan-Haller: If okay, I want to bring it back to port efficiency. Can you tell us a little bit, is it possible for you to share a little bit more about your views on efficiency and what holds them back?

Mr. John Rayfield: No, I cannot.

Dr. Tuba Özkan-Haller: Okay.

Dr. Rachel Fontana: I'm going to, then, take this opportunity to ask one more question. From your current position on house, T and I, what are you seeing your committee working on in the near future that's most applicable to NOAA and HSRP? Because I know it bleeds in a little bit, right? You've talked about the icebreakers and the Coast Guard. Is there anything else we should kind of be aware of, from your perspective?

Mr. John Rayfield: Well, the coordination among the agencies on ATONs is something that really, really needs to be tightened up, because it's just a recurring problem. And it doesn't, I mean, you don't go out one morning and decide you're going to put in a new federal navigation channel and put it in that day. These are multi-year processes. Why the Coast Guard can't be ready when the project is finished is a mystery to me. The Coast Guard (I wonder about them sometimes), so they oversee what's now Chapter 700 of Title 46, which used to be called the Ports and Waterways Safety Act. And they are supposed to do port access route studies to make sure that you have safe routes for you all to then survey and take care of. And under the law, navigation takes priority until the federal government leases the bottom land to anybody. And then not screwing up the lease takes priority. We started in 2006 trying to get the Coast Guard to do an Atlantic Coast port access route study so that they would be ready when we started leasing land for wind farms. And they would already have their navigation routes set aside and they wouldn't conflict with the leases. They did nothing. They did nothing. They did nothing. So finally in 2016, we said, "Okay, we're putting this in statute, write an Atlantic Coast port access route study." And they wrote it. And then we said, "Okay, when are you going to implement it?"

"Oh, we're not going to implement it. You made us write it, so we wrote it. Now we're going to do nothing." So in 2018, we statutorily said, "Okay, implement it." They were like, "Oh, well, the work we did was actually just total crap to shut you up and get you off

our back. So now we have to go back and do real work before we can implement it." Okay, so it is now 2026. They might have the Atlantic Coast Port Access Route study finished by 2028 if we are incredibly lucky. The leasing has largely occurred off the East Coast, at least north of Norfolk. So they will have to simply put their routes around any leased property. They are, however, moving forward on a Gulf Coast study and, remarkably, an Arctic study. And hopefully those will be more proactive. So that is certainly one thing that, yes, you all could take a look at-- get them to actually do their jobs.

Dr. Rachel Fontana: Thank you, John.

Mr. John Rayfield: Sure.

Dr. Rachel Fontana: Do you have any ending words of wisdom to provide?

Mr. John Rayfield: No, I think that's good. I appreciate it. And I think we went over all the high points and yeah.

Dr. Rachel Fontana: Thanks again.

Mr. John Rayfield: But thank you guys for having me. This was great.

Mr. Nathan Wardwell: I've got to figure out again what's next on the agenda here. Ashley Chappell. Yes. All right, well, thank you very much for that, John and Rachel. That was a great update. Now we'll have Ms. Ashley Chappell in her now role as Executive Director of the U.S. Committee on the Marine Transportation System. She's going to go ahead and give us an update. So, good to see you again, Ashley and looking forward to it.

Ms. Ashley Chappell: Nice to see you all. Actually, that trip down memory lane about HSRP was a lot of fun. One thing that didn't get mentioned, and John may remember this, I can't remember if he knows or not, but the early HSRP panels did the 10 Most Wanted, which was sort of a glossy production, a publication of the recommendations. The panel would sort of take a look at the recommendations it had made over the course of the past couple of years, prior years, to the NOAA Administrator and then created this glossy document, which may or may not have found its way to the halls of Congress. So that was one thing.

Mr. John Rayfield {no mic}: Yeah. The person who actually came up with the idea for that was not me. It Helen Brohl, who was actually your predecessor on the Committee on Marine Transportation.

Ms. Ashley Chappell: Right.

Mr. John Rayfield {no mic}: It's really Helen's baby. Sorry.

Ms. Ashley Chappell: Yeah, no worries. So and actually the timing of the Committee on the Marine Transportation System and another act that hasn't gotten to mention really yet, the Ocean and Coastal Mapping Integration Act, as well as the Hydrographic Services Improvement Act, you can see the theme here. And it really, you heard it today in John's remarks about pushing federal agencies to coordinate through whatever means possible. And so there are two acts, the one that created the US Committee on the Marine Transportation System, as well as the one where you saw me last, the Ocean and Coastal Mapping Integration Act and the Interagency Ocean and Coastal Mapping Program. You know, those are two that really are intended to spur interagency coordination. And so that's what I'm here to talk with you about today, is where we are with the Committee on the Marine Transportation System. And, yes, I am the second person in this role as Executive Director, following Helen Brohl, who is famous in her own right. We all know and love her. So if you'd jump to the next slide.

Really have to say I'm so excited to be here. I just walked in the door and felt it in my heart that I'm back in the NOAA world. So thank you for inviting me to speak. And I'm up here with Chris because he didn't want me to sit alone.

Mr. Chris DiVeglio: You'll hear from me next.

Ms. Ashley Chappell: This table makes me think we should have like big turkey drumsticks or something. We're up here. All right, why don't we jump to the next slide?

What I thought I would do is tell you, for anyone who is not familiar with the CMTS, I'll give just a little bit of background and then touch on the things that we are doing in the CMTS. And I've used up a lot of my time already. So this slide is just to illustrate that the CMTS involves lot of different agencies, a lot of departments, a lot of agencies. If you jump to the next slide, please.

These are all the agencies running across the top. And you don't need to really look at this except to see in the X's what this slide is showing. What this matrix is showing is overlapping interest areas in the marine transportation system. We have 30 to 35 agencies at any given time who have either MTS responsibilities or interests or equities working and talking, coordinating, or trying to as best we can on these many and varied issues. And I'll hit some of those I think in the next slide.

Yeah, so just a little bit more history. Right around the same time as some of these other things were happening, the CMTS was created to look at the marine transportation system, to promote integration with other modes of transportation and that intermodal concept, and then to coordinate, improve the coordination of and make recommendations related to marine transportation system relevant to federal policy. So, you know, again, kind of the same origin story about coordination and supporting MTS. Let's go to the next slide, please.

The way we're structured, CMTS is housed in the U.S. Department of Transportation. That was by design and sort of lobbying by Secretary Mineta at the time of creation, because at that time, the Coast Guard was actually being moved out to the new Department of Homeland Security. The Department of Transportation had the Maritime Administration and the St. Lawrence, Great Lakes St. Lawrence Seaway, but would be missing that sort of thing that would keep it involved in the very interagency elements of transportation. So Secretary Mineta really lobbied to host the CMTS, and that's why we're in DOT. And it works. The Coordinating Board of executives who lead and support the Cabinet Committee, which has met only once, but the Coordinating Board meets all the time. Our Chair right now is representative of the Army Corps, Major General Jason Kelly. It rotates among NOAA, Coast Guard, Army Corps, and the Maritime Administration. So we kind of go in a cycle. I lead the Executive Secretariat that keeps all this organized, and then we have a working group of subject matter experts. If you jump to the next slide, this is really where the work happens.

We have different integrated action teams that are built around what the agencies want to work on together. The sort of theme at the CMTS is that two agencies can work quite well together. Three? Maybe, maybe not, but three or more is really where the CMTS kind of adds value by bringing those agencies together around a topic. And the aids to navigation, one that John just mentioned, you know, I'll be taking that back to the future of navigation integrated action team to say, “You know, maybe there's, if you aren't already talking about it, let's talk about aids to navigation,” and see where we can end up on coordination there. But the different topics that our teams here work on include maritime data, the Arctic supply chain and resilience, offshore, that group previously pretty much focused on wind energy but has since expanded to things like munitions and explosives of concern and other offshore topics. A big one for us is workforce. So I appreciated the discussion earlier about workforce. And then, of course, the R and D component with our science and technology group. Let's jump to the next slide.

So just some things just to illustrate really what we do. A big thing that we do every year is a tabletop exercise, every couple of years rather. The one we just had most recently was in the Port of Memphis in Tennessee. And the scenario that we created was around

an earthquake. And you think, “Earthquake, Tennessee, that would never happen.” But as it turns out, if you talk to our USGS colleagues, the Port of Memphis in that area is sitting on a big fault and it could actually very easily happen. And so we do supply chain disruption exercises to just sort of check in and make sure people know who to talk to or what we would do in these situations. Unfortunately, our tabletop exercises have a way of sort of coming true. Our first one was the Port of Baltimore, and the bridge. We did a scenario with a bridge collapse. Not 6 months later, the Francis Scott Key Bridge collapsed. Our second one was in Cleveland, where we had a railroad bridge and a barge collision. And that came true a few months later. So we're really hoping that Memphis does not see an earthquake. But nonetheless we run the traps on it just to make sure, you know, that people are thinking about different kinds of emergencies and things to cover. Next slide, please.

Another one I sort of alluded to already, this is something we did with the Maritime Operational Threat Readiness Group, the GMCC that does response and readiness efforts in the maritime domain. Munitions and explosives of concern came up in a big way with wind energy. And since then just having the clear protocol for what the federal agencies are supposed to do when a lessee reports that they have discovered something that might be an explosive of concern. So we've written a protocol and we'll be having a tabletop exercise to test it. Next slide.

So this one, this is really, Captain Chopra, this is, you know, your question earlier about workforce. And Admiral van Westendorp alluded to this because we were just talking about it at a CMTS meeting last week. This particular event, the CMTS really leaned in to support a wide variety of stakeholders-- federal, industry, nonprofit. NMEPA was there. But this is American School Counselors Association. It brings all the public school counselors, K-12, together every year to learn about new techniques and whatnot in counseling. But over the past few years, we've had a really strong presence because it's kind of educating the educators, really, to talk to their students from K to 12 about maritime. And I think that the influence that we have brought from CMTS is not just supporting the mariner workforce, but really the whole sector. Because when I came into this position, this was all about mariners. But I wanted to bring that whole geospatial, the science, the STEM fields, let's bring it all. And so we have quite a wide variety of booths at events like these, and we're really pushing having more so that when counselors walk down a row and they see everything is maritime related, it's really, really quite impactful, as the Admiral was describing too. So workforce is really something that a lot of our agencies can get around because of the need. Let's go to the next slide.

And we will be continuing that in our work plan for the coming year. And I thought I'd just hit some highlights of the other things that we work on. I know I'm a little bit over time. But just to make you aware, we do different ways of showcasing the marine transportation system. One product that we have at the CMTS is the *Federal Funding Handbook*. I don't know if anyone is familiar with it, but we make that huge effort to bring together all of the different federal funding opportunities we can find that relate to the marine transportation system in one place so that ports and other folks writing for grants can have that at their fingertips. Next slide.

This is our workforce arena, those Mariners Row events. We'll be hitting on those and other stakeholder engagements. Military to Mariner, also a big focus of the CMTS. And Mariner health and welfare, mental well-being, mental welfare. Next slide, please.

And this is our third priority area on supply chains and the maritime industrial base. And this relates very much to the maritime action plan and the focus of this Administration on shipbuilding and building up the industrial base. So we do a lot here with our supply chain and resilience workshops and our R and D roundtables. We do a conference with the Transportation Research Board every couple of years. This one coming up will be in 2028 on innovations in science and technology related to maritime and workforce. Next slide.

And our last work plan area is on reliability, efficiency, safety, and security of the marine transportation system. And this is where things like our Bering Strait study, our Arctic work happens here. We do a conditions and performance report to Congress. This is also where our coordination on S-100 implementation happens. So under our future of navigation team, we have Army Corps, Coast Guard, NGA, and NOAA all working to coordinate messaging and implementation of S-100 together so that we don't come across as one government with four different messages. So that's the sort of thing we work on there. And then finally, something that we are developing and will be exploring this coming year is an MTS network map or a model. And this is really the brainchild, if you will, of Captain Carmel from the Maritime Administration, something that he is really interested in pursuing. So we're going to be sort of pulling it together and seeing where it could lead and whether we want to pursue it further. And finally, the Coast Guard Board of Inquiry, I hope everyone has seen that the Board of Inquiry was finally published. And so the CMTS will be taking a look at that for where we can follow up on any gaps that involve multiple agencies and what value we can add. Next slide.

And that is it. Sorry to run a little bit long. Sped through that. Do you have time for questions?

Mr. Nathan Wardwell: Yeah, I was just curious. We don't have a lot of time. I did have one question. You had a slide with a matrix and agencies. And I noticed there was like one row which was like a major category where just about every agency was, there was an X for everybody. Do you happen to?

Ms. Ashley Chappell: I'd have to see it, but that was probably workforce.

Mr. Nathan Wardwell: Workforce? Okay.

Ms. Ashley Chappell: Yeah. Or data, that one is data.

Mr. Nathan Wardwell: Data, okay.

Ms. Ashley Chappell: Yeah, our Data Integrated Action team is also very busy coordinating, trying to, you know, data integration, data, interoperable data. They focus a lot there.

Mr. Nathan Wardwell: Great.

Ms. Ashley Chappell: As well as on statistics and things like that.

Mr. Nathan Wardwell: And while I'd love you to do an emergency scenario in Alaska, please don't do that anytime soon.

Ms. Ashley Chappell: I hear you, no. It's a bad reputation to have.

Mr. Nathan Wardwell: If there's no other questions, thank you very much, Ashley. We now have the opportunity to listen to Chris DiVeglio with an update on PORTS. Go ahead, Chris.

Mr. Chris DiVeglio: Good afternoon, everyone, and thanks for the opportunity to join you guys again. I'm going to give a couple of brief updates on the NOAA Physical Oceanographic Real Time System. You guys are already familiar. That's known as the PORTS program. I've heard it referenced a couple of times here already today. So I think we can proceed to the next slide.

So some of the content on this slide was already shared by Marian this morning. Again, just, I want to highlight again our new PORTS system that came online this year was the system up in Boston Harbor, which integrates a meteorological station, a side-looking current meter which is situated right outside of where the container terminals are and where the cruise terminal is there in Boston and the reserve channel. And we were also able to leverage the use of one of our NWLON stations up in Boston as well. There's still a planned air gap station on the Tobin Bridge, which is currently still in the works. So that was really exciting to bring that online and a couple of the

enhancements, which were also mentioned earlier. And I will elaborate on one or two of these in the future slides. So I'll let you proceed to the next one, Virginia.

All right, so as we mentioned, 41 active PORTS systems, which is pretty remarkable. With the addition of Boston Harbor PORTS-- the data from that system actually serves the needs of two seaports, so the Port of Boston, but in that general vicinity is also the Port of Salem, Massachusetts. So that leads me to my next point where, just a reminder that the data from one NOAA PORTS system often serves the needs of multiple individual seaports. So an example would be like San Francisco Bay PORTS-- there's obviously a lot of individual seaports in the Bay Area that are served by one NOAA PORTS system. So, naturally, as NOAA PORTS systems have come online over the years, so have the number of seaports served. And that brings us right now to our current coverage of 93 of the top 175 seaports in the U.S. by tonnage. Most of that list is based on tonnage. But that also includes some military installations. We're now more than 50% of those top seaports that are covered by NOAA PORTS. And that's a measure and a metric that we often report up the chain to NOS and to NOAA as the program continues to grow successfully. Next slide.

So it remains a successful shared responsibility partnership program. As we mentioned earlier, we proudly celebrated 35 years here in 2026. We've come a long way since the first system was established in Tampa Bay all the way back in 1991. We continue to field interest at CO-OPS and commitment for new gauging around the Nation. And we continue to say "yes" to those. So it's not just bringing new PORTS systems online, but it's also the enhancements to a lot of existing PORTS or sensor and station relocations. You know, through the current resource constraints, we are making sure we continue to keep up with our own housekeeping by tempering project lead times and expectations for our partners. Oftentimes when they come to us and make a commitment, it's a while before gauging can and is stood up. So we continue to work within our resource constraints. And another thing that we're doing, which I'll touch on, is just enhancing some of our stakeholder outreach and technical assistance, which we may lean on the panel for when the time comes to unveil some of the documentation. So we mentioned earlier, you know, falling under the realm of this slide is leveraging some of the PORTS disaster supplemental funding that we were able to come into in FY26, which has been really beneficial for us. Internally, we're continuing to revisit our internal procedures for directly charging to our partner funds, making sure we're being good stewards of the partner funding that we are getting as part of this shared responsibility partnership program, and just refining our tracking procedures for federal labor specific to PORTS. So lots of things happening internally to continue to make the program successful. Next slide.

I'm going to talk a little bit about some things coming down the pike, because I know that's often what people are interested in. We alluded to earlier that the next system to come online is actually going to be a Seattle PORTS system in 2027. After some initial delays, we've picked back up some momentum on that project. This was a result of a partnership with the Northwest Seaport Alliance out that way. This system is going to include a current meter, a meteorological station, and also integrate the Seattle NWLON, which happens to have observations in the bay there. Most of the new PORTS gauging is going to be focused in and around the container terminals on the south side of Elliott Bay there. So lots of momentum. And again, that is expected to come online by this time next year.

A little bit of updates on the lower Mississippi PORTS enhancements. This has been a big multi-year effort. This is a result of a partnership with the Louisiana Department of Transportation and Development. So there are the local system sponsors, but some of these new projects that are currently in the works as a result of a second partnership with the State down there and has a lot of high-level attention. Last year, back in 2025, we bought a new buoy-mounted current meter online off of Southwest Pass. This past January, we operationalized an air gap system up in the Baton Rouge area on the I-10 Horace Wilkinson Bridge. And just last week, we installed an air gap system on the Hale Boggs Bridge, which is a little bit up from New Orleans. That's the next one that's in play. We expect to get that data online and operational later this week. Looking forward, reinstalling two current meters, one in the vicinity of New Orleans at the Crescent City Connection and one up at Baton Rouge on the footers of the Wilkinson Bridge. There's still two more air gaps in play, both for 2027 and 2028, so we are focusing our energy now as well on the air gap system up on the Sunshine Bridge. You can see on the map there the red tick marks show, you know, where the upcoming air gaps are. And there's two blue tick marks at New Orleans and Baton Rouge to show the buoy-mounted current meter. So lots of enhancements there. There are three different pilot groups that use the river there. And there's been a lot of really strong collaboration with all the stakeholders, including the State folks down there. Next slide.

Air gap expansions. Really since the FSK disaster a couple of years ago we've really been fielding a lot of interest and requests for air gaps on bridges. A lot of mariners and bridge owners and stakeholders feel that air gap data is a really good tool in the toolbox to have. So currently there's a lot in play over the next 2 years. I mentioned a couple more coming down the pike for the lower Mississippi River. Right now, through a result of partnerships with the State of New York, there's actually four air gap systems that are in play for the Hudson River. You can see the map there on the right-hand side. In the short term, the first one that's going to be installed is the Mid-Hudson Bridge near Poughkeepsie this coming December, followed by the other three over the next year or

so. There’s a picture there of the Mid-Hudson Bridge and some design images there in the middle. I mentioned the Boston air gap that’s in play for the Tobin Memorial Bridge. There’s one as well, Sabine-Neches, the MLK Gulf Gate Bridge in Texas. And, last but not least, as a result of a partnership with Washington State, an air gap system that’s been sorely needed on the Lewis and Clark Bridge along the lower Columbia River out in the Pacific Northwest. So lots of air gaps certainly in the works too. And we continue to beef up the technology and the observations. Next slide.

And last but not least, I mentioned we are continuing to ramp up some of our stakeholder and technical outreach. There's a lot of feedback that we've gotten about just general questions that we get from existing PORTS users, future PORTS users, the general public. So having some of these things in our toolbox are going to be useful to share. And we're working with our stakeholder services folks right now and our technical assistance teams to generate some pretty graphics. So we're going to want feedback on these. So we may, if appropriate, reach out and connect with some of the panel members to provide feedback on those. Yeah, that's mainly what I wanted to give a couple of updates on today. And there may be some time if there's a couple of questions.

Mr. Nathan Wardwell: Thank you very much, Chris. There are a few minutes for questions if there are any. Yeah, Anuj.

Captain Anuj Chopra: Thank you, Chris, thank you so much. Chris, I'm a big fan of the PORTS program. I believe it's essentially required and it improves navigation safety. The fact that, even today, we have only 53% covered, to me, that's 47% not covered. To look at it that -- for me, over there, the glass is half empty. That's one side of it. And the second side of it is, even where it has been implemented many years ago, because of lack of budgets, how much of equipment has gone obsolete or in that space where it could be, you know, like for microwave sensors instead of the float sensors or audio frequencies sensors which are there? So with that background, what would be your comments? We are trying to revise our issue paper, which we did 2017 or 2018. And we did a little bit of study, so would be grateful if you can shed some light, the exact current state and how do you see that?

Mr. Chris DiVeglio: Anuj, I just want to make sure I'm understanding your question. Are you trying to understand-- I think something we touched on a little bit earlier when Marian was speaking about keeping up with the latest and greatest technology and making sure that observing equipment out there is refreshed and up to date-- is that kind of what you're talking about?

Captain Anuj Chopra: So that's one side of it. And the second side of it is the public-private partnership model is flawed, especially when there are multiple stakeholders involved, and where one stakeholder feels that, “If I spend the money, I'm actually aiding my competitor,” and that's in the busier ports, which should be a higher priority outside of that.

Mr. Chris DiVeglio: Yeah, again, just within, it remains a successful shared responsibility partnership program. You know, we continue to, we do what we can within NOS to allow the program to be successful. I can't speak to what some of the decisions are going to be up, you know, up the chain or down the pike. But we know that there's sentiment out there, varying sentiment on how the program should be governed. I'll leave it at that. But, you know, we are making sure that we're doing everything we can internally and within the line office to be able to govern it out as it has been. So I don't know if, Marian, if you want to add anything to that.

Dr. Marian Westley: Yeah, I mean, just to add, so one of the real beauties of the PORTS program is it is a partnership. So we are not engaging in sensors unless there is a partner who is supporting their maintenance and upkeep. We certainly have had PORTS that we've turned off because the partner lost interest or lost funding or whatever. For things that fall under the PORTS rubric, there's really nothing that's obsolete or not maintained because that's part of the agreement with the partner is this is the commitment to the ongoing maintenance of this system. So NWLON is different because NWLON is not partner- funded. That's from our base appropriations. So just to keep those two things really distinct, how the money works in PORTS is very unique.

Captain Anuj Chopra: Absolutely. Thank you, thank you so much.

Mr. Chris DiVeglio: If I may add to that too, and you just, you know, as part of the cost share model that we have and what funding the partners are providing to us, there is a component of that that does go towards recapitalizing station and sensor components. So because everything's operating in harsh marine environments, it's really important to make sure that we are keeping up with that. So, in my view, I don't think anything's fallen by the wayside as far as, you know, keeping up with the latest technology, because we want to make sure that it's operating and is able to be relied on for critical decision making when it's up and running.

Captain Anuj Chopra: I appreciate, and I understand where you're coming from and the constraints you have. You know, there are two sort of stakeholders here on the other side. One is, of course, the entity who you're partnering with as a commercial entity on the waterfront. But there's a second stakeholder, which is the safety of the mariner and safety of navigation. And unfortunately, that stakeholder is silent in this picture. So that's

where our concern was, or my concern was in our committee. We've had some meetings and discussions on that. So thank you for highlighting that.

Mr. Chris DiVeglio: You're very welcome.

Mr. Nathan Wardwell: I had a question. And we are kind of running late. I know, I guess I could have saved time here. I ran the beginning part of the meeting really fast, and now we're carrying over, and I apologize about that. I'm learning in the process.

Anuj reminded me, so there is another group that's working on an issue paper, Arctic-related, both charting and general Arctic. And, Ashley, I just wanted to throw out there if there was anything for our working group to consider as we're from the U.S. Committee on Marine Transportation as we draft that issue paper. Because I noticed there is a Arctic working group within your team and then also there is the Bering Strait study report, so--

Ms. Ashley Chappell: Yeah, we were directed by Congress to do the Bering Strait study and, in addition, the Maritime Administration, or Department of Transportation rather, was directed to set up an Arctic Seaway Federal Advisory Committee, whose purpose is to look at the Arctic for its potential for a seaway, not exactly like the Great Lakes or Lake St. Lawrence Seaway, but you know, that concept. And so our Bering Strait study is looking at it for the same reasons as well as for the emergency response. Do we have the emergency response capability to sustain a seaway? That's the main point of the study. But I think what I might do is, you know, maybe summarize that and share that with you all. So, you know, you don't have to just look at the legislation about our study. I can have a summary prepared that describes that as well as where we are with it and see if there are ways for, if you would all like to engage maybe at the midpoint when we're, you know, we're just now collecting stakeholders to engage with and we could engage with the HSRP as well.

Mr. Nathan Wardwell: Yeah, we'd greatly appreciate that. Thank you.

Ms. Ashley Chappell: Okay.

Mr. Nathan Wardwell: Yeah. Okay, I think it's time for a break, and we are meeting back here at 3:15. And then we will go into the public comment period. And after that, will be followed by a panel on NSRS modernization. So see everybody back here at 3:15.

Break

Rear Admiral Chris van Westendorp: Okay, thank you, everybody. I know that was a short break, but we have the all-important public comment period. This is the first of a couple that we'll have for this HSRP. I am going to turn this over to our esteemed Policy

Advisor, Robin Czeidinski from Coast Survey to read and summarize. I encourage anyone in the room who would like to provide a public comment to find a microphone so that it can be recorded for the record. On the screen, the comments will be displayed and are actively being collated into a document that's shared with the HSRP members and NOAA. After the meeting, the comments will be posted to the HSRP website and included in the public record. Amanda, are there any comments to share that can be read into the record? Or Robin for that matter?

Ms. Robin Czeidinski: Yes, thank you, Admiral. The first public comment we received comes from Mr. Ryan Lynch of Maritime OIC, LLC. He said, “Please find attached (and this will be distributed to the panel members) a document, which is a briefing note from Maritime OIC, LLC, a Houston-based maritime industrial economics advisory firm and U.S. small business. Within this report, we analyze the supply-demand balance of the National Ocean Research and Survey Fleet through 2040. It is submitted as a written public comment for the record of the September 28th-29th meeting. The analysis finds that roughly 40 vessel equivalents of derived mission demand is measured against only 37 hulls of supply today. Once NOAA's navigator delivers, no U.S. research or survey vessel construction is funded anywhere in the system. With age-outs averaging about two hulls per year after 2030, the central balance will reach approximately 35 vessels short by 2040. Hydrographic missions compete against fishery surveys and funded science for every remaining hull, increasingly so in the polar regions. The note closes with five considerations for the panel's deliberation, beginning with a recommendation that NOAA publish an annual requested versus executed days at sea series by mission family. The full model, its parameters, and the underlying fleet register are available to the panel and its working groups for examination and challenge. I would welcome the opportunity to present these findings during a public comment period or to brief the panel at whatever technical depth is useful.”

The second public comment comes from Mr. Roderick Batty, founder of Hydrographic Surveyor. He says, “I'd like to see the mapping discussion reframed for this Administration. Center the need around national security and securing our borders. That goes for the exterior coastlines as well as the Great Lakes.”

And our third public comment of the day comes from Guy Knowle, “Thank you for the historical review of HSRP and potential additional stakeholders in governance challenges that will arise as autonomy and data dissemination issues become prominent. Looking forward, does the HSRP expect to create opinions on how governance of technology implementation will be implemented through NOAA alone? Or can their work influence how the CMTS and other agency collaborations can become

more efficient? Address coordination issues more quickly as technology changes faster?"

Those are the three written comments we have received.

Rear Admiral Chris van Westendorp: Okay, thank you, Robin. If there is anyone in the room who would like to make a public comment for the record, do we have a microphone? Okay, Amanda is standing up in the back. We'll give folks a few minutes. I am okay with awkward silences, unlike some.

Ms. Amanda Phelps: Since we have not received any additional public comments through the online webinar or here in the room, we'll note that we do have a public comment period again tomorrow from 10:30 to 10:45. If you think of anything you'd like to provide as a comment, we'd be happy to take it then or through the hydroservices.panel@NOAA.gov. Thank you.

Rear Admiral Chris van Westendorp: Okay, thank you all and yes, please do send those comments to the hydroservices.panel@noaa.gov for those of you who have not had a chance to yet and wish to do so. With that, I think we will close the public comment period for today and I will turn things back over to the Chair.

Mr. Nathan Wardwell: All right, thank you very much. And I'll echo the Rear Admiral's comment there at the end. I encourage those online that are listening to please submit public comments. They're very helpful for the panel as we think about our recommendations going forward, getting that stakeholder input. There's a lot of value there. So I encourage you to submit your comments.

We're now going to roll into our next session, which is preparing to implement the changes to the National Spatial Reference System, the foundation to all geospatial infrastructure. Dr. Dan Roman is going to be moderating this. We'll have a panel. The panel members are Mr. Derald Dudley, Mr. Vince Oiser, Osier. Sorry for that. Mr. Tim Burch and Dr. Chris Parrish will be joining us remotely. And I'm very excited about this. Both Derald and Tim participated in the NSRS panel discussion up at the Alaska Geo Summit last week. So I'll hand this over to you, Mr. Roman, and take it away.

Mr. Galen Scott: There we go. Good afternoon, everybody. I'm Galen Scott from the National Geodetic Survey. And I am thrilled to be here with you today to introduce this panel about the modernized National Spatial Reference System. Those of you that have been on the panel for a while know we've been talking about this awhile, a good long time, and just on September 15th, we hit the launch button for the beta testing period. So we're now moving from the research and development side to the implementation side. And this is really where we need that kind of engagement, right? We can't do this

on our own. We could build the best system ever, but if we don't get that support to implement it properly, it doesn't really matter. So this is where we turn to you all and look for your support in making this thing real. And with that, I'm going to turn it over to Dr. Dan Roman.

Dr. Dan Roman: All right, and in case you hadn't noticed, we're missing one of our panelists, so hopefully he'll be arriving shortly. Again, I am Dr. Dan Roman. I am the Senior Advisor for geodesy. Until a few years ago, I was the Chief Geodesist, if that term is more familiar to some of you. I would say that after a few years ago was about the time we realized that the modernized NSRS was indeed going to be modernized and that we were actually going to have to implement it. So I did have to take a step up a little more in the duties, focusing more on the outreach component and, in particular, dealing with the other departments. So I will note that my colleague sitting next to me is Derald Dudley. He is with Department of Transportation. Vince, if he arrives, but he is still with the Census. And I bring them up because, in the end, those agencies are the ones that are under our purview to try and encourage to adopt the modernized NSRS. But as with most things, it's never that simple because we can't just go to them and have them stand up and they take everything out of hide and they go ahead and implement. In point of fact, the Department of Transportation gets a lot of its data from the states and from the other localities. So they send federal highways, for example, would send money out. Then the State Department of Transportation would then turn to professional surveyors and remote sensing groups. I think we have Chris Parrish online representing ASPRS and Tim Burton is representing the National Society of Professional Surveyors. So point of fact, it's the private sector that ends up implementing a lot of this stuff because they usually have business in front of the government. That data is collected, processed, and then put through to the government. So the question then becomes, how do we work both with the private sector, essentially as a force multiplier, because if we can get them to implement it in their code, be it some Trimble Business Center to any number of other different systems where it's incorporated into the actual software, then the government agencies that receive that data will automatically be in the modernized NSRS. Implementation becomes a much simpler process, except that you have the matrixes across the government agencies, the government at all levels, the private sector as well as academia. So the panel is diverse enough in that we will talk about the transportation component. And if Vince gets here, we'll have a chance to talk about how Census also receives a lot of data. They don't necessarily collect it all. They receive it. They have to be able to process it and convert it into a consistent reference system. And then the final takeaway is this, is that the departments that we're talking through, NOAA basically has the ability, Department of Commerce, NOAA has the responsibility and authority to go and make

modernized NSRS. We've had that for a couple hundred years now. We defined that coordinate system. But in this modern age, under the Geospatial Data Act, implementation is more of an interagency working group. It is something that is a function of the Federal Geographic Data Committee, which is all the U.S. government agencies, all the departments that have geospatial data. To that end, then, those all come together and they have a strategic plan. And in the strategic plan, they say, “Use the NSRS.” That's an easy thing to say, but it's a harder thing to do. So within each of the departments, we've been standing up or trying to nucleate working groups inside the departments. And they will indeed try to work forward towards identifying what data sets they need to modernize. But in addition, we will rely on the private sector, professional societies such as NSPS and ASPRS to talk to their members to help them to establish their own working groups and their own tools and technology that they can come back to all of the government agencies that it is incumbent upon to adopt the NSRS. So it's a “rising tide floats all boats” analogy here because we need the private sector. We need academia. There's a lot of cross training that occurs here. And we need the rest of the U.S. government to also start to adopt their own mechanisms internally. The program office inside of NOAA is not big enough to take all of the geospatial data inside the United States government. (Vince is here as well.) We have to rely on the other departments to do it. And we also have to rely on the private sector to try and help support that effort. So it's a cross the board type of effort. I think with that kind of setup, then I'm going to turn over to Daryl. He has some slides he'd like to work through and then we'll take questions after we've finished working down through the different panelists. Thank you.

Mr. Derald Dudley: So I'm here on behalf of Amy Nelson, the Department of Transportation's Chief Geospatial Information Officer. We're very fortunate to have her. She's a great person and super motivated to help citizens of the United States.

Dr. Dan Roman: Are you just reading?

Mr. Derald Dudley: I think I have slides on now. Yes, I do. Okay, thank you. Turn microphone on. But anyway, I’m here on behalf of Amy Nelson, the Chief GIO of the Department of Transportation, just a great person and wonderful person to work with and very motivated to help the citizens of the United States. She sits on the National Geospatial Advisory Committee and is also chairing the FGDC's working group on the NSRS. So she has a lot of leadership roles that we can follow. I'm personally the lead of the transportation team of the National Spatial Data Infrastructure and Co-chair of the FGDC working group on standards development. Next slide, please.

So as we get into the modernization effort, and we were talking to the NGS and talking to everybody within the department, we kind of figured out people are having the same

questions over and over again. So we wanted to make a few notes on nomenclature. You know, the NSRS modernization is the process of updating the National Spatial Reference System. So that, you know, transitioning from older datums like NAD27, NAD83, the modernized NSRS would be the final result of all that. People want the geographers at the Department to understand that we're moving from, you know, in CONUS1 reference frame to multiple reference frames, terrestrial reference frames, and that's North American, Pacific, Caribbean, and Mariana, and, you know, why does that matter? So that we have one shared framework that keeps DOT data interoperable across that space, so as you, we talk about experiencing the interstate system as one system, not different jurisdictions. Same thing with these terrestrial reference frames. As you cross those frames you want to experience transportation as one system, not separate systems developed by, or managed by different organizations or different jurisdictions. So those four regional frames are what we call the new data frames. Next slide, please.

Slide here kind of touches on, parts of transportation are touched by the new reference system. What I want you to take away is that as we think about transportation going into the future and with automation, we're talking about the whole system, not just airplanes, not just cars, not just trucking, but all that will be integrated, all that will rely on this new modernized system. So being able to locate a vehicle through GNSS and using this new reference frame, these new reference frames accurately within two, you know, in some cases we'll need about 10 centimeters for automated vehicles. So this reference system really helps us kind of enable the modernization of transportation across America. The next generation transportation will be transformative. So we're very happy that NOAA and NGS is doing this work. Next slide for us please.

So I had a person do this slide from Amy and I. And the first thing they said is the DOT's role is to collect geospatial data from state to local to industry partners. That is not the case. The DOT's role is to ensure people's safety and then make sure, then the next item is to make the transportation system more efficient. We do that by collecting geospatial data. As Dan said, we're not typically data originators. We typically aggregate from lower jurisdictions like states-- or I should say, I shouldn't say lower, I should say partner jurisdictions-- state, local, industry partners, things like that. We then add value either by cleaning it, putting it all together, processing it, and transforming it where it's needed so it's all aggregated into one space and has probably supplementary information added to it so that it's more consumable by the end user and then we disseminate that information. Currently, almost all of that information is in NAD83. And most of those data sets do not require accuracy more than 25 feet. So keep that in mind as we move ahead. Next slide, please.

So we inventoried all of our data sets. It wound up being about 250 geospatial data sets in total. And the ones that had positional accuracy, horizontal positional accuracy tighter than 10 feet, or vertical accuracy requirements of higher than five feet, we called them red zone data sets, meaning that they would have to be resurveyed. The other data sets that are not, don't need as much accuracy could be, not necessarily transformed because that might introduce more spatial error, but we could just note in the metadata that it is an equivalent to the new modernized system. So that, we kind of worked that system out with NGS after a couple of meetings when we, well two or three meetings, maybe four or five meetings where we met and we were like, “Okay tell us what to do.” And they were like, “Well, we can't tell you what to do. That's your business process, not ours.” So, you know, there was some, sort of some friendly banter going back and forth there. But we finally got, we finally understood what they were saying and got to the point where we kind of came up with a business process for identifying datasets, marking those that didn't need to be transformed as equivalent, and then coming up with a plan for resurveying those that had accuracy needs tighter than five feet horizontal or five feet vertical. Next slide please.

There is a special case for the Federal Aviation Administration. The International Civil Aviation Organization, or ICAO people call it, require that the navigation data be published in WGS84. So to make sure that we're adhering to that, or compliant with that international standard that, you know, the whole world depends on for safe aviation, we are going to just resurvey those pieces that-- we won't resurvey those pieces in, that deal with the navigation piece of it. But we would resurvey the stuff that's on the ground that's not necessarily informing navigation. So we would have to, we’re still working on that system completely. But there is a special case here where we kind of have to work around international policy that we have to comply with. Next slide, please.

Some of the things we've kind of run into. Since there is one, now going to be, when you talk, you know, national data frames, national data sets, we'll have national data sets that cross multiple terrestrial frames. So that's new to us. We usually just publish in one spatial reference frame. So there's a new strain on disseminating data. How do we do that? If your CONUS data sets are crossing two terrestrial frames, can we publish that in two frames, or do we publish it in one? We're still kind of figuring that question out and working with Esri to kind of look at options here. One option might be to publish in an international terrestrial reference frame that closely tracks impacts with the new frames. So we're weighing the tradeoffs there. We have to figure out the new business cases with the new reference frames. But that's okay because we want the accuracy. We're willing to deal with the new headaches and overcoming those challenges because we want the accuracy.

Another thing to keep in mind is that this is a federal mandate only. So while the Executive branch and Executive departments have to comply with this, sub-national jurisdictions don't. So it's our job to express to them why this is good and help them understand that this is the right path and that we're all kind of working on this together. Some recent progress here in the bottom corner there is DOT and Esri have stood up a beta testing group. So we're working on a joint working group with FGDC to do that. And that FGDC Working Group has been set up. Next slide, please.

So lessons learned. What to plan for up front. My slides here do not match those. So I'm going to read from there. Pardon me. A note about the raw data: In the past we kind of relied on surveying, stuff like that and they'd give it to us and it would be in the new reference frame and we didn't really concern ourselves about keeping the raw survey data. That may not be the case anymore. We may need to consider holding on to the raw survey data as we move forward and then that gets into what's the storage challenge of that? Are these new business challenges that we hadn't thought of? Also, finally, this is an iterative process. This is not a one and done. For us, the data sets that would need to be resurveyed-- we can, we survey all the airports in the Nation every 5 years. So if we had, you know, 60,000 airports that needed to be resurveyed because of the new data challenges and the new spatial accuracy requirements, that would wind up being a lot of money. So we're looking at this as, okay since there's a 5-year cycle on resurveying, we feel like we can be compliant with the modernized National Spatial Reference System within that 5 years, which is coincidentally and very luckily the 5-year span in the Geospatial Data Act to be compliant with the standard. So we feel like we're very confident if this becomes a standard required by the FGDC that we can be compliant with that policy. And then final slide, please.

So yeah, as I mentioned, the DOT, Amy is heading the Federal Geographic Data Committee's working group on the modernized NSRS. Some things we're looking at: What does compliance mean? How do we coordinate across agencies? How should contract language change, especially if we're providing people money to provide us data, should that language include how the data are referenced? And also looking at our data supply chains. How will this affect that? And how do we prepare as an agency, as a department to prepare for that in general? There's also engagement at NGAC, the National Geospatial Advisory Committee. They're working across federal, state, local, and public, and academic areas. They're focusing on voluntary adoption and building persuasive why cases for the modernization effort. And there's also underway is an--sorry, my slide here is a little out of focus. They're looking at a definition for authoritative geospatial data, which is, that's fun. That's a new challenging understanding of geospatial data over the past 30 years. So they're getting into that. Yeah, but that's, in a nutshell, what the DOT is doing. Happy to answer any questions I

think at the end over the panel, okay. But Dan, thank you for your time and happy to be here.

Dr. Dan Roman: Certainly. Just for the record, the NGAC is the FACA for the FGDC, the Federal Geographic Data Committee. So they're your counterparts wearing different hats. Vince, if you're ready. All right, go ahead, and thank you.

Mr. Vince Osier: Hi, my name is Vince Osier. I'm with the U.S. Census Bureau also in the Department of Commerce with NOAA. So I'm glad actually our DOT colleagues went first because you did a good presentation. So we're very similar in that we are more a data aggregator working with local, state, tribal, and other federal agencies to put data together. I do want to call out Dan in particular, as well as Dana Caccamise, Michael Dennis, and Galen Scott, who's here. They've been great to work with. I worked with them somewhat on the conversion from NAD27 to 83 20 years ago, when I started. And that was actually, to me, harder than this one, I think, in a lot of ways. So we learned a lot of lessons with that. I think I also want to call out Amy Nelson at DOT. She's been great, as they said, she's heading an FGDC task team, now working group, to help coordinate this and make this into a formal standard for the Federal Government. So with the, as a data aggregator, we'll work with a lot of local governments. But a real key is, unlike a lot of users who are on the more accurate, precise surveying data, as DOT said, they do have a few data sets that are that level of accuracy. We did a business evaluation of our data sets that exist and where we plan to be going over the next 10 to 20 years. And we're looking at somewhere between 8.5 to 14 feet, which, after working with Dan and others, that's kind of on the cusp of whether we actually need to transform the data or not. But I think out of due concern, we're going to transform the data through the various NAD83 flavors of datum to ITRF 2020 once that's available for us to transform to, and then move to the latest NSRS. This will get us well within our accuracy levels. After we do that, where we're a little different, we have one large system called the MAF/TIGER system, and almost all data products at the Census Bureau that are geographic or geospatial in nature have to follow or come from that system. And working with Dan and others, because we have a national data set that's also covering, as I want the other U.S. territories included in the data set eventually, that we need a consistent data frame for most of the software companies, we're on a large Oracle spatial database. And then we create products for other geographic information system software, especially Esri, but also QGIS and others. And we need to be able to work with our partners and the various levels of government to transform the data consistently. So even if they're not storing their data in this new frame yet, they need the ability to consistently transform the data. And that's where we're working with Amy's group to work with the software companies on beta testing to get a consistent output. I don't, I assume that's going to take at least a year to get

through but, and then with the *Federal Register* notice published on the standard. But as DOT was saying, we have a similar issue in that we're locking down our IT systems right now for the lead up to the 2030 Census. So we want to get prepared. But we won't, let's say, pull the trigger to do the transformation on our MAF/TIGER system or products until at least 2031, 2032, which is still in the 5-year window of the Geospatial Data Act. But it also gives us the time to make sure we've all worked through the bugs and difficulties in this conversion. I think that's it from our side. I don't. Are we answering questions at the end?

Dr. Dan Roman: That was the intent. I wanted to give everybody a chance to speak and then I'm trying to step through here. I see Tim, I think you're next up. So if you're ready to speak.

Mr. Time Burch: Thanks, Dan. Yes, my name is Tim Burch. I'm the Executive Director of the National Society of Professional Surveyors. I am a licensed surveyor in Illinois and Wisconsin. I can't believe it's going on almost 5 years ago, I decided to drop out of the private sector and be the advocate for the professional surveyors. And what a great time to do this. I have been involved with NSPS for several decades. So I remember back in the early days when we said, "Hey, why don't we introduce a new datum?" What was that, 20 years ago? And so the talk was there. And even then the crusty old surveyors said, "Nah, we're good with what we've got. We don't need to change anything." What has been nice has been working with NGS all of these years and watching how this is coming together, learning more as we go along, and really watching them put this together. I got to tell you, especially over the last 18 to 24 months, of how much work they've put into this and the fact that it is a datum that we're going to be able to trust for generations going forward. We were in Alaska last week, and one of the things I noticed my first time to Alaska, driving through some of the back roads, how bad their roads are because they're breaking up, they're shifting. I mean, you felt like you were on a carnival ride because all of this stuff is moving. Well, it's hard to have historical survey data on something that's moving. This datum is going to allow us to do that. And so part of what we're trying to do at NSPS, working with NGS, is to prepare all surveyors. That's private, that's public, anybody working for the federal, for the states, for the municipalities, every surveyor needs to know what we've got to be prepared for going forward. So one of the things that we are doing is we have a subcommittee working on just on the modernization and coming up with FAQs and workflows for every type of surveyor. And that's going to include, and I appreciate the opportunity to be here today, hydrography. That's one of the things that I don't think that the surveying profession truly puts together sometimes is that, yes, it's okay for us land surveyors to go over and check a monument or what have you. When you're on a coastline, when you're out in the middle of a Great Lake, there's no monument to just

run over and check. The data has to be good. And being able to be on one datum going forward where anybody that's working on all these big data sets, putting them together, that's very important.

Having been in private industry and worked with the different counties, different municipalities, any time you've got data from any of these sources, it was a crapshoot on how you were going to fit it together. And there's a reason they called it that term "rubber sheeting." Because it is the Wild West when it comes to datums. So the fact that we're going forward with this is very important. One of the things I really like about this new system going forward is how much we're really breaking some of these coordinate systems down in places using low distortion projection areas. The fact that, you know, there's a big portion of the surveying profession, if you even mention ground-to-grid coordinates, they run. They don't want to deal with it. The nice thing going forward, for most systems, there's not going to be that issue. What you get is what you get. And hopefully your data, which was going to coincide with Consultant B, will fit seamlessly together. That to me is a big thing. So for lack of a better term, I say it's leveling the playing field a little bit.

I do want to address something a little bit that Rachel brought up earlier, and that was challenged a little bit by Nathan, the geodesy crisis. It's still, I mean, it is big time for professionals, for the private sector, for the public sector, for academia. That's one thing that we are trying to work with NGS and the colleges because we've got to instill something out to future students, hopefully future surveyors, future geodesists, that this is an exciting time to be involved in geodesy, in surveying, in data collection. It is truly a career for the future. And we need to be able to explain that to our students coming in and to the parents, who are still the most influential even though their kid's looking at the phone and ignoring them the whole time. That part of workforce development, we have got to be on top of our game.

The other challenge with this new datum as well, is going to be an aging workforce that is overseeing a younger crowd, that they send them out with the equipment, push this button, push this button, push this button and collect the data. We have a great opportunity here to-- which would be typically a mentor-mentee situation. But it's potentially going to be a mentee-mentee on that other end. You're going to teach the young person everything that's going on within that equipment, but you're also going to teach, to be honest, the professional that's signing for this work. They need to understand what's going on, even if they're not the ones out doing the collection. So that's important.

You know, another thing that we've got to, you know, that the surveying profession has to be on top of is how this all works together. And we've talked about it and you're right,

Derald had a great set of slides which really drove a bunch of points home, that all of this data needs to be, if it's going to be done as a consultant for a federal agency, really things need to comply with the Geospatial Data Act, and that each of these agencies need to be able to understand it. The thing is the agencies aren't the ones that have to understand what the data is. It's the consultant. It's the professional. It is the program managers within those agencies that are putting things together. And we need to learn all of this together. So it's important that we do all of this together.

Another thing that I will mention that I'm very, very pleased with, albeit cautious, that NGS has done, has expanded going forward into their other programs the use of other constellations. That using just the GPS constellations from the U.S.-based DoD, that was limiting at times. Now we're going to have an opportunity to have more robust data going forward. Albeit, we got to be careful with that. I still say you still have to check your work.

I will say one big challenge we have, and this is really where it comes back into, not just the coastlines, but into the low lying areas, we've, the biggest concern that the surveying community has with this going forward is, how is FEMA going to work with this? And we have to make that connection with FEMA and figure out how to get them to embrace this as well. That's going to be a work in progress, just like the Census, just like the DOT. That's one concern, big concern on the, from the surveyors' perspective because they're the ones filling out the elevation certificates. They're the ones doing the letters of map revision. We need to be able to definitively talk with FEMA and have this as authoritative data going forward so FEMA will accept what we do. Because depending on the situation where you're at, if your elevations are coming in per the new datum, but they, you know, numerically are lower than what a floodplain line is, even though it's in a different datum, there might be some pushback on getting something accepted.

The last thing I'll bring up, and this is kind of putting on another hat that I wear. I'm the Chair of the professional standards and ethics for the International Federation of Surveyors. And one of my passions is professional ethics. And this is, to quote Jack Dangerman at the UC several times, "AI excites me and it scares me." We need to be careful with the data going forward, what is collected, what we have just automated at times. It still needs to be checked by a human. If it's going to be professionally signed, you can't just run it through the spin cycle and say, "Yep, we're good to go," because there still are a lot of bad actors out there. If they get a hold of data that can be manipulated, who knows? Who knows? I'm very excited about this opportunity going forward with this new datum. And that's one of the things that we're going to continue to work with NGS and the Hydrographic Society and the photogrammetrists and hopefully

the GIS community, the geodesists. And another big one that we're going be working with are the educators. Going forward, we need to be in lockstep going forward, understanding what this data is all about. There's going to be growing pains. But in the long run, I applaud NGS for what they've done. And I'll also applaud the leadership at NGS, Dr. Wheatley, Laura, and what Rachel has said about things going forward. Leadership has stood behind them, and I applaud them for doing that as well. I think that'll wrap me up, Dan.

Dr. Dan Roman: All right, well, thank you. I have a couple of things I was going to remark on in the end. But just for your awareness, Amy Nelson briefed Department of Homeland Security this past week, and CISA is very interested. And they're going to do the 14 or 16 critical infrastructures. But in addition, FEMA's on the list, as are a number of other agencies within Homeland Security. So we are working through the departments, making sure that they are engaged from the top down and from the bottom up.

All right, the next speaker and the last one before we get to questions, hopefully, is Chris Parrish. Chris, you're online. We don't? Oh, I'm sorry. What? You're saying he has, when he has no class? Chris has got a lot of class. All the time.

Mr. Derald Dudley: I think that he's busy teaching and trying to recruit new people, so we should--

Dr. Dan Roman: Oh, we'll let him off the hook.

Mr. Derald Dudley: Aw, you beat me to it.

Mr. Tim Burch: Sounds like he's got his priorities in the right place.

Dr. Dan Roman: He does indeed.

Mr. Derald Dudley: Well, at that opportunity then, when he comes in, we'll make sure he has the opportunity to speak.

Dr. Dan Roman: I think, to kind of follow on some of the comments before we get into questions, real quick, interoperability. I mean, a lot of the discussion is you've got your own data set, you've collected your data, you've processed your data. It's consistent. That's precision. How does it work when you compare data from somebody else to what you have? How does it compare to data that you've collected a long time ago? This is the interoperability piece, and this is what the Geospatial Data Act is about, is trying to make sure that all the data are findable, accessible, interoperable, and reusable.

Part of that, then, is making sure that they're in a consistent reference frame, and that is a modern one that is tied into the International Terrestrial Reference Frame, which is the

frame that the rest of the world is moving to adopt. The maritime side and ICAO are still on the WGS84, but the other side of that is the WGS84 and ITRF are actually, there's a bit of a convergence there. A lot of the techniques making WGS84 are used in the definition of ITRF 2020. So there's some similarities and some synergy there that's starting to come together. But the key takeaway is the interoperability. How does your data compare to somebody else's data? And if you're on a dynamic Earth, how do you account for that time change over time? Measurements, particularly in California, where when you measure it, particularly horizontally, but also vertically, as the groundwater extraction occurs, the ground can go down a lot. And if you don't have a mechanism for accounting for that change, how do you compare what you saw today with what you saw yesterday? And if you have a good model of that deformation, that change over time, then you have a better chance of trying to relate the data from today to the data yesterday to the data that your colleagues from a different company may have observed at a different time as well. So that's the interoperability piece. This is making all of those data layers work together so that you can then take all those layers, put them together, and you can have actionable data out of that. It's not just that they're data, but that you put them together and you have information and it becomes more sensible. So with that preamble, are there questions?

Oh, Chris is here. Chris, you're online?

Dr. Christopher Parrish: Can you hear me?

Dr. Dan Roman: We can hear you. Go ahead, Chris. You're on.

Dr. Christopher Parrish: Oh, do you want me to go ahead and start my presentation? Am I up next?

Dr. Dan Roman: Go for it.

Dr. Christopher Parrish: I arrived just in time then. I just got back from teaching class. I just made it back to my office. Hopefully you weren't waiting for me. Let me see. Do I have the ability to share my screen and just do this myself? Are you all seeing my screen by any chance?

Dr. Dan Roman: Not yet. We see your shining, smiley face, but I think that's our slides.

Dr. Christopher Parrish: It says I need to ask the presenter to be able to share the screen.

Dr. Dan Roman: Can you present his slides? So, Chris, they're saying you cannot share your slides but we can present from here.

Dr. Christopher Parrish: Okay, that's great. That works too.

Dr. Dan Roman: All right, so you'll just say “next slide” when you're ready to advance. Can we bring up the slides then? They're up.

Dr. Christopher Parrish: This doesn't look, well, maybe this is right. Okay, we'll just, can you flip to the next slide? I just want to see if, okay, yeah, yeah. All right, thanks.

So good afternoon, everyone. I'm Chris Parrish. I think every time I've been asked to brief the HSRP, it's been wearing a different hat. And today is no different. I was actually asked by Galen today to speak on behalf of the ASPRS NSRS Modernization Working Group. So the first question that you all might have, and if you could go to the next slide, “What is ASPRS?” And what is our NSRS Modernization Working Group? So we're a professional society. Much like in this audience many of you may be members of THSOA, similarly, we're a professional organization that has active representation from government, academia, and industry. We promote the ethical application of photogrammetry, remote sensing, and GIS; advance the science of understanding of these disciplines; and expand of public awareness. ASPRS also maintains an active certification program.

And a second ago I mentioned THSOA. THSOA and ASPRS membership actually intersect. And where they intersect is in the bathymetric LiDAR and coastal mapping contingents. And, if you go to the next slide, I thought it would be interesting in this audience, actually, to talk for a minute about the history of ASPRS. It was actually founded by a NOAA Corps officer, except not exactly. The year was 1934. And the NOAA Corps did exist then, but it wasn't called that. Back in those days, it was the U.S. Coast and Geodetic Survey. So by the 1930s, the Coast and Geodetic Survey had actively started using cameras and airplanes for compiling coastal topography. And that went on to what was called T-sheets. And then the T-sheets got combined with H-sheets to form the final chart. And so one of the people that was instrumental in pioneering this was the person shown on the slide here, Lieutenant O.S. Redding. He was a U.S. Coastal Geodetic Survey officer. And he was, by that point, already kind of famous. He had invented something called the nine-lens camera, which was absolutely state of the art for the day. Anyway, back in 1934, Lieutenant Redding had a group of people over to his house in D.C., and they got together and decided to form what became first the American Society of Photogrammetry, and today is ASPRS. Next slide, please.

So within ASPRS, we've got an NSRS modernization working group. And what is this? Our NSRS modernization working group basically works directly with NGS. It kind of serves as an intermediary between the membership and between NGS to kind of convey to the membership what's going on with the modernization of the National Spatial Reference System, to answer questions that people may have, to get those

questions back to NGS. And one of the things that we're working on right now, we're actively testing the NGS beta products. I wasn't able to join the earlier session, but I'm guessing that Dan or somebody went over the recent release of the NGS beta product. So that's something we're actively working on. You see the leadership, the Chair of the committee is actually Dr. Qassim Abdullah of Woolpert. I think Qassim was not available today, which is why you've got me as a backup speaker. Next slide, please.

So a minute ago, I mentioned THSOA and ASPRS and how they intersect in the bathymetric LiDAR and coastal mapping contingents. I wanted to talk for a minute specifically here in the HSRP about a couple of the things that the modernized NSRS does that really benefits people that work in this subfield. One of them is this. I'm guessing that this is something that's maybe been discussed in this group before. But people who work in kind of the bathy-LiDAR world and just hydrosurveying in general, we've got a, I guess I'll call it a discrepancy, that exists in the fact that OMB Circular A-16 specifically designates the NSRS as the Federal Government's geodetic reference system. At the same time, we've got IHO S-4, which states that ENCs must be referenced to WGS 84. What does this mean in practice for people working in the subfield? It means that a lot of times they need to have their data referenced to multiple reference frames. It means that sometimes they need to have complex transformation workflows. This is, in my opinion, all about to get a lot easier. Why? Well, because NATRF2022 is identical to ITRF2020 at epoch 2020.0. And furthermore, WGS 84 (G2296) is aligned with ITRF2020. So anybody that's got NATRF2022 coordinates at an arbitrary epoch can convert those coordinates to epoch 2022.0, thereby simultaneously being in ITRF2020. And for practical purposes, all purposes, meaning hydrographic survey specifications, we can deem that to be approximately equal to WGS 84 (G2296). So it greatly streamlines that workflow of being able to kind of walk between those two different sets of requirements. Next slide, please.

And then on the vertical side, things also get much better. This is not an official VDatum roadmap. This is just a version that a colleague and I put together to try to look at what this looks like under the modernized NSRS. But basically, for anything that falls into the category of ellipsoidly referenced surveying, ERS, and this is today's multi-beam surveys. It's also anything that is done with bathymetric LiDAR. You're typically starting with GNSS positioning. And so that means that you're starting in a geometric datum. But ultimately you want to take your heights over to tidal datum or to chart datum. So we want soundings referenced to mean lower low water and heights of things referenced to mean high water.

How do you do that? There are multiple ways to walk through this roadmap. But the simplest case, you need at least two things. You need a geoid model, and then you

need, let me momentarily call this a separation grid that goes between your orthometric heights and local main sea level. So how does this get better? Well, first of all, GEOID2022 is vastly better than any of the previous geoid models. It incorporates all the recent GRAVD data, so gravimetric geoid. So we're going to see vast improvement there. And then in going from NAPGD2022 to local mean sea level, that gets better too, because instead of the old VDatum topography of the sea surface, which had to also account for errors in NAVD88, now we can truly use something that has physical meaning, a mean dynamic ocean topography type grid. And so just overall, this transformations between verticaled items is going to get a lot better. Next slide.

So back to our NSRS Modernization Working Group. What are some of the specific things that we've been doing working with NGS and working with the membership? One of them is, a couple of years ago, we came out with this article called “Ready, Set, Modernize.” And it was basically getting the geospatial industry ready for the modernized NSRS. We had different sections of recommendations. So some of them addressed specifically manufacturers of instruments or geospatial software. Some were more for users or service providers. Some were for the entire industry. But it was basically letting people know what they need to know to get ready. We've also, again, sort of acted as an interface between NGS and between the geospatial community. And then most recently, what we've been doing is trying to get the word out about these new beta products that have come online and get people testing those. Next slide.

In terms of fielding questions, we get a lot of them. And so I should say a lot of NGS members, not all, but certainly a lot, work for maybe small- to medium-sized geospatial services firms. So these are companies that are getting contracts. Often these contracts are from federal mapping agencies or state government agencies. And they are to go out and collect imagery or LiDAR data. And they have contract wording that mentions, and currently, you know, it'll say something like, “All deliverables shall be referenced in NAD 83 (2011), projected in, blah, blah, blah, and with NAVD88 heights, using GEOID18.” That's a typical example of what current contract wording might say. So one of the bigger questions that we've been getting from members is just, what exactly is the new wording going to look like when we start seeing that? And one example is on the bottom of the slide there. Next slide.

And then another kind of related question. So for a lot of these firms, they work with hardware and software that comes from a lot of different companies. They might have a sensor that's manufactured by Company A. They might have a subscription PPP GNSS service from Company B. They're going to put this together to do some trajectory processing. They're going to maybe use another set of software to generate final geospatial products. They're maybe going to use some GIS software to do QA/QC

editing. So one of the questions is just, as a company, how do people make sure that all of these different entities, that they're all ready for the modernized NSRS? That's a question that we've been getting.

And then one at the bottom of the slide there, another question that we've got is, for either agencies or individual companies that have large existing geospatial holdings, how should they transform? What should they do with these existing coordinates? If they just go the route of transforming, how long is that going to take if they've got, say, petabytes of data? Next slide.

Yet another thing that we've been working with NGS on is kind of polling our membership about top 10 uses of the NSRS just to be able to provide information back to NGS on ways that membership is using the National Spatial Reference System. So I won't read all of these, but you can see some of them. Obviously, NOAA CORS Network, OPUS, NCAT, VDatum, training and educational materials, et cetera. Next slide.

And yet another thing we're working on, I was going to say a final thing, but there's actually probably more than I'm showing just in this presentation. But another thing is case studies, so case studies of how people are using the modernized NSRS. And I'll mention two in particular. And these are two that I happen to know a lot about because they're ones being worked on by our Geospatial Center for the Arctic and Pacific (GCAP) at Oregon State University. The first one, so DOGAMI, this is the Oregon Department of Geology and Mineral Industries. So DOGAMI has decades worth of shoreline transect data. And they use that data for sediment transport, littoral cell budget studies, which in turn support long-term coastal change, geohazards monitoring, you know, landslides, rockfalls, earthquakes, essentially tsunamis, which we're vulnerable to out here in the Pacific Northwest. But to be able to use these historic data, along with current data, we need to be able to put them all into a consistent reference system. So in this project, what we're working on is investigating transformation methods, including the new NGS beta tools, to be able to get everything into a consistent reference frame. And then the results of this we're going to make publicly available and put out there for others to be able to follow. Next slide.

This is another case study. It's one that's kind of related. This one is near and dear to my heart for a number of reasons. I've been working on this for a while. But it relates to the Oregon Beach Bill. So the Beach Bill in Oregon, this was signed into law in 1967. And basically, what it did is it provided the public with access to all Oregon beaches. So it's basically a zoning easement. So anybody in the public has access to the beaches in Oregon. It's a really nice thing. It allows us to all go out and enjoy the shore. But in doing this, even back in the 1960s, people realized that if you're going to create this

easement, there has to be a specific line that defines where people can and can't go. Where do people have access to? So this is defined by something called the statutory vegetation line or SVL. And in the interest of time, I won't go in, I could give you all the history here. I'll skip it. And I'll just say, so this SVL, it defines where the public has access to. But it's based on NAD27 coordinates, which is not even the current NSRS. This is what was before the current NSRS. And those coordinates, unfortunately, are actually written into State law. So what do we do with this? This is yet another one where we're investigating various methods of transforming those coordinates, basically bringing them forward in time, and being able to get modern NATRF2022 coordinates of the statutory vegetation line. Next slide.

And I think, if there's one more, I think that's actually basically it. So that's my 10-ish minute highlight of what the ASPRS NSRS Modernization Working Group is working on. If you've got any questions for the working group, again, Qassim is the Chair. I put his email there. And I feel like everybody knows how to reach me these days. I've got two email addresses, as many of you may know. I've truly enjoyed my time at Oregon State for the past 12 years, but I'm moving on to a new position at UNH Center for Coastal and Ocean Mapping in the role of Co-director at the start of 2027. So I've got both of my email addresses there. I know I joined late. If there's time for questions, I'll be glad to take them. Otherwise, thank you all.

Dr. Dan Roman: I do believe we have, it looks like 17 minutes left. So I'm hoping to have a couple at the very end. Are there questions in the room? Hey, aren't you supposed to have given this presentation?

Dr. Christopher Parrish: Oh, Qassim is there.

Dr. Qassim Abdullah: Yeah, thank you. And, you know, I choose you to represent. You are very eloquent, Chris. Thank you.

Dr. Christopher Parrish: Thank you, glad to do it.

Dr. Qassim Abdullah: And good, very good. And thank you for bringing the similarity between WGS84. And I know we didn't emphasize it a lot earlier, but there was concern about the FAA requirement for airport to be WGS84. And I agree with you, it's not a concern. If there is a difference between our new system and the WGS84 (2020), for example, will be in a millimeter or submillimeter. So we are safe now. Currently, we have problems when people mix WGS84 with NAD83. But in the future it will be just fine. Thank you.

Dr, Christopher Parrish: Yeah, I agree.

Dr. Dan Roman: I'll have to maybe rebut a little bit. They are not equivalent completely. WGS84 is based on about 17 or so stations around the planet. So you don't have the intensity of the deformation model that you're going to see with NATRF. We've been able to describe a lot more of the motion. So when it comes to like the airport survey program that we have, we typically do that in the terrestrial system. Because the vertical datum, we will map it to GEOID 2022 to get the vertical control. So for the runways, you do want them peaked. You want the water to run off. But for the aircraft, when it's flying through the air, it's the ship in the middle of the ocean, it's no big deal. You can be WGS84 as an approximation, as a navigational approximation of ITRF 2020. But as you start to bring a ship in to land or you start to bring an aircraft in to land, then you have to start to focus a little more. It becomes, the differences can be in the decimeter range, which probably is not a problem for aircraft landing. More than likely the pilot's in there finessing it anyway. But if you put it on GNSS to try and navigate in, there may be more of a bump. In addition, keep in mind that the center of the Earth is within it about a decimeter. But there are some other distortions that need to be mapped out a little bit more. There are seven-parameter transformations every day between WGS84 and ITRF. But how many people actually use them? Most people just treat them as the same and don't even notice that there is an actual seven-parameter transformation that they should use. But they're probably not even aware, because even I have a hard time finding on the NGA website where that's located. So they are very close. And that's what I actually, before you started talking, Chris, I had actually prefaced my remarks with something like that, that they were very similar. But they're not exactly identical, and the trick is when you start to get into areas that are deforming and changing, that's when we need to be concerned about the vertical deformation, particularly in the hydro areas. And so bring it back home to take it away from the areas and focus on the water areas, that the land extends from onshore to offshore under the water. And if there's vertical land motion occurring, it's not just onshore, it's happening offshore. And that can change the whole tidal characteristics, any number of things can occur. So that's why we try and manage that as best we can. Again, in the deep blue sea or the wild blue yonder, ITRF 2020, WGS84 no difference. And I will kind of take a nickel back on one other area too. GNSS is the tool du jour. We used to use chains and rods. It is a mechanism for obtaining coordinates. What we provide are coordinates, authoritative coordinates. There's proliferated low Earth orbit. We might be trying to figure out how to use Starlink to figure out our positions in the future, eLoran. There are so many other tools that are that can go into the toolbox. But in the end they still give coordinates, authoritative coordinates. But the reference systems, WGS84 versus ITRF 2020, there is a lot of convergence. NGA and a lot of them are taking a look, particularly at Galileo. I agree, we do keep an eye on the different systems. We like to make sure, trust but

verify. Make sure that those coordinates are what you think they are. But in addition to having redundancy and resiliency, it's nice to have this extra information and be able to collaborate and use that extra information. So we do take and tend to favor those, but I'm just caveating a little bit with Chris. I'm wildly enthusiastic. But there are some subtleties here that come into play when you're dealing with things, when you start to deal with like, particularly precision navigation, when you want to keep an autonomous vehicle going down the road. Now decimeters matter. And this is part of where the time varying aspects come into play. If you have the coordinates for the road from 2020, but meanwhile the Earth has moved, and somebody's receiving their signals from the GPS satellites and they're a decimeter or two decimeters off, doesn't seem like much, but It can be enough if you're not trying to stay in your lane, if you're not lane-keeping, so--.

Mr. Nathan Wardwell: I think that I had a question there.

Dr. Dan Roman: Certainly.

Mr. Nathan Wardwell: It's perfect timing. So it was kind of wrapped around a couple commonalities I've heard of data between what we've heard today, but also Alaska Geo Summit, interoperability of data in time, right? And so that kind of hit on that time component, which you are using the autonomous vehicles, right? So in Alaska, Glacier Bay National Park, eight centimeters a year of vertical land motion, right? And so you try to do some mapping in that area where you have a tidal datum that might be based off of 10 years ago, and then you have a GPS observation based on, you know, yesterday, and a LiDAR survey that was done, you know, 5 years ago. You know, what are we actually looking at if we're trying to do change detection or something further, right?

And then data interoperability, there was, Chris, your graphic of showing the simplification of the transformations was great, right? So GEOID18 isn't actually a thing in Alaska, right? We use 12B, right? So there's a fundamental difference. We're not even getting to NAVD88 the same way that the rest of the country is, right? And so with the, we know that data that's collected has much more value than what it's originally collected for, right? And something that further kind of highlights that is, I mean, Ashley had that matrix of all the agencies, and the line there was data. Everybody was interested in data, right? I think with the advancements in AI, that's going to get pushed even further, right? You're going to extract even more value out of the information. So I want to kind of roll it back to John Rayfield's discussion and how HSRP can bring value and with some of our mission. And I was curious, has there been any kind of economic impact statements on the value that is brought by better data interoperability in the NSRS?

Dr. Dan Roman: PORTS comes to mind. Marian's like, “What?” No. It's basically a digital twin. What we're looking at is, how do you bring all this information together? How can you make better determinations for water coming up and onto the land? But in, particularly in a port region, if you've got a good understanding of where the shoals are and all the built infrastructure, including bridges, and you can bring the ships in more efficiently over the shoals, under the bridge, avoiding all traffic, and pull pier-side on-time, and then offload and get back out. In addition, when you offload, you've got the drayage on the pier where you put everything. It goes on the right truck, on the right train, and it exits the area in the same reference system. So you start to increase the efficiency of your ports. And that was a discussion I believe we had earlier where we were talking about ports and port operations and being able to bring them in. Port of Long Beach, I believe, is the one where there is a local reference system that helps control the shipping as it comes in so they have a better understanding of where it's located in terms of the entire traffic flow schema. I know I've seen at least, I'm not sure how production oriented it is, I've seen a lot of research done in the Great Lakes region where they had a robot wandering around with the side scan sonar checking out the moorage areas to check and see if sediments had come in and they needed to dredge or anything like that for shipping that was pulling in and out of the ports all the time. But there was a way of automating that. And again, though, only if it's in the same consistent reference system. And pulling all that information together improves your safety of life because you don't want the ship to run aground and particularly risks that might be there, but also the efficiency with which you're pulling in and out of port and maximizing profit in terms of the throughput of the port. So I think that gets at some of your questions.

Mr. Nathan Wardwell: Yeah, no, definitely, that helps. And Marian, I see you're ready to get in there. I just wanted to add a little bit, though, because I know HSRP, and that's why, you know, our purview is hydrographic services, right? You know, but when we're talking about the economic impact of the value of the data, right? There's more than just the port, right? Because the NSRS brings value to the entire continent, well, the country, right, you know? And so it doesn't, we're talking about interoperability is like, well, if we're talking about that, why stop it at the coast, right? You know, we're trying to help advocate for the value.

Mr. Derald Dudley: We're certainly aware of the Department of Transportation. We look at it as shore to store. So when you talk about the modernization of the National Spatial Reference System, we're very aware of the economic impacts of that on the transportation system. I would love to see a cost-benefit analysis or something like that. But, you know, that would be for the citizens to express their will, and that would have to come from somewhere else that, you know, so.

Mr. Chris DeVeglio: Nathan, yes, we do have a socioeconomic benefit study, but it's old. It's probably from 2017 or 2018. And so we consider it to be very, very low and relatively limited in terms of what it covers. But that estimate was like $8 to $10 billion in benefits over 10 years. But that was really before Uber and Lyft and everything took off. So yeah, the value is way greater than that right now. But we don't have one that quantifies it currently.

Dr. Dan Roman: I will also add that this is extending more than just at the coast and the ports. The Mississippi River is a good example. However many different tidal data or different data going up from Cairo to whatever, one of the things we're looking at is, if we can get GNSS, you have the ability to pull all of those different datums together and you'll be able to integrate them. We have one of our, Shachak Pe'eri is actually taking a look up and down the Mississippi River, trying to unify that entire set of datums up and down the river. The other part is, and we've already experimented with this in the Great Lakes, which is a major thoroughfare for shipping anyway, but we're seeing centimeter-level heights across the lakes, which are a tremendous level surface. A lake, like any cup of water, the water should equilibrate to a common surface if there's no disturbing forces. And this is what you see in the Great Lakes. But historically, it's been hard to pull it apart. There's the lake that's tilting from glacial isostatic adjustments, seiche, all that activity that goes on there. But once you mitigate that and you go back and you look at the water surfaces, we're seeing centimeter -level agreement all the way around. So the expectation is we'll see this coming up and down all the rivers, Columbia River, Mississippi River. And the intent then is that you not only have your shipping-- if I recall correctly, I'm not sure if it's still true, but at one point I had understood that Memphis is like the second busiest port on the Mississippi River for international trade, that ships would literally drive up to Memphis, because I think FedEx is there, but that they would offload there and send it further into the country. So making sure that that entire transportation system works efficiently is part of this. The other part is that then the terrain is in the same system as the river and it's tied in at the centimeter level. So when you have a storm or you have some sort of a flooding event and it's coming down and the river's going to jump the banks, you know how high it's going to be because you can also map the terrain surrounding the river in the same reference system. So then you know where the waters are going to go. So this isn't just in a coastal area where you get coastal inundation, but literally along the rivers. And you then can protect some of the towns that might be living alongside the river. But there's a number of different ways in which we're trying to make all of this data more interoperable, more accurate, more consistent. And that's what we're trying to drive to. I think that a lot of these impact a lot of the areas of concern for HSRP. Other questions? We're almost done anyway, it's 3 minutes.

Mr. Nathan Wardwell: Jay, go ahead.

Mr. Jay Satalich: This is a question for Dr. Dan Roman. NGS has done a tremendous job with the NATRF2022 and the counterpart geodetic systems that are going to be rolling out. So kudos to NGS. What do you see, you know, from the user perspective, you know, we understand there was a pandemic in the middle of all this business and users are anxious to get the new data. What obstacles or barriers do you foresee need to be overcome to bring this across the finish line next year?

Dr. Dan Roman: For modernization, I think we're in pretty decent shape. We're getting a lot of feedback. We're addressing and going through the punch list of items that, you know, maybe there's an issue with the NCAD and the different software. This kind of gets at what I was saying before. Administratively, I don't think there's too much of difficulty in terms of that. But it's, there's the next set of suites of software, OPUS Projects. The modernization effort, we're not going to roll out in OPUS Project. But we are going to have it as a next step. So we're still trying to work through this. But there's a deficiency in terms of staff availability. And so there is some effort there that we can work through. But having the resources that are required to do that may make it flow a little more efficiently. Beyond that, I would say the harder task are my fellow departments. Again, we can make the reference system, but they don't have to adopt it as readily. We need to work through these other departments to help them understand at the top level the need. And then also from those that are actually having to implement these types of activities, be it the surveyors or the US Army Corps of Engineers districts that actually are implementing these changes, the Headquarters have to understand that those groups need to be able to use these tools. So they have to make resources available through those departments. So part of this, if you're talking through to NOAA and Department of Commerce is making sure that they can talk to their other departments, their counterparts and make sure that they understand that this is an ongoing effort and it should be a priority. Amy's an excellent resource, but she's the GIO. She's Special Information Officer. She's not the Secretary in charge of the Department. So getting traction at the department level, if they could reach across, there could be some education into the benefits to trying to move to the NSRS in a more timely manner. Because again, transportation, all these different sectors, the key is interoperability. If we've all migrated then we can be interoperable. Again, we will continue to press forward as best we can with the resources we have. There are more tools. IFTM 2.0 is, right now we have a deformation model that describes the velocities probably to about a centimeter over about a 10-year span. So reliable estimation. It's, you know, it's got some errors, maybe, particularly in California, where the plate boundary exists. But in large part it's fairly reliable. We're going to look at something like InSAR. We're going to take satellite imagery and we're going to look at the

ever-changing Earth, detect vertical land motion along the shorelines, and use that as an ability to sit there and say, “Okay, we can see these changes that are occurring. Now we can start to do a better job of figuring out coastal resiliency as well as any port operations that might be impacted, if not now, maybe in 10 years or 20 years to start being able to predict potential problems that are coming.” So those are the types of things where we're going to take a look to that. We coordinate with NASA and USGS. This is not intended to be a NOAA deformation model. It's intended to be a national deformation model that USGS uses and that NASA uses and that we use so that everybody gets a consistent result whatever application they might be using. So that's part of what we're aiming for. Resource-wise, I will maybe defer to Marian if she's got some other ideas as my Director. Put her on the spot too. “Thanks, Dan.”

Dr. Marian Westley: So we're just starting to kind of migrate away from getting all the software finished and over the finish line-- we did that a couple weeks ago-- and to receive feedback. And then we do have sort of an ongoing long-term engagement with our partner federal agencies. There's something called the Are You Ready campaign and getting, helping other agencies get themselves ready to make that transition. I will say that they did that to me. Before I became their Acting Director, they came to CO-OPS and said, “CO-OPS, are you ready to do this for the tidal datum reference?” And so we are, again, an early adopter of the NSRS. Through the same process, really looking at which of our data sets are geospatial and require that accuracy, which don't. I'm less concerned about where my buoys are located offshore, very concerned about where my tide gauges are. So we're adopting the NSRS at the tide gauges just in the manner that any other federal agency who's a partner to NGS would be doing that process. And so, again, if you haven't told your staff to start trying out our tools and submitting feedback, please do. We can't do this alone. Thank you so much.

Dr. Dan Roman: Well, we are at time. I think I will turn it back over to the Chair and see if he's got any further items.

Mr. Nathan Wardwell: Great, I don't have anything to add other than thank you very much. Let's do another round of applause {applause}. And I'm going to go ahead and hand it right over to Rear Admiral to carry us through.

Rear Admiral Chris van Westendorp: All right, thank you, Mr. Chair, and thank you to this panel. This has been great. NSRS is, it's here, right? Kind of like AI, it's here. So everybody get ready. I did want to note for everybody's awareness, you probably noticed that the seat to my left is empty. Rachael had to step out, but she wanted to convey to the group here that she is deeply committed to this effort and was able to give it as much time as she possibly could today and wants to thank the panel for coming and speaking with us and taking on the next phase of implementation in that regard.

At this point, Eric, I'm going to address you as Vice Chair for the first time. And I'd like to ask you to lead us through the panel wrap up.

Mr. Eric Peace: Always a bridesmaid, never a bride. But I'd like to say one thing before I start on that last panel. I'm glad there's smart people like you folks because I was half lost the entire time. But as long as there's enough water underneath me and enough air above me, I'm good.

So with that, we're going to do a brief recap. We'll go around the room, talk about what we heard today, kind of just a short synopsis, 1 to 2 minutes per person on the panel. And we're going to go ahead and do that in reverse order. So, Jay, if you'd like to start, please, sir.

Mr. Jay Satalitch: Very good, thank you. This is my first meeting, so I'm the newbie here. I'm just trying to fit in. There's a lot to absorb. I read through all the position papers over this last week so that I didn't look unprepared, but it's a lot to absorb. I like the discussion on GIS. I view it as a form of literacy for the 21st century. And, you know, in some of the presentations, you know, people were discussing means of delivering data. That is your delivery means. And it's how today's generation is wired. And I liked what I heard with that and I encourage NOAA NOS to continue along those lines. Thank you.

Mr. Eric Peace: Thank you, Jay. And then online, Rebecca, are you there?

Ms. Rebecca Quintal: Hello. Yeah, very interesting talks today. I will echo that the Spatial Reference System is not my expertise as well. So I am very thankful that there are people here who not only understand it, but can improve it. I also was, picked up on the WS84 reference system for aviation and was glad to hear that there was consensus there that it's not a problem. I'm sure everyone can sigh relief there. So I'm looking forward to the talks tomorrow, and I thank all of the presenters today.

Mr. Eric Peace: Thank you, Rebecca. And, then Tuba had to depart early. So we're going to go over to Kate Mickelson, please.

Ms. Kate Mickelson: I'd also like to thank all of the presenters. This is my first in-person meeting. I'm grateful to serve. I was grateful for a couple of things. Also, spatial reference systems, not my area of expertise either. I was really happy to hear from NOAA PORTS and see the robust work that's going into installing additional air gap meters and sensors and tide gauges. Those are things that are, for us here on our river system in the Columbia River, especially important. And to see NOAA's commitment to continually be adding that additional maritime infrastructure is really encouraging.

AI's role in our maritime domain, that's something that's going to be interesting to continue to keep an eye on. And I was grateful to hear a little bit more, as a new

member, of the historical understanding of HSRP. And I am grateful for the reminders to have our members, individually from us, test out the new tools and provide that feedback. So I'll be sure to get something out to those we work with on our river system. And then, thank you again to the panelists and the staff and at NOAA and the presenters as well. So thank you very much.

Mr. Eric Peace: Thank you, Kate. Captain Kurtz, please.

Captain Carolyn Kurtz: Yeah, so just to echo what my colleagues have already said, I really appreciate the in-depth presentations, particularly in the areas that I'm less familiar with. I feel like every one of these meetings, there's just more information where I gain a better understanding of what NOAA does, not just the water things that as a pilot I'm concerned with. So thank you for everyone that has shared their expertise here. And I also really appreciate the updates on the things I am more familiar with. It's really encouraging that those things have not been cut, that they're robust moving forward and being implemented more and more. So, Marian, thank you so much. I really appreciate everything that you do. And that's it. I'm really, I'm also looking forward to the opportunity to work with the panel members on updating the paper that we're working on for PORTS, a position paper from the panel. So yeah, thanks. We'll see you tomorrow.

Mr. Eric Peace: Thank you. Kimberly Holtz, are you on? Okay, we'll move right on to Ms. Hargrave, Deanne.

Ms. Deanne Hargrave: Yeah, thanks. Just an observation, you know, we heard at lunch about doing more with less or less with more, whichever one it is. And it's just incredibly impressive the work that's been done and the updates that were presented to us early in the day today. Just, it's really mind blowing. So, you know, thank you to everybody here who presented on behalf of all the people who are doing this incredible work. It's very much appreciated.

One other observation is, like I said earlier, this is my last session. Eight years ago, the number one item on our agenda and on our priority matrix and was mentioned multiple times today was interagency coordination. I personally have struggled to understand how HSRP can help with that. But maybe we've been a little bit successful because I think we saw two fantastic examples today. You know, Ashley's presentation about CMTS, there's a huge interagency coordination happening there. And the panel we just had is, you know, this working group across agencies. So just really encouraging to see that and, yeah, hope to keep that forward momentum. So yeah, look forward to tomorrow. Thanks.

Mr. Eric Peace: Thanks, Deanne. And is Nicole online?

Dr. Nicole Elko: Can you hear me?

Mr. Eric Peace: Yes.

Dr. Nicole Elko: All right. Thank you for the opportunity to comment. Thanks for the really interesting panel discussions. Everything that happened today, as usual, was very well done. Thank you to the organizers.

I agree that the NSRS modernization, as I mentioned earlier this morning, just so impressive. Thank you for getting all that information out to us. Let's keep up the momentum. I'll encourage my stakeholders to utilize the tools, test them out. It's on my to do list. Also really appreciated the historical review, being very deep in a similar historical review of an organization; that really hit with me as a current event.

I do want to call out the importance of sustaining that connection to Congress. I know that the departments, the offices are very good at it. Rachael, thank you, if you're still there, for being that person. And John, the connection there to having someone that is immediately connected, you know, staffing a committee, that's pretty special, really, for offices in the Federal Government to have that type of communication and transparency and ability to share with your stakeholders. So kudos on that. I work with a lot of other federal agencies and this is the best. Y'all do it better than anyone. Yeah, that's all, really. Hi, Ashley, great work on CMTS. Great to see you. Thanks for continuing this stakeholder engagement across the agencies. And, again, thank you to the organizers for this day.

Mr. Eric Peace: Thanks, Nicole. Captain Cruz.

Captain Alex Cruz: Great meeting today. It was very exciting, especially in the afternoon. Congratulations to the panelists because they did extremely well; they did a well done job. It's important what NOAA is doing with the PORTS programs for the safe navigation of the Nation. That's extremely important. And definitely, we have to keep the buoys and the lights on. Looking forward for tomorrow.

Mr. Eric Peace: Thank you, sir. Captain Chopra.

Captain Anuj Chopra: Thank you. Like Deanna, 8 years are coming to an end. So today is my last meeting. Really enjoyed the information shared. Highlights, I think, were the 20-year HSRP history and, more importantly, especially looking at the expectations going forward as to what is expected from us, especially with the changing landscape, as in AI and data and technology is the biggest challenges. The CMTS update was amazing, particularly passionate on the PORTS program and very grateful for the update and continue to push on that for safety of navigation. I learned a lot on the NSRS. You know, we used to, in navigation we thought the gold standard was WGS84,

right? And now we learned, no, there's a better standard. And we learn more. So, so grateful to that and the interagency coordination. So really, I learned a lot and I like what I hear. But thank you and look forward to tomorrow.

Mr. Eric Peace: Thank you, Anuj. Qassim.

Dr. Qassim Abdullah: Thank you. It was a great day, definitely. Kudo to NOS and OCS and NGS and CO-OPS for their report. It was a great progress. It's impressive to see. I will start with the NSRS modernization effort. That's a huge, giant thing, definitely. And coastal mapping, ENC, observation and modeling the PORTS, for example. The Last Mile modeling Chris brought, and embracing the AI, partnership with academia, the rehiring, for example, that's all a great achievement. The Hydro Health 2.0, which will be based on state, not regional, will be great. With that, I'd just like to add a suggestion of the resources help, like about the feasibility study of the return on investment or the value of the NSRS. Well, 217, I think Galen said, that's really old. I mean, we need a new one today if we can. And the reason I'm bringing it up, the UIGS {sic} 3DEP program-- everybody, all right, I assume, familiar with it, with the value of it-- it didn't kick off until they issue what they call “nee-yah,” National Elevation Enhancement, something like that. And they hired a consultant to work a thick study about the value of it, you know. And that report concluded the return on investment will be 3 billion a year, you know. And that's what made it happen over The Hill, definitely, when they saw that. And 3DEP is very, very, very successful program nationwide. I think we have something even could be more important, that's one. We just need to, for future support, I mean, just, getting to the beta out is not enough. This is just the beginning, you know. So maybe we can produce something like that to speak to the value of the NSRS to the Nation. Thank you. That's all I have.

Mr. Eric Peace: Thank you, Qassim. Mary Paige.

Ms. Mary Paige Abbott: I first wrote down a single word, which was “wow.” And then I realized after listening to all of the rest of you, that I would say a couple other words. I personally really enjoyed the very first session. I liked the overview of the opportunities and challenges. I could listen to that all day long. And what I heard today was reminiscent of, I had, in fact, I was here in Crystal City back in either 07 or 08, I was here on another meeting and Admiral Thad Allen came in. He was Commandant of the U.S. Coast Guard at the time. And he told our group, which was America's Boating Club, United States Power Squadron, that he wanted to see us work more tightly with the Coast Guard Auxiliary and some other of the recreational boating organizations. And he had the three C's, that I think really impacts this. What I heard today and all of us going forward was: first was to collaborate; second was to coordinate; and third was to communicate. And those three have to go. You don't do one or the other. You do all

three. And I think I heard that today. It was the strong message of the collaboration, the communications, and the coordinations. So thank you very much everyone for enlightening us.

Mr. Eric Peace: Thank you, Mary Paige. Now we're going to move on to our non-voting members. Dr. Westley, please.

Dr. Marian Westley: I am just so pleased we're doing this in person. First of all, it's wonderful to be forced to kind of organize your thoughts and think, "Oh, what are my highlights? What are we getting done?" Because in the day-to-day, it's really hard to see the big picture. So it's just great putting those presentations together with me and my team. It's just a great opportunity to really reflect on things that went well. And then also, I just, I love all the sidebar conversations. I know we worked really hard to have meaningful remote engagements. But I just get so much more out of our dinnertime conversation with Jay and Captain Carolyn and just all the sort of things that are happening on the margins of the meeting. Because we can have these formal conversations, but my brain is just like a popcorn popper. It's just kind of something will pop out a little later, and it'll probably be because of a sidebar conversation. I just get so much inspiration and energy from these meetings, so thank you.

Mr. Eric Peace: Thank you. Ms. Laura Rear McLaughlin.

Ms. Laura Rear McLaughlin: All right, push to talk, got there. Okay, well, I didn't know I was going to give closing remarks, so that's great. But yeah, just really excited to be back here at the HSRP meetings. It's been a few years since I've been engaged. But really excited to hear all the conversation, not just the NSRS, but, of course, that's where my heart is nowadays, but around all the other mapping and charting efforts across NOAA and to hear all of the stakeholders as well and what their interests are and how what we do on a daily basis affects what they do on a daily basis. And it is really exciting to kind of see that.

This geospatial data, data that you can't really see and it's, you know, you can't hold it. We're not a fish; you can't hold it. And it really does make a difference to everyone in an economic way that you just don't realize, necessarily, until you really sit down and talk about it. Thank you for letting me be here.

Mr. Eric Peace: Thank you. Dr. Armstrong.

Captain Andrew Armstrong. Not quite. No doctor here. But thank you anyway. So yeah, well, Marian just said something that struck a chord with me, and that was the popcorn thing. And so I realized that in my notes, I had all of these little places where I put a star by some comment. I had about seven or eight of them in there. In general, I really

appreciated Mr. Rayfield's presentation. I was around through all of that. I was on the board from the beginning. And there were a few bits of the background that I wasn't aware of, much that I was, so I really appreciated that. And I appreciated his thoughts on what was going to be important for the agency going forward and particularly the technology and the ASV use. I also appreciated learning some things about NGS and CO-OPS that I maybe had heard about, but in particular, the NGS beta. I plan to get busy and take a look at that. CORA, I had never heard of that before. I think that's an awesome thing, and I'm certainly going to turn that over to my colleagues to take a look at. So thank you for those.

Mr. Eric Peace: Thank you, Captain. So I'll offer a few of my thoughts before I pass it back to the Chair and the Admiral here. The big things I heard from Mr. Rayfield, who I've known quite some time, and I really appreciate his insight because he knows what he's doing. And you're exactly right, I heard technology, and I heard no increasing budgets. So essentially, you don't take advantage of the technology, things are going to be left behind, and you're not going to get funded. I fully envision we're going to have decreased budgets for the next 10 years at least, if not more. So I think that kind of dovetails in with that interagency cooperation and take advantage of the other agencies where you can. So for instance, right now the U.S. Coast Guard is putting sail drones all over Lake Erie. Why not slap whatever you need to sound out there and complete an entire project? Because they're just going back and forth and looking at the border. So there's opportunities there to look at tapping into those other agencies, use their resources, MOAs, MOUs, whatever. But I think that's really a major thing that Congress is looking for, is to save money. And to save money through cooperation interagency and using technology. With that, thank you very much for the day, and I'll turn it over to the Admiral here.

Rear Admiral Chris van Westendorp: All right, thank you, Eric, thank you, HSRP members and non-voting members, I really appreciate those insights. You stole all of my thunder, so I have nothing to say. No, I'm kidding. No, I think that there are definitely a lot of common themes that we've all picked up on today. And the way I summed it up, when I think about who we are within NOS, Coast Survey, CO-OPS, NGS, we are all very much leaders and active participants in credible, authoritative science, and we are very passionate about what we do. And we are very proud to share all of our accomplishments. And one of the things that I love about the HSRP is that you actively listen to the subject matter experts and those leaders, and then you think quietly and you're like, "Okay, now what's next?" And, you know, listening to Mr. Rayfield today talk a little bit about the history, I thought it was interesting to get his insight on how those subject matter experts back in the day, and I will say 30 plus years ago, they were very happy with the way things were, according to what he shared with us from the Hill's

perspective. And they weren't necessarily all that thrilled about what's next, but then the Hill took action. And then the Government was able to, the careers were able to weigh in and, lo and behold, that innovative spirit that we're so proud of within NOS and our kind of foundation for offices, we met that moment, and now we have those electronic navigation charts. We're moving towards S-100, a new national spatial reference system, PORTS, like all these exciting things. And it's that spirit of innovation and that desire to modernize that I think is winning the day over that desire to just, “Everything is okay and everything is staying the same.” So that was good to hear. And then that brought me to the present, thinking about the modern workforce: who we have, who we don't have any more, and who we need, and kind of this common challenge that we have that maybe the panel can help us out with on figuring out addressing that particular challenge. And then at the end, you know, and everybody has, I think, alluded to this, if not said it outright, technology, get on board or get out of the way. And I think that that's very prominent in what we're doing. And it's good for the panel to recognize that and to keep telling us to push forward with that.

And, Mary Paige, man, I'm just going to call you out as my final thought here. One of the things that I have in my personal leadership philosophy, I talk about three Cs. They're different three Cs than the ones that you had, and I will share those over a beer. But I thought that your reflections on Admiral Allen's three Cs of collaboration, coordination, and communication, that just shone through very brightly for me today. And I just want to thank you for that reflection and thank all the panel members for your thoughts. And now I will shut up and get off my soapbox and turn it over to Nate, Mr. Chair.

Mr. Nathan Wardwell: Thank you very much. One of the major challenges of going last has already been said, right? You know, a lot of everything's been covered. I think, just initially echo a little bit what's been said already of thank you very much for the NOAA staff for pulling this together. We've talked for years and months about like, “Hey, we want an in-person meeting.” And Marian talked about the value that brings to that. And so just another round of applause for that. {applause} That is what we're doing, yes.

And John Rayfield's session was great, right? You know, understanding the vision for this panel to begin with. I love it, a guerrilla workforce or something. And, you know, it answers some of the questions that I've had in my head as I've been on the panel. It's like, hey, it is intended to help support funding for National Ocean Service. And that's no surprise, right? You know? So hearing that from John was great. And the talking about like doing more with less, right? So that's not eye opening. We know that's nothing new, right? I've heard directors talk about that for years as we sit in these panels, right, you know? But acquiring and distributing data less expensively was something John said. And we know leveraging technology is going to be the only way we can do that. Rear

Admiral did a great job of communicating that, right, you know? It's helping out with that innovation is where HSRP can potentially help. And I-- and John mentioning, you know, move beyond electronic navigation, right, you know? It wasn't something that I'd thought about, but, you know, it's like, "Whoa, okay, well, what is that? What does that mean?" You know? But, like, pushing that innovation through public-private partnerships-- I mean, we say it all the time. I mean, the work that UNH does, the work that Oregon State University does, the work that all the groups out there in building our geodetic workforce and the National Geospatial Modeling Grants, right? And collaborating with industry and federal partners to make that happen is a very-- Oh, I had one other, I had the same popcorn thing, right? And I got all these little stars around things. But, you know, Ashley mentioned the 10 most wanted. I remember that back in the day. It was, one of my mentors, John Oswald, brought that back to the office and was like, "Hey, take a look at this," you know? That's something for the panel to think about going forward. I hadn't realized the history of where that pulled together, but we write these letters of recommendations, and you read through those year after year, and very similar recommendations, right? And so, like, what can we do to help push those forward and make that happen? So just excited to be here today. And all the discussions, I think-- I don't know. We're still a little ahead of time.

Rear Admiral Chris van Westendorp: I can read that or you can read that.

Mr. Nathan Wardwell: Why don't you go ahead and read that?

Rear Admiral Chris van Westendorp: Okay, I will not let you adjourn the meeting yet, Mr. Chair. Just for everybody here, for those that wish to join us, we will be meeting in the lobby for dinner at six. And we'll be walking over to Matchbox for a dinner reservation at 6:30. Depending on which GPS and which spatial reference system you use, it should be about a 12-minute walk. So hope everybody can join us. And now I'm done speaking.

Mr. Nathan Wardwell: And so tomorrow, I don't have, what is, we have tomorrow before, since we have a little bit of time, right? Tomorrow we're getting started at 8:30. Does that sound right? Yep. So 8:30, and we'll start with a recap. So it's a wonderful time, you know, at dinner we'll have discussions and kind of, there'll be more thoughts about what we discussed today. And we'll, you know, kind of bring those thoughts forward in the morning to help with the discussion going forward. Then we're going to have a panel, "NOAA Advances Ocean and Great Lakes Mapping" discussion, another public comment session, NOS modeling modernization right before lunch. After lunch we're then going to go into HSRP working group and recommendation letter discussion, and then the meeting closing. And so really, at the end of the day kind of wrap-up will be another time to kind of reflect on what we heard during the past 2 days and really kind

of start to narrow in on our recommendations for the Administrator. So with that I'll go ahead and adjourn the meeting and look forward to talking more.

DAY 2
8:30 a.m.- 2:30 p.m.

Mr. Nathan Wardwell: All right, it looks like it's about 8:30, so maybe we'll go ahead and get started here. Okay. Great, well, welcome back to the HSRP meeting, Day 2. Yesterday was nice and productive. So it was great to be back in person. Today we have another full day, starting with a panel on NOAA advances in ocean mapping, and then NOS modeling modernization, and wrapping up with some HSRP business at the end of the day. This morning we'll start with a recap from yesterday from our members. We'll again do a brief introduction in case there's any new participants online but also add in some reflections from yesterday, from what we were hearing from all the panels. Before we get into that, we'll have about 45 minutes this morning before the next panel, just kind of give you an idea of time there. And before we get into the reflections, I'll hand it over to Rear Admiral to cover any administrative updates that we might need this morning.

Rear Admiral Chris van Westendorp: All right. Thank you, Nathan. Yeah, I agree. Yesterday was a great day. It was good to see everybody and break some bread and share a meal last night. Just want to remind everyone that the HSRP is a public meeting and we do appreciate public comments. We ask that public comments be kept relatively short. And all of the comments will be recorded as part of the public record. We will have our public comment period for today at 10:30 a.m. So for those of you who have not submitted yet, please do submit to that Hydro Services email. And now, Galen, are you in the house? Amanda is in the house. Okay, Amanda, if you could please just go over the privacy disclaimer one more time for us.

Ms. Amanda Phelps: All right, the privacy disclaimer is set to the rules and regulations that are part of this meeting for in-person and virtual participants. This is to assist and protect our organizers, panel members, speakers, and attendees. For speakers today, please respect the posted agenda times and any guidance given by the organizers so we can stay on- time and have ample time for comments and questions from the panel during this meeting. For virtual attendees, please use the question pod found at the bottom of the panel on the bottom of your screen. You can submit questions at any time. And those can be shared during the public comment period at 10:15 on the agenda. You can also follow up with any questions or public comments to hydroservices.panel@NOAA.gov. Please reach out to Virginia Dentler if you're having connectivity issues. Also, a note that these sessions are being recorded, transcribed, and will be posted to the HSRP website after the meeting.

The speakers have provided their written permission to speak, and individual permissions are required for photos, videos, and voice on audio. The meeting and the webinar will be retained and disseminated on our website again and accessible to the public. If you decline to these specifications, please consider not speaking or dropping off the webinar.

Mr. Nathan Wardwell: Okay. Thank you very much, Amanda. All right, we're going to go ahead and go into the round robin. And so with the HSRP members, go ahead and please, again, as I mentioned, you know, state your name, provide a comment or impression about the meeting from yesterday or on a related HSRP and NOAA topic. And we're going to go ahead and start with you, Ms. Rachael Dempsey, and then followed by the HSRP members. And for the members of the panel, this will be also, you know, keep in mind we're, after this meeting, we'll be working on a letter of recommendation to the Administrator. So think about your recommendations as we have these reflections. Hand it over to you.

Ms. Rachael Dempsey: Okay, thank you, good morning, everyone, both in the room and online. Thank you again for joining us today. I want to reemphasize the importance of the fact that we're back together again after a long break. So this, yesterday I had to leave a little bit early, but I really appreciate the conversations that we had yesterday. I hope the information that we were able to share with you was insightful and informative and gave you all something to think about as far as recommendations, because the recommendations that you provide to NOS and NOAA are thoroughly considered and taken very seriously. I also want to pass along our thanks to Mr. John Rayfield, who came over to meet with us yesterday as well. I don't have anything else this morning. Looking forward to the rest of the day today. Back over to you, Nathan.

Mr. Nathan Wardwell: Great, thank you very much. Mary Paige, we're going to start with you. I apologize. Just yesterday we were talking about this, how it would be more appropriate to give a heads up to which order we're going in, whether it's reverse alphabetical or alphabetical. So I apologize in advance, but why don't you get us started.

Ms. Mary Paige Abbott: Mary Paige Abbott, I'd like to change and go to my maiden name, which is Gregg so I'm in the middle of the pack. In looking back and thinking about last night, I don't really have a lot to add to my comments from yesterday. I have four words, really more than four words, but basically our mission continues to be educate, advocate, and that, I heard yesterday, and I believe Qassim is the one who utilized it first, and I'm going to steal it first, is a continuous improvement on our technology and utilization of it. And lastly, the fourth word, well, because that was more

than four words, but the last word I wrote down was “wow.” So it was awesome and I'm looking forward to today.

Dr. Qassim Abdullah: Qassim Abdullah, I’m with Woolpert. And I would like to just show my, I'm pleased with Mary Paige being in this meeting, just because that's the first meeting somebody compete with me on the name order. I'm always on top, but I have to get used to it. Thank you. Now, I don't really have much to add to what I said yesterday. I'm very pleased with the Rachael report and all the director and non-member’s reports. It's great progress considering the reduced workforce. I mean, this is amazing. I mean, you definitely did a lot with less. And thank you for doing that. I mean, NSRS modernization, we are in a beta stage release. We have the coastal mapping, coastal data observation between the ports and air gaps and installation. Blessing the AI and the academia, a new Hydro Health strategy based, on state-wise instead of region, which gives us better resolution with version 2. And what Mary Paige said, to adopt this, educate and communicate, that's a great thing. Thank you very much.

Captain Anuj Chopra: Good morning, thank you, thank you so much. Really enjoyed yesterday, lots of valuable information. Upon more reflection, I thought I'd bring up a few points. Of course, you know, it's 8 years, I repeat that from yesterday. I wish I had heard what I heard yesterday from when we were looking at the history of HSRP and what our playground is as a HSRP panel. So I would first recommend is a recording of that should be given to every new member of HSRP to understand what the scope of our work is. It's very valuable. I mean, it was a 101 class for me yesterday. So that was amazing.

It was great to see how well CMTS is integrating multi-agency. I know we've requested that and recommended that in our letters repetitively. That was a great progress. As much as the PORTS program has made success with outreach of 53%, for me that 47% is important. And I feel that funding model is flawed because the main stakeholder, the average Joe, the average sailor is left out of it because it deals directly with safety of navigation and safety of human beings in that space of the seafarers. So it needs to be re-looked at. Amazing progress, but at the same time, more to do.

Congratulations to Marian, the NSRS, there is no, I mean, shorter words to really say how we can move on that. But I was looking at three more points and I thought I'll bring that up. I think we've seen this happen, as in the last 8 years, summing it up, it's been a continuous change. And one thing is it's very delightful, nice to see how NOAA is embracing change and moving with change because technology is changing so much. So there's a big, big congratulations in that space. Absorbing of AI and using AI tools, I can share with you that in the private sector the C-suite is putting targets of 40%, up to 40% efficiency increase by each department to be documented and quantified as in

money and time. This is the dictate from major U.S. companies. So because I work in that space, I can share that with you this is what's been told to them. So it's a great place to start knowing that our budgets are fixed. And we saw the budget story yesterday. Maybe if we can use the tools to increase our efficiency and where we can increase that studies done, then we can do more with less, which has been the theme for yesterday. Last but not the least, I'd like to say NSRS is exceptionally important. It's perhaps a fork in the road where the way we do things in navigation will change. And it's right from the average Joe, right from your GPS, what we use. So we need to have a structured approach and strategy for outreach. It shouldn't just be, you know, what we've done before. This needs, a strategy needs to be developed and structured using skills which are in mass media and public and, Marian, we have an expert here. I'm sure she can opine much better. But I feel it's, a special approach needs to be taken, and hopefully we'll get to include that in our recommendation letter. But thoroughly enjoyed it and looking forward to today. Thank you.

Mr. Nathan Wardwell: Thanks, Anuj. Go ahead, Captain Alex.

Captain Alex Cruz: Good morning, Captain Alex Cruz. It's difficult to go after Anuj. No, it was extremely beneficial to know about the genesis of HSRP, because knowing the origin, we now can trace to go to the future. So that was very enlightening. I want to say a public thanks to Admiral Evans, Ben, for your service to the nation, NOAA, and HSRP. It was great being here, during your leadership. Looking forward for today's work. Thank you very much.

Mr. Nathan Wardwell: Do we have Dr. Elko online virtually?

Dr. Nicole Elko: Yes, good morning.

Mr. Nathan Wardwell: All right. Go ahead. Please go ahead, Nicole.

Dr. Nicole Elko: Hi, everyone. Good to see you all. Nicole Elko, the Executive Director of the American Shore and Beach Preservation Association. I wanted to make some comments on coastal resilience this morning, which is the subject matter area that I've been brought on the panel to address. And I was inspired by the history talk yesterday, as I mentioned. So I wanted to share a little bit of kind of the history of coastal resilience from my perspective with NOAA, actually over the last 100 years. So ASBPA, the organization that I represent, was formed in 1926. And one of the key people in the formation of our organization was someone you may have heard of if you're a NOAA history buff. His name was Rear Admiral R.S. Patton. He was with the U.S. Coast and Geodetic Survey and he was the Commander in Chief of the Division of Charts. He served as ASBPA's very first Secretary in 1926. And at our first meeting, he gave a paper entitled “The Purposes of the American Shore and Beach Preservation

Association.” He laid out the core philosophy that we still follow today. And in that was that the public interest in shore and beach preservation, or I should say, the interest should lie with the public. It should not be something that is pushed upon individual property owners or small beach communities because it is necessary for states and federal agencies to play a role in safeguarding our nation's coasts. He was also a big proponent of data. You can say NOAA's tools and services back then, in particular for delineating the public-private boundaries that were constantly moving with the tide, and we are trying to figure those issues out with beach erosion and coastal change, even at that time. He then went on to be the editor of our journal, *Shore and Beach*, which we're still publishing today. He was our first editor in 1933.

The collaboration with NOAA continued. Another famous NOAA person, who was-- what was his title? He was, Leo Otis Colbert was our President in the 1950s. And the collaboration continues to this day, as you know. In fact, in many ways, one example would be at our conference next week, we are co-hosting a stakeholder workshop with NOAA entitled “Shaping Advancements to Federal Coastal Flood Hazard Information.”

So I say these things as a reminder to the HSRP of the importance of the coastal resilience element of our charge. It was really important for the last Administration. Coastal resilience was a buzzword. Not so much this time around, but that doesn't mean the mission isn't there and the need for the tools and services aren't there. So whether that was 4 years ago or 100 years ago, the need for NOAA's data and services to fulfill the mission of coastal resilience, or nowadays, we might rephrase that and say, “safeguarding our nation's shores,” remains just as important today. So as I cycle off the board, I hope that that focus on coastal resilience remains. And I'm happy to stay engaged to ensure that continues to happen. Thank you.

Mr. Nathan Wardwell: Thank you very much for that great history, Nicole. That was wonderful. Deanne?

Ms. Deanne Hargrave: Hi, good morning, I'm Deanne Hargrave. I've moved back to Alaska, and so my focus has recentered on Arctic issues. And something that stood out for me yesterday-- And I really appreciate the updates on the work that's been done since we last met. And one of the things that we covered was the 2026 survey work. So particularly a map that stood out to me was the Alaskan Arctic map where there's a blue line, there's a blue line that goes through the Czech GC and over into the Beaufort. And that got me very curious of how was that line selected? What does that mean? What's the survey coverage? Really appreciate the QR code on that slide because I went there and learned a lot about what that survey entails. And I'm still curious about it because just thinking about how quickly the Arctic is changing, you know, if-- It takes time to plan a survey, it takes time to plan a mission. And you do that based on the anticipated use

or the use at the current time or historical use. And with how quickly it's changing with the thought of introduction of icebreakers, tankers, and new kinds of traffic that haven't historically been seen in those areas, I'm curious to know how we can adapt to those changing uses.

Since we had this last Arctic issue paper 8 years ago, the traffic through the Bering Straits has doubled. So curious if we're doing, you know, traffic-informed survey prioritization there, and leveraging things, like I just learned about Access AIS as a NOAA internal source for that kind of information. So that kind of feeds into, something we'll talk about later today is the Arctic issue paper. And other than that, just looking forward to enjoying the rest of the day. Thank you.

Mr. Nathan Wardwell: Thank you very much, Deanne. Is Kim Holtz on online?

Rear Admiral Chris van Westendorp: No.

Mr. Nathan Wardwell: Okay, well, if she is able to join us later, we'll give her an opportunity to provide her reflections. Pass on to Carolyn.

Captain Carolyn Kurtz: Good morning, Carolyn Kurtz here. I would just like to echo some of the sentiments of my colleagues so far-- that I'm really grateful for the in-person meeting, the opportunity to look people in the eye and have conversations in and out of the room have been really valuable so far. And I learned so much yesterday and I'm really looking forward what today has in store. So thank you.

Mr. Nathan Wardwell: Great, thank you very much. Kate Mickelson, I believe you're up next.

Ms. Kate Mickelson: Good morning, everyone, thank you. Yesterday was a wonderful day, and I'm very grateful to everyone. I thought, again, everything was very wonderfully presented and, as Rachael said, extremely insightful and informative. I'm continually impressed by the team at NOAA, the hard work that they do for all of us in the maritime industry is really incredible. I think one of the takeaways that I had was the importance of interagency cooperation. We kept hearing that from each individual presenter and how they really are looking to see more of that. And also, the number of acting, acting, acting, acting. And so, when you start to see interagency cooperation and acting, I think that any extra support that we can provide you is something that I really want to be able to do personally and professionally because I think that's something that we see that people are really asking for.

Again, back to NOAA PORTS. So grateful to see all of the hard work of NOAA PORTS. We rely on that on our river system in the Columbia every single day, all day. AI and technology, getting on board or getting left behind on the docks. And then again, as

everyone has mentioned, the historical overview was truly wonderful, especially for someone just coming on, so thank you.

I'd like to thank all of the HSR members who are leaving after very long terms. It's really, truly an incredible effort that you've put in. And the time and commitment is really remarkable. Thank you very much. And thank you for the warm welcome.

Mr. Nathan Wardwell: Great, thank you very much Kate. Tuba.

Dr. Tuba Özkan-Haller: Yes, good morning. For those of you who are joining today, my name is Tuba Özkan-Haller, and I am Oregon State University's Dean of the College of Earth, Ocean, and Atmospheric Sciences. Reflections on yesterday. So the first panel, we started out with the panel on NOS's Navigation Observation Positioning Services. And right off the bat, I walked away with this understanding and knowledge of just how much work, how much effective work is taking place within this organization. Really impressed by everything you've been able to accomplish since our last meeting, which wasn't that long ago since our virtual meeting. So really, first off, congratulations on doing this work, really just keeping your steady hand on the helm and on course at speed, as far as I can tell.

The 20 years of HSRP, yes, agree with all of my colleagues here, Mr. Rayfield's stories were really insightful. And it's always great to hear about the origin story of a particular group because it does give you sort of that direction and understanding why things are done the way they are. So thank you for that session. That was really useful.

We heard from the Committee on Marine Transportation Systems. And I was really impressed by that discussion as well, especially around, there was a statement made at one point about how if it's just two agencies that are trying to work together, that's doable. But the moment it's more than two agencies, it becomes more difficult and, you know, more intentional work has to be done. That reminded me about the interagency issues that we talked about when I was on the National Academies' Ocean Studies Board some years ago. And this pertained to maps around coastal flooding. Many of you might know this, NOAA produces maps, coastal flooding maps, USGS does, Army Corps does. And all of them are different. All of them are different for good reason because, you know, the planning horizon associated with the work of an agency might be different from another. The tools that they're using might be different. But if you're a member of the public, I don't know, small community, you're trying to decide where to put your next school or water treatment plant and you look at these maps and they're all different, essentially what happens is folks just throw all the maps away because they cannot make decisions based on-- they don't know which map to use. And so this is a topic where I really felt like in an overarching, you know, and now that we've got AI, an

overarching AI tool can even help people interact with these maps. So I wondered if there was a way for us to continue to push that interagency-- I don't know, is this a new issue paper that I can suggest? Just a thought.

And then finally, the National Spatial Reference System implementation, another really insightful panel, just amazing work. And like my colleagues already shared, I think a huge step up in the way we're doing our work. As always, I appreciate the comments and questions that my fellow panel members are asking. And I just want to close by saying just how much I appreciate that you all are hiring, that you're bringing the new talent onboard to do this work. As an educational institution, that warms my heart. And then I'll close with a question, something we haven't really talked about during this meeting, and maybe at some point I would love to get some information about fleet renewal, NOAA's fleet, where we're at with that, ships. If at some point there's time to squeeze in some updates on that, I would love to hear more. Thank you so much.

Mr. Nathan Wardwell: Great. Thank you very much, Tuba. Mr. Vice Chair.

Mr. Eric Peace: Good morning, Eric Peace, Vice President of the Lake Carriers Association representing the U.S. Flag Fleet on the Great Lakes. I behaved myself yesterday, but I'm not going to today. So I don't think there's any argument that the PORTS program is probably one of the most important things that NOAA does for safety and navigation. But I also agree with Anuj that I don't agree with the cost share model. And the reason I don't agree with the cost share model is, take Cleveland for instance, where the U.S. Flag Fleet bears the full cost share for foreign competitors. So while we pay for that port meter, which is critical to the safety of navigation on the Cuyahoga River-- and if anybody's ever been on the Cuyahoga River you can, you know it's probably the most twisty, windy, narrow, confined navigation channel in the United States-- but we pay for that. And who gets the advantage of it? The Canadians, foreign ships, everybody else gets the advantage of that port system. I don't disagree that it needs to be there. I just don't agree with the cost share model. And I think that's something we need to fix. Just like I don't pay for my stop sign by myself outside of my house. We all share that cost for that safety. The last thing I'll say is that, we've already talked about it quite a bit, but I want to thank the NOAA staff that has really done a fantastic job of putting this together. I put together meetings. But this is a big deal, and it's a lot of work. I think we all appreciate the fact that you did it and I'll suggest a round of applause again. {applause} That's it. Thank you.

Mr. Nathan Wardwell: Great, thank you very much. Is Rebecca online? Okay, great. Rebecca, why don't you go ahead, please. Thank you.

Ms. Rebecca Quintal: Yes, hi, everyone. Yeah, Rebecca Quintal, Vice President of Business Development at SEACORP, which is headquartered in Rhode Island, which is where I live.

I'm going to mention something that none of us have brought up yet, but as a geologist, I feel remiss not bringing this up. I really enjoyed Captain Armstrong's marine critical minerals talk. I like to think of the work that NOAA does, the HSRP, the areas that we're working with, everyone kind of understands the safety of navigation aspect, et cetera, but really pulling it back to the Department of Commerce and how critical this work is to fuel our economy. So those marine minerals, I'm very much looking forward to following the development of those models to be able to identify, locate those minerals in a quicker fashion using sonar and cameras, et cetera, for us to be able to provide a steady supply of those minerals, which are used from everything from defense, aerospace, electric batteries, you know, all of our electronics. So very much looking forward to following that work.

And I do want to echo Anuj's comments. I also really enjoyed the history of HSRP, and I'd like to watch that recording again because I didn't catch everything the first time, and agree that that's a great idea, Anuj, to have new members watch that video as part of their onboarding. Thank you.

Mr. Nathan Wardwell: Great. Thank you very much, Rebecca. Jay.

Mr. Jay Satalich: Thank you. Great presentations yesterday, a lot to absorb, but looking at some vignettes, the history of the HSRP was great. And I second what Anuj said also. I think that future members of the panel need to understand the context for how and why this was formed and what the marching orders are, what the mission is. So I think that's important. The propeller head in me was fascinated with the PORTS presentation, especially the tide gauges, because, as a land surveyor, we use that information also when we're determining mean high water, mean lower low water. And that's a follow-up that I'm going to hopefully use this platform with NGS for some modernization with sea and shore boundaries with Shalowitz, because we've got a new system now, which segues me into the third item, which is the NSRS. Really good presentation on that led by Dan Roman. We are waiting for that. And I'm pleased that everybody in the other disciplines here understands the importance of the NSRS and how that's really the glue that's holding everything together. Thank you again. Those are my comments.

Mr. Nathan Wardwell: Great, thank you very much, Jay. We'll go ahead and now move on to our non-voting members of HSRP and NOS leadership. And we're going to go ahead and start with you, Captain Armstrong.

Captain Andrew Armstrong: Thank you. Just reflecting on some of the discussion yesterday and my notes, I picked out a couple of things that I intend to take back with me to my job at the Joint Hydrographic Center, particularly in the workforce education area.

The Admiral mentioned workforce in some of his remarks, and there were a couple things that came up after Tuba talked about training students to access data sets and use those. I think that, I think we're finding that a lot of the skills of a hydrographer or cartographer often involve technical issues beyond the core science. So I think that's particularly important. And the other thing that I noted was, I think Anuj mentioned the use of AI for training videos. And so at the Center of Excellence, we have a mandate to make some training videos. So I'm going to look into that very seriously. Thank you for those comments, thank you.

Mr. Nathan Wardwell: Great, thank you very much, Andy. Laura.

Ms. Laura Rear McLaughlin: Good morning, everyone. Yeah, I thought yesterday was great. And especially the NSRS panel, where I realized we have a lot of work to do. And Anuj sort of talked about it this morning in terms of outreach and really getting folks on board. And that is next in our lineup. Marian mentioned yesterday our Are You Ready campaign, and that is really focused on our Federal Government partners, trying to get them ready and get their data ready. And the next step really is our outreach to our stakeholders. We've been doing that all along, but it really is now boots on the ground time for us to get that into action.

What else did I say here? We do have an approved comms plan at the DOC level, Anuj. And it does include outreach to media and things like that. But I think the stakeholder engagement piece is the next part of what we need to do and write an exact plan for that. So we're going to work on that in the next couple of months in terms of, really, what is our stakeholder engagement plan? So it's coming, it's just resource-limited at the moment. So yep. And yeah, just thanks. Looking forward to the rest of today.

Mr. Nathan Wardwell: Great. Thank you very much, Laura. Director Westley.

Dr. Marian Westley: Thank you so much. And I just wanted to reflect briefly on Nicole's comments that she made. So I really appreciate reminding everybody of the role of coastal resilience in the HSRP. The HSIA explicitly, you know, directs the Administrator to collect, install, maintain real-time hydrographic monitoring systems, hydrodynamic forecast models. You'll hear more about the models today to enhance navigation safety and efficiency and provide foundational information and services required to support coastal resilience, planning for coastal transportation and other infrastructure, coastal protection and restoration projects and related activities. Doesn't surprise me at all,

Nicole, that your organization overlaps with our history so closely. So CO-OPs, as I think all of you know, started as the tide gauge component of the Coast and Geodetic Survey and, you know, really focused on, at the time, you know, in the sort of 20s and the 30s, very live, very controversial issues of where the shoreline ends, what's state property, what's federal property, who gets the right to extract resources from coastal waters, et cetera, et cetera. Jay was very helpful for helping me find the actual Supreme Court language that says the Coastal Geodetic Survey will collect 18.6 years of data to tell us. Nathan, you pointed me to the Dinkum Sands case. Anyway, so we've been in this business of the long-term record maintenance for shoreline boundaries, for geodesy, for geospatial applications. HSIA pushes us to make that real time so that those, that information that we're collecting to get the tidal boundary is also being provided in real time to ships for safe navigation.

In my mind, those two missions are completely tied together. A safe port is also a port where you don't have ships colliding and spilling their fuel oil. It's also a, you know, safe navigation is also a safe place for your coastal residents to live next to. So I've always been very, very comfortable with that sort of navigation safety and coastal resilience are really the same mission. My team sort of humors me, I get enthusiastic from time to time, and I came up with this tagline, “data from seconds to centuries,” so they put it on a sticker for me. But that thing, again, we collect data in real time, we provide it real time. Navigation users use it in real time. But it's the exact same data and requires the same standards and careful data management as we need in order to establish shore boundaries. And that long-term record sea level change all, again, comes from the same tide gauge. That tide gauge that gets the ship under the bridge safely, prevents that oil spill because it's preventing those collisions, is also generating your sea level record. So, Nicole, you're right that in different political moments, we emphasize, or we can more easily sell one aspect of that mission to the other, but it's the same instrumentation and it's really fundamentally the same mission.

I really liked the language in the executive order on maritime dominance about really thinking about coastal port infrastructure and supporting those economies and those communities that are relying on maritime trade, but living and having, raising their families in our port areas. So again, I just really appreciate that this panel is able to look across that full range of our timescales and support our mission in both aspects. So I'm very excited to have, you know, modernization of the NSRS, port resilience, navigation services all bundled them to one. Thanks.

Mr. Nathan Wardwell: Great, thank you very much, Director. I'm going to hand it over to you, Rear Admiral.

Rear Admiral Chris van Westendorp: All right. Thank you, Nathan. And thank you to each of the members and non-voting members. Really appreciate your insights. Once again, like yesterday, you stole all my thunder. But I think I can add a couple more points here, not just thinking about yesterday, but looking forward to today.

I think we can all agree that yesterday was very heavy on updates, some history, of course, and a bit of a vision into the future, thinking about all of our programs that you all have noted today, some of the efforts that we've worked on. Today, we are truly shifting gears. Okay, so this is Day 2, talking about advances in ocean and Great Lakes mapping, critical minerals, modeling modernization. Before we do all of that, I have a challenge for this panel. My challenge for you is to zoom out. Each of you was brought here and selected as a member of this panel because you have your own individual perspectives, your own subject matter expertise, things that you're really, really good at. You're probably even aware of things that you might not think that you're very good at. What that means to me is that you actually have a fresh perspective for the people who do know a lot about a particular issue and area. My challenge for you is to come together today and, instead of thinking about more localized or specific topical-type things that you individually might be really good at, think about strategically as a team, as a group, how you can bring your perspective to think about the national federal complex and how Coast Survey and CO-OPS and NGS can potentially do what's next. Take that context that we heard about yesterday, we're going to talk a little bit more about today, but then think about what's next. And I think that Mr. Rayfield would probably approve of that approach, right? He pushed us to find ways for our various programs to work better together, to better integration within NOAA's data collection and distribution programs and amongst NOAA and other agencies. And integrated capability is what is going to keep our commerce moving, what is going to support our national maritime infrastructure, our coastal resilience, and our maritime transportation system and our economy. So just help us define. That's your task today. Strategically come together, think together, have healthy debate together, and think about what comes next on a national scale. Okay, thank you.

Mr. Nathan Wardwell: Thank you for that challenge, Rear Admiral. So one of the, I said yesterday, one of the disadvantages of going last is everybody gets to talk, hit all the highlights, right? But the advantage is-- I'm like 4 hours behind. And so I have a little bit of jet lag this morning. It gave me an opportunity to help me collect my popcorn thoughts because I got several pages of scribbled notes here that probably only I can decipher. I think as I was actually this morning, a little bit last night, as I was reflecting on our conversations yesterday and then also listening to the conversations today, this morning, I kind of keep coming back to the idea of the interoperability of the data and really the overall economic impact of so much data that is provided by these three

agencies-- National Geodetic Survey, Office of Coast Survey, and CO-OPS. And I mentioned this yesterday, but I would also push us to think beyond the economic value that we always talk about, like the commerce of vessels and moving goods in and out of ports. But it goes well beyond that and whether or not-- I mean it was hit on great by Nicole and Director Westley of whether or not this data is being collected for coastal resilience, sea level trends, national security or critical minerals, it's all the same data. And there's a ton of value there. As this data is collected, we don't actually understand the full value of it going forward. So I would also put a challenge out for us to push to better understand that economic value of the data. Because we also heard from Rayfield that we're going to be acquiring and distributing data less expensively, right? And so we need to, we're not in an environment where significant budget increases, especially if we're not able to show the economic return on what is being accomplished. And so this was, I'm really looking forward to today and continuing the discussions in person. And thank you everybody for the comments this morning.

I will, I believe, so now we're going to go ahead and roll into, I'm going to pass the baton to Mr. Steve Loy from NOAA's Office of Coast Survey to start the first session of the day on NOAA Advanced Ocean and Great Lakes mapping.

Mr. Steven Loy: All right, while we're getting everyone up here, I'll go ahead and just get going. Good morning, members of Hydrographic Services Review Panel, NOAA leadership, public attendees. Welcome to our morning session, “NOAA Advances Ocean and Great Lakes Mapping.” I'm Steven Loy with NOS's Office of Coast Survey, and I have the privilege of moderating today's panel. When we were putting this together, we were trying to figure out what we wanted to do here. And there's just so much happening in this space just within NOAA internally. So today we brought together leaders across National Ocean Service and the Office of Oceanic and Atmospheric Research to examine how NOAA is expanding, modernizing, and accelerating our national mapping efforts. So over the next hour and 15 minutes, we'll explore how our line and program offices are executing, coordinating, innovating on a lot of cool core statutory mandates like Hydrographic Services Improvement Act, Ocean and Coastal Mapping Integration Act, and the Ocean Exploration Act, while aligning with our major federal initiatives, emerging requirements, such as marine critical minerals efforts, all of these things which have been a major focus of the past year or so, and certainly the next few years ahead.

We have a very distinguished five-member panel here, representing, I think, a strong and full continuum of NOAA mapping, experts from airborne topobathymetry to deep ocean exploration, those supporting safe navigation, and those coordinating it from a bunch of different angles. It’s a great panel here. We’ll let them introduce themselves.

But just real quick: We're going to have Ms. Rachael Dempsey, Deputy Assistant Administrator for National Ocean Service, Captain Bill Mowitt, who can tell us a little more, but he's finishing up a stint as Acting Director of Ocean Exploration, Office of Atmospheric Research and NOMEC Co-chair, Mr. Brian Mueller, Acting Chief of Remote Sensing Division, National Geodetic Survey, Captain Mike Gonsalves, Chief of the Hydrographic Survey's Division, Office of Coast Survey, and, online, joining us remotely is Ms. Meredith Westington, Acting Co-chair of the Interagency Working Group on Ocean and Coastal Mapping.

So our format today, we're going to start with a few minutes of opening remarks from each panelist, followed by a targeted and moderated question and answer session. We'll leave time after my questions and invite some questions from the HSRP members here. We will be stopping firmly before 10:30 to allow public comment periods to proceed. So I ask our panelists and HSRP members to be conscious of that time. We'll work our way down the table and to online. And, too, if it's possible, if we could get Meredith shown up on the screen here in the room, that'd be appreciated. Again, please introduce yourselves, and given this panel represents such a breadth of NOAA's mapping expertise and advocacy, if you could give us a little bit of remarks about your respective position and office as it relates to mapping. And then we'll jump into questions after everyone's gone. So, Ms. Dempsey, the floor is yours.

Ms. Rachael Dempsey: Good morning again, everybody. So you guys know who I am, Rachael Dempsey, DAA for National Ocean Service. Just by way of a quick introduction for those of you who may not be aware of my background: So 28 years as a naval officer with background in everything from meteorology and oceanography, intelligence, cryptology, cyber. I've also had the opportunity to be a part of ship scheduling and ship acquisition and undersea surveillance and everything dealing with all that stuff. So this environment is not unfamiliar to me, it's just coming at things from a different perspective. So in my current role, which, gosh, it's hard to believe I'm going on my fourth year now here. It feels like yesterday I was brand new. But I was hired to be the DAA for Navigation, Observations, and Positioning, which, as you know, oversees OCS, NGS, IOOS, and CO-OPS. I get to provide some strategic direction and resource requirements assistance for our directors that are doing some really important work. It has been a pleasure and an honor to be able to engage with our maritime community, the navigation requirements that go along with that, and maintaining commerce for our country, as well as being able to provide support to coastal resilience efforts in those spheres. So that's, there's your baseline for me with that. I'll kick it over to Bill.

Captain William Mowitt: Hi. Thanks, Rachael. I'm Captain Bill Mowitt and I'm just finishing up a stint as the Acting Director of NOAA's Office of Ocean Exploration, which

may not be familiar to all the panelists. So I'll talk a little about OE and a little bit about myself. I've been with OE just over a year and half, coming from NOAA's uncrewed systems operation center, so one of the focal points in NOAA for adopting new technology, and before that, a couple decades of NOAA marine operations and other science activities. But for those that aren't familiar with the Office of Ocean Exploration, our charge from Congress under the Ocean Exploration Act is to map, explore, and characterize the deep ocean to understand living and non-living marine resources to support national security and prosperity. What does that mean? A couple of things. One is deep water mapping. So we are one of the biggest producers of NOAA mapping data. It's easy to do when your swath width is measured in kilometers. It's pretty easy to rack up the square nautical miles. So we have kind of an easier job than Coast Survey when it comes to that. But mapping is fundamental to Ocean Exploration's DNA. It all starts with a map.

And then we go on and focus on characterizing the geology and biology of the deep ocean environments. We're talking usually deeper than 200 meters. So I kind of think of us as maybe like a first cousin of the Office of Coast Survey. And we're more focused on deep water mapping as well as the exploration and characterization, less on the navigationally significant charting.

A couple other things. You can't really work in the deep ocean without using a lot of technology. So focusing on developing technology and bringing it into operations is a big part of what Ocean Exploration does. And finally, we have a big focus on engagement. So we operate a couple of ships, NOAA ships and partner ships operated by NGOs. And they're usually live streaming their data. If you look at "NOAA Ocean Exploration Live" right now or "EV Nautilus Live" right now, you can watch those two ships mapping in the Central Pacific. That engagement is important because it's something Congress told us to do. It helps us get the general public excited about ocean exploration. But we're finding it pays real dividends in the deep sea minerals world, allows the government to show up as a transparent provider of information and a trusted source. So that's, engagement piece is important to what we do as well. And I will pass the baton.

Mr. Brian Mueller: Yeah, good morning. I'm Brian Mueller. I work for NOAA's National Geodetic Survey. And, like many of you in this room, I am not a geodesist. So I work on the remote sensing side of NGS. My day job, I'm one of the four Branch Chiefs under the Remote Sensing Division. For the past 3 months, I've been moonlighting as the Acting Division Chief, filling in for Mike Aslaksen, that some of you may have worked with.

Remote Sensing Division, we're a pretty big group within NGS. We're about 40 full-time federal employees and about 25 contractors. And so we have essentially three mission areas. And coastal mapping is what, you know, we'll be focused on today. That's one of our mission areas. We also do the emergency response to support FEMA and recovery efforts. We also do work for the aeronautical survey program. We also have a branch that does some of the geodesy side of the house, our field operations branch located down in Chesapeake, Virginia.

So the coastal mapping side, we map roughly 10,000 to 12,000 miles of shoreline a year. We work closely with the port system. We're updating and doing change detection on about 105 priority ports. There's about 175 of those priority ports in the U.S. And so we're monitoring the change, updating geographic data, geospatial data, and getting that data applied to the nautical charts through the Marine Chart Division. You know, we use a wide range of technologies to help us do this mapping. We're a pretty heavy aerial imagery shop. We have access to aircraft that we collect aerial imagery for shoreline and delineate shoreline that way. We also do a lot of topobathy LiDAR operations to help us delineate shoreline that way. We also use satellite imagery occasionally to help us do those kinds of things. So I think there's a lot of opportunity for us moving forward with some of these new technologies, new sensors coming onboard, and I'm excited to talk to you today about that.

Captain Mike Gonsalves: There we go. And we're in? Sounds like it's working. Good morning, I'm Captain Mike Gonsalves. I am the Chief of the Hydrographic Survey Division within NOAA's Office of Coast Survey. As a NOAA Corps member, one of the maritime NOAA Corps officers, I've spent over a decade on four of NOAA's Hydrographic Survey ships. So I feel like I'm a user as much as I am just a acquisition thing, whatever it is, I do it for my day job at the moment. Within the Hydrographic Surveys Division, we, our role is to, in terms of a life cycle, it's, number one is to develop the specifications of how the hydrographic survey data is acquired. Our team is responsible for prioritizing where that data is acquired. And then we will then put together the project instructions and task orders to assign it out to the various assets that we have at our disposal. And then ultimately, our role is to qualify and determine that that data meets the requirements so that it's fit for purpose and can go out to the users to ultimately be on the chart or to explore or to coastal mapping resilience or whatever you want to use for it.

I will say that within HSD, we've been retooling our processes for the better part of a decade. Our intention was to do more with the same. Since 2025, it's kind of more with less. That's okay. We do what we can. We have been updating our specs. We did the first major update last year in over a decade. The idea was to make our specifications

more accepting of less traditional data. It was very much geared towards acoustic multi-beam. We recognize that there's a lot of less traditional sources-- the satellite-derived bathymetry, crowdsourced bathymetry, even topobathy LiDAR-- that didn't fit well with our specs. So by changing that, that made this a little bit easier to ingest some of those data types and also to allow in some less traditional data types. For example, with the critical mineral exploration, magnetometers, sub-bottom profilers, that's not the normal thing we talked about acquiring. So by changing our specs, we're able to bring more of that sort of data in, which has been helpful. And also we've made the requirements agnostic to the platform and methods that we use. So to that end, with our industry partners, we leave it to them to innovate. If they wanted to use an uncrewed system, they want to use an aerial system, they want to use an underwater system, they want to use AI or not, we leave it to them to innovate it all in their different ways. And many of them have done so. Again, we're trying to do what we can to allow the industry and the discipline to expand where it naturally makes sense to do so.

We've also been upgrading our model of our hydrographic health. I think that was mentioned yesterday, in terms of how we go about determining where it is we should be surveying to make sure every kilometer we acquire provides the maximum value to the taxpayer and the maritime community. And we can certainly speak more towards that if any questions come our way. And the last piece that we've been working on is really, again, a years-long effort within our division to automate and streamline our various review processes, because we recognize there's a time value to the data that we acquire. So we really, through these processes of scripting and other efforts, we really reduced the residence time, the time that the surveys stayed within our division, from months down to really weeks and if not days for key surveys that are flagged for that. And really what that's done is then given us increased bandwidth to, again, focus on updating the hydrographic health model to make sure our data is more tailored, or also to give us the bandwidth to bring in less traditional sources of data through our external source data pipeline, which might be a good handoff for Ms. Meredith.

Ms. Meredith Westington: Thanks Mike, can you hear me okay? Oh, good, okay, all right, great. Okay, so I am Meredith Westington. I am acting as NOAA's Integrated Ocean and Coastal Mapping Coordinator and the Co-chair of the Interagency Working Group on Ocean and Coastal Mapping. I think many of you are probably familiar with Ashley Chappell, that she was in this role about 2 years ago before she went to the Committee on the Marine Transportation System. So my personal background is that I'm a long-standing geographer. And I appreciated some of the comments made earlier about shore and sea boundaries, because that is one of the things that I worked on. And so I have a deep appreciation for, sort of the full data lifecycle and the legal implications of not managing that. But in my role here as the IOCM Coordinator and the

IWG-OCM Co-chair, we talk about ourselves as sort of the glue across all these different agency mandates for mapping data and trying to bring people together to facilitate cost-effective mapping. We're anchored in that Ocean and Coastal Mapping Integration Act. And so we provide tools like the U.S. Mapping Coordination site. We've also done a series of studies, spatial priority studies, a 3D Nation requirements and benefits study to try to dig into what it is that the community, the broad community of mappers are seeking. When they say mapping, what do they mean? And we also lead the Brennan Ocean Mapping Fund, which I think some of you are probably aware of as a partnership program. I think it was mentioned yesterday. And then we spend a good amount of time interacting with folks in the regions on regional mapping campaigns. So I lead one in Alaska called Seascape Alaska. But we also participate in the Florida Coastal Mapping program and the Lakebed 2030, which is not federally led, but we do support that. And in fact, to Nathan's point about having jet lag, I was in Alaska last week, and I was in the Great Lakes the week before, you know, working with all these partners to try to advance mapping. So and then the last thing, I think you guys are familiar with the standard ocean mapping protocol, so that's also something that my group works on. But I think that that might be it on introductions. Over to Steve.

Mr. Steven Loy: Great, thank you, Meredith. So thank you all for those introductions. I think you can see NOAA has got a lot of different types of mapping happening in a lot of different areas. I think that's really exciting. I'm glad we can have everyone sitting up here to talk about this. So, for the next half an hour or so, I'm going to give some questions to our panel. And then we'll reserve the last half hour here for the panel to bring your questions. If you don't have any questions, I'll have a few in reserve, but I won't expect that. So, again, as we go through these questions, I'll be directing them individually here. But, to our panelists up here on stage and Meredith remotely, if you guys want to give counterpoints or comments to other people's responses, please do. Either raise your hand or, Meredith, speak up, and we'll make sure we give time for those. Again, we'll go for about the next half hour or so.

To start, Ms. Dempsey, can you help set the stage a little bit for us from your perspective as a leader within NOAA, within National Ocean Service, and from that Navigation, Observation, and Positioning Portfolio, and just sort of tell us where our oceans and Great Lakes mapping is at from where you sit? Thank you.

Ms. Rachael Dempsey: Sure, sure, thank you for that, Steve. So when we talk about our responsibilities for mapping the Nation's EEZ, we often talk in percentages. Those numbers are loaded, I'm going to tell you, depending on the angle you're taking, you know, where you're talking about and whether or not you're talking about if it's been mapped or if it's been mapped and available for public use. So let me just put a number

out there that, for me, is much more meaningful as far as the magnitude of what we have to do: 9.9 million linear nautical miles. That is how much work we have to do. And you heard us in our intros talk about the thousands of miles that we're doing per year. So what that equates to is we're about one to 1 to 2%-- 2% on a good year-- of our progress towards getting our mapping goal accomplished. That's also something to keep in mind, that some of these areas, when it comes to our rubric for our prioritization, we also have to think about going back and remapping areas, all right? Based on the amount of change that happens, the number of ships going in and out of port, right? We have to do revisit. We experienced this with the Francis Scott Key Bridge. We reopened the port, but the area outside of the channel hadn't been mapped since the 70s, and so we had to go back in, remap that area to open up a secondary channel to reopen the port. There's many examples that are similar to that.

The other challenge that we face is we're often on an annual planning cycle. So for example, I sit on a group called the Fleet Council, as does Bill, and we plan out something called a Fleet Allocation Plan, which allows us to schedule using the NOAA ships available in and where we can send those NOAA ships every year. One year at a time does not really allow us a strategic perspective to achieving a goal. That makes it, that gives us a challenge to face.

One of the other challenges that we face is that we really have a hard time with the capacity for our workforce. So as we mentioned, a number of personnel that we have available to help us with QCing, doing QA/QC on the data that's coming in, is resource-limited. So it is okay for us to get all that data in. And we are on the receiving end right now of an awful lot of data that has benefited us from the deep sea mining work that we've been doing over the course of 2026. But it does take time to make that data navigation-quality. And so we are limited in how quickly we can get that information out. That's great that we can use Starlink. All our ships have Starlink. We can get that data back. But if it's going to be made navigation-quality, it's going to take us some time to get it there. So it comes down to some resource challenges that we face. We want to do more, faster, better, higher quality. We want to use tools available to us, like AI. You guys have heard me talk yesterday about data and observations and the importance of that. So there is opportunity for us to consider what those technologies can do to help us to meet those goals. There is a fleet plan that is in development right now. OMAO has been working very, very hard with the support of all of the NOAA line offices to develop a really comprehensive fleet plan. That is getting ready to go to the Office of Management and Budget very soon-- hoping. But we've worked very hard on this. And the intent of that fleet plan is to be able to communicate really what our fleet needs are going to be in the next 5 to 10 years in a really meaningful fashion. Because we have to be able to publicly communicate to industry, to the shipbuilding industry, to the maritime

industry, what it is that we need to have in place in order for us to meet their needs. Okay, so looking forward to that being released here in the next couple of months.

There is some good news here. So, Tuba, you mentioned earlier about wanting to see where our fleet was in the rollout. I am very excited that, in 2028 and 2029, the *Navigator* and *Surveyor* are due to come online. Let me be clear-- and I don't want Rear Admiral Kerry to get upset with promising too much too far in advance-- that's the delivery from the Houma Shipyard for us. Then those ships have a shakedown period, a delivery and evaluation period. So it would probably be a year or so after that before they're going to be-- for example, the *Fairweather* replacement will be up to start doing the work in the Gulf of Alaska again, which we're very excited because *Fairweather* and *Rainier*, they're grand ladies, they're grand old ladies. They've been around and serving us dutifully for many, many, many years. And ships that are working in a maritime environment require a lot of care. Salt water, salt air, hard, you know, rough seas, you know, wear on the life of a ship. So we're excited to get some new vessels out there to support us.

There is a goal that's out there right now also, and Captain Mowitt knows this very well, is the NOMEC goal for mapping the EEZ by 2040. That is a challenge. It is not a minor challenge either. And I will say that I challenged our Office of Coast Survey to take a look at what it would take to get us there. While these numbers are not publicly available, I will say that, with the Class C ships and the Class B ships that are due to come online, as well as an investment with industry, our industry partners that do mapping, we have a path to get to 2040. If we don't have our Class Bs and Class Cs, correction, if we have our Class Bs and Class Cs but we don't have additional resource investment in our industry partners, it's likely going to be 2060, 2065 before we can get our mapping goals accomplished, okay? That's a long time. I think it’s really important for us to understand that there has to be a number of things put into place: investment in the resources, our maritime resources, that's our workforce. There has to be investment in the data that we have available to us. So think our National Bathymetric Source as well as our ability to bring the data that is being contributed to that up to par and QA/QCed on a more expeditious, thorough basis.

And also our partnerships, again, I'm really beating the drum on our industry, but our resources available to support our industry, the finances available to support our industry are important. The demand signal is there. I think that, I know Captain Mowitt's going to talk about his contributions to the deep sea mining piece. I see deep sea mining as another catalyst for our investment in mapping of our EEZ. And it's important for us to take advantage of that. So, Steve, I hope that gets to your question.

Mr. Steven Loy: Yeah, I think it does. I think it might bring some more questions, too, which we'll get to here shortly. I just want to make sure we make time for all of our panelists here. So speaking of that deep sea mining piece, Captain Mowitt, I'm just going to jump to you real quick. Yesterday, we heard a fair amount from Admiral's presentation and from Andy's on some of the marine critical minerals activities that have been happening, many of which have been there in your office. As the attention is turned to this activity, what's Ocean Exploration been doing? Can you talk about some highlights from that and the type of assets you're deploying and maybe how it contributes to those issues that Ms. Dempsey just spoke to? Thank you.

Captain William Mowitt: Yeah, thank you for the question and thanks for the opportunity to speak on this. I think of Ocean Exploration as really balancing two mandates. I talked about the Ocean Exploration Act and all of our activities that have been sort of enduring and ongoing for decades, really. Last year, in 2025, the President signed an executive order 14285 (You guys probably heard about it yesterday) directing NOAA to really focus and accelerate work related to marine critical minerals. So any gray hairs that I have and maybe Admiral Evans have are probably related to developing a mapping plan in very short order. So the executive order did two things. It directed NOAA to really accelerate permitting for deep sea mining activities in areas beyond national jurisdiction, and then directed NOAA to work with the Department of Interior and develop a mapping plan to map, explore, and characterize deep sea mineral resources in the U.S. EEZ. And so that's something that Admiral Evans and I worked quite a bit on last summer. And I would say that that mapping plan is really starting to bear some fruit. So this year NOAA's involved in, I think, 18 (the number of changes almost weekly), but 18 expeditions to map and characterize deep mineral resources in the U.S. EEZ and one with one partner nation. So that is a lot of effort focused on that.

A couple things: I think if you look at the mapping plan and think about the resources it would take to fully implement it-- and it would really require every deep water multi-beam on the face of the planet right now to get that done in a timely way. So NOAA's really taking, I would say, an all-hands on deck approach here. So that means we are working with the NOAA white hull, soon to be blue hull, fleet. So the NOAA ship *Okeanos Explorer* does a lot of deep water mapping and mineral characterization, working a lot in the Central Pacific this year, working with the Cook Islands and in American Samoa. We work with partner vessels, so we support the activities. Well, actually, backing up just to the NOAA fleet, it's not just the *Okeanos Explorer*. We're working with the NOAA ship *Nancy Foster* on the East Coast to do work related to heavy mineral sands, working with the NOAA ship *Rainier* in the Kingman and Palmyra to do some characterization work there. So again, kind of all hands on deck.

On the academic and NGO fleet side, we're supporting the *EV Nautilus*. That's done a lot of work sort of further afield in CNMI and Guam and a bit of work in the Federated States of Micronesia. And finally, we're working a lot with commercial partners. So Coast Survey supported activity in American Samoa with one of their prime contractors, NV5. Ocean Exploration is working a lot with commercial high-endurance uncrewed surface vessel providers, so working with Sail Drone in CNMI this year with some support from Coast Survey in the contracting end, and working next year with a USV provider to be named in the Virginia Mineral Sands area. So really kind of using all of the tools available. Yeah, I'll stop there.

Mr. Steven Loy: Great, thank you, Captain. We're going to switch gears just a little bit. We talk about fleet, and we're thinking boats and ships. But I think within NOAA that also means our aircraft, right? So, Mr. Mueller, if you could just speak a little bit to, as I understand, the NGS (National Geodetic Survey) received some targeted Remote Sensing Division supplemental funding. Could you talk a little bit about the sort of milestones and opportunities that that funding has created and what you've achieved with it? Love to hear about that. Thank you.

Mr. Brian Mueller: Yeah, great, thank you. Yes, we in RSD have received a lot of supplemental funding over the years. We award contracts from that funding to some of our industry partners. And they really help us map the areas impacted by hurricanes, for the most part. You know, when you look at what we awarded in 2025, it was about $9.5 million we had in funding on our contract. Last year we spent about $80 million in hurricane supplemental funding. And if we step back, since a lot of us were in Alaska last week, we supported the Typhoon Merbok with our partners at USGS. We spent about, our contract was about $10 million up there. And we did topobathy LiDAR surveys, we did topographic LiDAR surveys, and we did aerial imagery collection, all within the Norton Sound. And so with that kind of data, we're looking at being able to update around 8,000 miles of shoreline in Western Alaska and areas that haven't been previously mapped or the mapping is outdated. That also helps support our VDatum models for Alaska. And so that's going to be a huge benefit for, like I said, VDatum and for updating the ENCs and the shoreline for Alaska. This last year, like I said, we spent about $80 million in about 8 months. It was a massive workload for the RSD team. But that was all essentially funding from Hurricane Debbie, Helene, Francine, all those storms that impacted the Gulf Coast, Florida, North Carolina.

And so what we're trying to do through that funding is update shoreline in areas. We're trying to move away from wholesale remapping. That takes a long time. And Rachael mentioned, how can we get some of this data out faster? And I think that's a big part, just being able to identify areas of change. But when we look at like Louisiana, that's a

huge area. So we're looking at about 10,000 square miles of high-resolution aerial photography that we're collecting there and being able to update that shoreline in Louisiana. We're doing a lot in Alabama, Mississippi and Florida as a result of Idalia, Debby, Milton, and Helene, a lot of imagery and a lot of topobathy LiDAR. I think we're doing about 25,000 square miles of topobathy LiDAR off the west coast of Florida. And that is to, there's a baseline which is really a good, they collected some the topobathy LiDAR out in the Gulf there before the storms. And so we're going back in remapping some of that to look at the seafloor change there off the west coast. One of the things we've started to do through some of these hurricane supplementals, as well, is do topobathic riverine mapping. And that's really to support the National Weather Service and their National Water Model. I think we all saw results of that horrific flooding in North Carolina as part of Helene. And so that's been a really interesting project for us. Something that is pretty new for RSD is some of the riverine modeling.

And so outside of some of that supplemental money, we're also using some of those funds in our shoreline mapping contract to support the rest of NGS, some of the GRAV-D work, some of our FCORS work, and we're also doing InSAR analysis for Mississippi River. We're looking at land deformation along the entirety of the Mississippi River. There's a lot of work that these supplemental projects bring in, but that's also a big concern for us internally.

When I mentioned in 2025 we spent about $10 million in funding, that resulted in about 150 contract deliverables that my group has to review, go through the QA/QC process, and then we move it through out to the public. You know, we provide all that data out publicly. But then we're also providing it to OCS, the Marine Chart Division. They're updating the charts. So that was about 150. With this last supplemental funding, we're looking at about 1,000 contract deliverables. So a massive workload coming into the Remote Sensing Division. So we're trying to figure out how we can prioritize some of those areas, make sure we're getting out information as needed.

We've been working really closely with North Carolina Department of Transportation. They've asked for some priority areas for the topobathy riverine projects. And so, you know, it's kind of feast and famine there. We, the supplemental money really allows us to do these really big, targeted areas impacted by storms, which is great. We can go in and update large amounts of shoreline. But then, you know, there's, that's just one part of it, that shoreline.

So, let's see, what else did I? Oh, yeah. So I think, just, takeaway on that, the supplemental funding is, you know, we don't get that every year. You know, that's appropriated by Congress. And so if no storms happen, we still can update shoreline.

We still have money within RSD to do that. But the supplemental projects really allow us to update and collect data for a big area that's impacted.

Mr. Steven Loy: Awesome. Thank you, Brian. I think, going along with that theme of having to do things better and faster, Captain Gonsalves, what emerging technologies-- it could be hardware, platforms, USVs, sensors, or it could be processes or procedures-- what's this new tech that we've been talking about today that's, I think, bringing you return on your investments, either now or upcoming in the future, thinking of things like your regional mapping plans or Hydro Health or any of those sorts of topics? What's coming up, and what's being used to do your work smarter, better, faster? Thank you.

Captain Mike Gonsalves: We're doing stuff. I mean, first I want to give a shout out to some of our, like our academic partners, like, the University of New Hampshire. They've, this isn't, none of this is new, right? We didn't decide to start becoming efficient last week or last year. This is what we've always been striving to do. So in terms of coming up with better algorithms at the acquisition for bottom detection, for gridding it, because all the hardware is getting better, so the density of data is getting more robust. So as we get better at handling the data, just more data keeps coming. So we're kind of constantly chasing ourselves. And now how we figure out storing all that in the cloud and figuring out the way users can get it, these are things we're all trying to figure out. But it certainly, I would say it starts with our academic partners, and certainly in cases like the University of New Hampshire, that's a good public-private partnership where they're not doing that on their own. So that's been very handy. Within the Hydrographic Service Division ourselves, we-- in terms of how we actually acquire the data-- we do it through three different pipelines. One is through, as Captain Mowitt said, our white hull, soon to be blue hull, fleet, right? Our in-house NOAA ships. We have our Hydrographic Surveys Services contract. So we have our six private vendors that we have to acquire the data for us. And then we have sort of our external source data. So again, I think like along the lines of what Brian was speaking towards. And I think all of those groups are sort of independently, it's great that they're in some ways independent of each other because they're all sort of developing things in parallel and taking different directions. For example, in the NOAA fleet, OMAO, the Office of Marine and Aviation Operations, has really been standing up their uncrewed arm, which Captain Mowitt was, in his previous life before OER, was leading. So they're really putting together a lot of, they have some DriX, some aerial vehicles, some gliders. And OMAO, we're trying to figure out what's the best, what's the model for how that works. So we certainly leaned towards some of our industry partners, how they're doing it in the field. So I think that's going to be really interesting.

On the contracting side, for our contracting partners, we've certainly seen, I think Samoa was a great example of, it was for the critical minerals. This is not something that we, the Hydrographic Surveys Division, normally partakes in. So there's a lot of, and really I think even Ocean Exploration, in some ways we were kind of writing the requirements as we went. But it was very interesting to see, again, bringing in our Brooks Act contracting partners that kind of know and understand what we're doing, to try in real time to figure out a good plan of, I think it's Captain Mowitt who once described it of we use sort of the surface ships to sort of find like sort of the baseball fields, the stadiums underwater. These are, you know, several miles down. To then we'll have the uncrewed underwater vehicles to kind of found, to find like the pitcher's mound and then eventually we'll send down the box cores to find like the baseball. So it's all these different nested technologies to slowly bring in and discover these different things. And now, again, we see in the academic side, we're trying to figure out, hey, is there a way we can find the baseballs from the surface? That would be very efficient, save us a lot of time and money and effort, certainly be of value to all parties involved.

And then lastly, again, on the external side, that sort of third pipeline, I think, recognizing the different technologies that are out there. I think we heard about the Yukon River yesterday and using satellite technologies. I think that's a very smart and clever way to very broad, very shallow, like, terrible for acoustic multi-beam; that is not the way to survey that area. So I think these different technologies is a real way to go about trying to figure that out. And even within satellite-derived bathymetry, the algorithms are sort of changing. We aren't really looking for empirical depths anymore. Just so much of, where is it deeper? Where is the channel? That's all we really need to know because those boats are going in and out one way or another. So we can just tell them this is the deepest way through. So I think that's a good approach there. Did I miss anything? Did I get all your pieces there?

Mr. Steven Loy: I think we'll have some more questions for you here.

Captain Mike Gonsalves: There we go. I'll stop there and see if the audience wants more later.

Mr. Steven Loy: All right. I've got one more question here for Meredith, and then I'm going to turn it over here to the HSRP. Ms. Westington, I think you're in the enviable position of having to try and coordinate all these things we just heard about and working on achieving these national mapping goals. It requires a lot of coordination here. HSRP advises the NOAA Administrator on aspects of the Hydrographic Services Improvement Act. But, as we're seeing, mapping is a mandate for a lot of different agencies, as we heard from like {indecipherable} CMTS and partner presentations, and it's not, clearly, just to support safe navigation. So wearing your Interagency Working Group on Ocean

and Coastal Mapping Co-chair hat, it’s a big hat, what is the role of the Ocean and Coastal Mapping Integration Act and your IWG-OCM group there to advance our nation's mapping goals? Big question. Thank you.

Ms. Meredith Westington: Thanks Steve. Okay, so the IWG-OCM, I mentioned, is anchored in the Ocean and Coastal Mapping Integration Act. And we were reauthorized in 2022, along with the NOMEC Council at the same time. And in that authorization it specifically says, you know, we support the NOMEC Council. And so within OCMIA, that Ocean and Coastal Mapping Integration Act, it establishes a program and some direction for the IWG-OCM to coordinate comprehensive federal ocean and coastal mapping efforts. If you don't know, it's co-chaired by NOAA, the Department of Interior, USGS, and then the Army Corps of Engineers I-ATLAS program. We actually meet on a quarterly basis. And so all the experts that are in this room here, along with our interagency partners, we get together with, we interact with, like I said, the states. I talked about the regional campaigns earlier.

One of the things that we also do that I didn't mention earlier is we do a synthesis of all the data that is available at NOAA's National Centers for Environmental Information. So we are tracking progress towards our mapping goals via the NOMEC strategy. And I think you've seen the big red unmapped thing. So that's something that we also produce to keep track of what is going on.

And what else? The thing I wanted to mention is that by law we're supposed to meet on a quarterly basis. And we just had an in-person meeting at the end of last month, so end of August. And we, as a group, we hadn't met in 2 years. So it was a big deal for us to sort of reconvene and figure out like, what do we want to do? This is a hugely complex space. And there's a lot of different directions and a lot of different interests that people have. And so we carved out space to talk about a work plan for FY27 to FY29. And we prioritized, we came up with a bunch of strategic objectives and we prioritized things. And so I can tell you that out of that effort, we have a bit of a compass. And that is, the first one is to enhance mapping coordination. So that gets a bit to the U.S. Mapping Coordination site, which I've mentioned before. I'm assuming a lot of you, hopefully in the audience, on the panel, already are aware of the site. We do use it to publish priorities, plans, and including the latest in the deep sea minerals plans or priorities space. You can find that in there.

Anyways, the second strategic objective has to do with expanding next generation mapping technology. So that's a really good compliment to what Captain Gonsalves was just talking about. And then the third one is to enhance capacity to use and apply integrated mapping tools. And so I think that might be a bit of a nod even to what I heard Tuba say earlier today, that there's a recognition, that there's a need to integrate

the data for a lot of different reasons and we know that there are some different potentially competing, or at least might be assumed to be competing products, that publicly maybe not everybody understands the benefits of using one product over another. Yeah, maybe I'll just park it right there so we can move forward with the panel, but that's just sort of a smattering of things that we do within the IWG-OCM.

Mr. Steven Loy: Awesome, thank you, Meredith. At this time, I'll turn it over to our HSRP panel. Again, just wanting to be cognizant of time here. At 10:30 we've got a public comment period here. So if you could raise your hand. And, Nathan, if you could help direct those questions. And I ask the HSRP if you could just specify who your question is for or if it's for the panel as a whole. Thank you very much.

Mr. Nathan Wardwell: Great, yeah, sure, no problem. Qassim, I saw your hand jump right up. Go right ahead.

Dr. Qassim Abdullah: Thank you. Yeah, before I forget my question. Thank you very much. Very enlightening presentation. So I have a question and a comment. The question: we know we have the integrated coastal mapping by Mrs. Westington. And we're coordinating among federal agency and other partners, definitely. I'm kind of wondering on NOAA level--and this could be a question for Rachael, actually-- on which level all these, the hydro services, the NGS, the Ocean Explorer, those presentations today, are coordinated, you know? Because with the limited resources we have and the combined technology—technology is getting integrated, whether we like it or not, you know, like mentioned for hydrography, you need satellite-derived, you know, bathymetry, for example, multi-beam; those all start being running before coastal mapping and deep ocean. So there is a lot of overlap. Technology is different, device difference. But data processing, data QC, we could all come together. So I'm wondering, when we establish these, it might go into vertical silos and people not talk to each other. So maybe it's opportunity to take advantage between all this mapping activity to see where we can come together to help each other. That's my question.

My comment: the AI, now we are embracing the AI as great, I mean, we notice it. I compare it to 2 years ago, when we used to bring it up. Oh, no, no, no, we're not into that, you know. Now as we are, fully open for that, which is great. But I didn't see much on the AI arena and the mapping. Rachael, you mentioned about data QC, for example. You have a lot being thrown on NOAA between all these departments of mapping. And it needs a lot of QC, especially if it's coming from consultants. GeoAI has a great opportunity now, you know, in our business. And I'll tell you, example, my company, we didn't wait to grow it organically because we're going to miss the trend. You know, we bought, we acquired a company, AI company, believe it or not, just so we hit the ground running. And I'm afraid, NOAA, if you're going to wait to grow that organically from

within, will be too late because things are moving so fast. So I hope you look into consultant, or bring in somebody else to help you how to get on that train, for example. Because GeoAI is a great opportunity for NGS and other, all the hydro service mapping, to keep you going. There is a lot of automation can be done in the QA/QC, for example, which is manual labor sometime. That's all I have. Thank you very much. Yeah.

Ms. Rachael Dempsey: So I'll take the first comment just very, very briefly. Great point. I know that the OCS team is working on it. But I'm going to let Captain Gonsalves and Ms. Westington talk about that. But let me go back and address your question about the coordination levels. So this is happening on multiple levels, which I think that this is a good thing. Any time we lay out our annual plan, it's happening at the subject matter expert level. So anybody who needs any work done that is happening at that subject matter expert level, it then goes into a fleet working group. The elements are prioritized based on the inputs. So for OCS, we talked about our rubric that we go to for the prioritization. Fleet working group then puts together a fleet allocation plan based on the individual line office rubrics and then the overarching NOAA rubric. And that is then submitted to the Fleet Council. The Fleet Council is led by Rear Admiral Kerry, so the head of the NOAA Corps and responsible for all of the OMAO operations. And then that is approved. Once it's validated and approved by the Fleet Council, it then goes to Dr. Jacobs for final approval. Okay, so there's elements at every level where they're involved in that. Now I will say on the deep sea mining side, because it's so specialized and it has so much interest in it, Captain Mowitt mentioned that we went through prioritization processes this past summer, which is very detailed. The political leadership helped us out with that. We brought our resources to bear. And so that was led and coordinated at a much higher level than normally done for the regular mapping and charting as well as the surveys required by folks like Weather Service and Fisheries Service. So it is a very good process. I did mention, though, that going 1 year at a time has its limitations. And so we are working right now on a longer-term allocation plan to look in the out years so that we can plan and meet campaign needs, for example, and then budget and allocate resources towards that. So I hope that answers that part of the question. But let me kick it over to Captain Gonsalves and to Ms. Westington for your comment.

Captain Mike Gonsalves: I appreciate the comment. Again, we've been investing a lot of time and effort in coding and software solutions to automate a lot of the processes that we do. We haven't, at least within the Hydrographic Surveys Division, we haven't done a lot. We haven't leaned in as far into machine learning and artificial intelligence as we should. We do have a project from the Hydrographic Health model, understanding the-- we call it the decay coefficient-- understanding for a given survey, how long is that survey still fit for purpose as hurricanes go through, tidal processes other geologic

things act upon the seafloor? At what point are we no longer as confident as we want when we're talking inches of under keel clearance? So we do have a project that's underway. Right now it's working in and around Florida. We have some repeat surveys. And we're trying to use some machine learning to sort of extrapolate to understand. As Ms. Dempsey mentioned, it's not just about acquiring that 9.8 million linears, we also have to go back and redo some of the other ones. So we do have a project there. Another hurdle that I see is, at the moment-- this has been brought up a few times-- is with the workforce itself. We lost a lot of people over the last few years. And we're slowly rehiring. But in some respects, we're kind of rehiring the same people. We're rehiring physical scientists, rehiring geodesists, rehiring cartographers, which is good. But they're not the AI specialists, right? We probably need more in the way of IT specialists, data engineers and data scientists and things like that. At the moment, I think we're having trouble communicating that up the chain, of recognizing that to change the way we're doing business, we may need to change what our workforce looks like a little bit. And I think, as somebody mentioned, as I think the Admiral mentioned, or Ms. Dempsey mentioned yesterday, hiring has finally eclipsed attrition where we've managed to maintain a steady state. But I think in some respects, we may have to pivot a little bit for the shape of that workforce, to try and, to lean into some of these new tools.

Ms. Meredith Westington: Do you want me to chime in real fast? So to your question about coordination and how that's working, so we do have some structures within NOAA. We have a NOAA IOCM coordination team. And so there are program office reps that have been identified to join that team. And you're looking at, at least two people on this panel are in there. So that would be Captain Gonsalves and Brian Mueller, so for their programs. But there are many interests across NOAA for mapping. And so we have reps, and we meet on a regular basis to hash out the coordination details of that. And then as part of the IWG-OCM and that big annual meeting that we had-- So I'm the primary rep for NOAA in that space. I'm also the Co-chair. But we made a point at that annual meeting to invite the NOAA primary reps, the NOAA, sorry, program office primary reps to that meeting in order to also have engagement with the individual NOAA programs and those other interagency programs, so the USGS Coastal Mapping program, for instance, or the I-ATLAS group. So that, we have structures in place to be able to support that. And the U.S. Mapping Coordination site, again, is another one of those structures that we have. And both of our panelists that I've already pointed out, their programs do contribute their current year and out-year plans to that site to, again, help with the communication and coordination piece. That’s all.

Mr. Nathan Wardwell: Great, thank you. Anuj, I believe you would like, you have a question, go ahead.

Captain Anuj Chopra: Thank you, thank you so much. I really appreciate. And I wanted to focus on the new fleet acquisition and the usage of the existing fleet. So, sorry, a three-part question just to understand where we're going with this. One, what is the current ratio of the fleet to the uncrewed systems within NOAA? Second part is, you're using six subcontractors. What is their ratio? How are they using their floating bottoms to uncrewed systems. And then combining these two, looking at a new acquisition, the '28 delivery and '29 delivery and future plan of expansion, what are the ratios which we are working at? What I'm driving on this is NOAA has gained some amazing expertise in the space over the last--I've had the privilege of seeing many of these uncrewed systems and how reliable they've become. So are we really exploiting and working towards using more uncrewed systems so that these linear miles can be exponentially increased? Thank you.

Captain William Mowitt: So I think what you're looking for is like a ratio of linear nautical miles acquired by a traditional crewed vessel versus non-crewed system. I don't know the answer to that. But I can tell you a little bit more about what NOAA's doing in that regard. So I think a couple things to think about for the-- NOAA doesn't necessarily have to acquire and own the uncrewed system to acquire the miles. I think we're still assessing the models in a lot of cases using commercial uncrewed systems to acquire those miles instead of owning and operating. We're doing both. So NOAA owns and operates, I think, currently two DriX uncrewed surface vessels. More of those are coming. But we probably do more work with commercial partners to acquire those miles using commercial uncrewed systems. Still more happening, definitely still more happening with traditional, you know, sort of white hulls. But I would say the ratio of uncrewed system miles is growing. And that's certainly, I'd say, NOAA kind of following the lead of the six primes. And I'm going to get way out of my depth here because I don't work for the Office of Coast Survey. But when I was at the Uncrewed Systems Operation Center, you know, we certainly saw what those primes were doing with uncrewed systems. We were like, "Hey, that's a pretty good idea. You know, we should probably do that as well." So I would say following the lead of industry there. And looking at the new fleet, a couple things to think about. One, the Class B ships are coming online. Those are going to have an equal ratio of additional uncrewed and crewed survey launches. So two, uncrewed systems to traditional crewed survey launches and, of course, like the ship's acquisition itself. So kind of an equal ratio there. But I would say, if you look at both the President's budget and the House mark, there is language directing NOAA to acquire its own government-owned, high-endurance USVs both for fisheries missions and for hydrographic survey and ocean mapping missions.

So more to come on that. We'll see what Congress does, right? Like, you know we're all waiting to see what happens. But I would look for that role to really significantly expand in the near future. Anything else?

Captain Mike Gonsalves: I'll quickly jump in again. From the perspective of our six contracting partners, as we write our specifications for where, the areas we send them, like I said, we're platform-agnostic. We leave it to these for-profit companies to determine what makes the most sense, whether it's crewed or uncrewed, because recognizing uncrewed is not the silver bullet; there are still people involved, again, people of different skill sets. And to some extent, some of our vendors, some of whom are in the room, they've been using uncrewed technology for decades now. going back, again, where it makes sense, usually in places like Alaska, there's not a lot of traffic. So back then you could have kind of dumber boats running by themselves and it wasn't causing a lot of mischief. It's, yeah, so to that end, I think the industry is slowly, I think they're further ahead than where NOAA is in some respects. But they haven't gone all in because, I think, in some respects, the, it's not a magic bullet that can solve all the problems. But there are certainly a lot of use cases where it makes a lot of sense. And I think as the algorithms and the thinking behind these things gets smarter, I think the usability is going to increase. But yeah, by and large, we don't dictate among our partners how they determine that ratio. They do that for themselves.

Ms. Rachael Dempsey: Anuj, let me just give you a couple of really high-level data points. First of all, just riffing off of what Captain Gonsalves just said, we've been using unmanned systems off our white hulls for a long time now. They are a huge benefit to us in maximizing our survey time to get more linear nautical miles per trip. Singularly, I think the technology for unmanned systems is also continuing to improve. They often have their own limitations. Depth sometimes is a limitation; weather sometimes is limitation; the capability to gather the needed navigation-level survey data sometimes can be a limitation. But there's certainly application across the board. The other thing is that Dr. Jacobs has really been challenging us to think outside the box. So when it comes not just to mapping and charting, but for other applications, the collection of the data for multiple use is extremely important. And he continues to challenge us. Are we doing everything we can? Can this be done through other means? Which is why we have not only unmanned undersea vessels, unmanned surface vessels, unmanned aviation vessels, right? but also even into the satellite level, which we've touched on here today.

I think the last point I will tell you is that OMAO is really starting to step out to, when it comes to those line offices or programs that might be resource limited. OMAO has purchased a couple of their own unmanned vehicles. And, just like a ship, they are

putting them on the docket for the fleet allocation plan of what surveys can use these vessels and what time those programs get on those vessels. That is going to be new in FY27 and we're really excited about that. I think NOS has one of those. So, yeah, we're getting there. We're making steps. But I think that the question that you're asking is very apropos. There's always going to be more that we can do. And certainly our leadership is challenging us to do that.

Captain Anuj Chopra: Congratulations. Thank you. I wanted to highlight that, with your subcontractors, it's always a good benchmark to see what you're using to what they're using and get those ratios right. So it's a mark of progress going. But I'm so glad you're looking at it. And again, congratulations to all of you. Thank you.

Mr. Nathan Wardwell: Thank you for that question, and this has been a great panel. We have about 4 minutes. And, Tuba, I know you have a question here, so why don't you go ahead and get that in there.

Dr. Tuba Özkan-Haller: Thank you. It's really more of a comment rather than a question, so this should be really quick. I want to refer to something that Captain Gonsalves said in response to Qassim Abdullah's question about hiring, right? You're hiring cartographers and GIS specialists, and those are really the tools that you do need. And one way in which we can bring AI expertise into the fold is what Qassim was suggesting, you know, bring it in from the outside. And that's a quick way of going about it. But the challenge there then, of course, is that those AI specialists might not be familiar with the domain knowledge that you require for this work, right? And so coming from the educational side, I will share with you that we're really revamping our curriculum to deliver to you GIS specialists and cartographers who also understand how AI works, bringing that work into the fold. This is not dissimilar from 20 years ago where we had to revamp our curriculum to ensure that our students graduated with all of the software tools that they needed. So now we have introduced something that we're calling an AI micro-credential. So it's a sequence of courses that students take, and you will see this micro-credential on their CVs as you're reviewing their applications. Of course, more experienced folks might not have this, though there is the possibility of more experienced folks coming back to school. These courses are made available online. So just a little plug for Oregon State University's eCampus program. So be on the lookout for folks who have the domain knowledge and expertise who also can bring the AI knowledge into the fold. Thank you for that opportunity.

Mr. Nathan Wardwell: Great, we have a couple more minutes still. So, Deanne, go right ahead.

Ms. Deanne Hargrave: Just a quick question that probably has a very long answer, or we could spend a lot of time on it, I would think. So we talked about white hull, blue hull data acquisition, six private vendor data acquisition, and the third one is the external sources. And I'm very curious to know, what are the roadblocks to really seeing the full potential of incorporating those external sources?

Captain Mike Gonsalves: I'll try to be quick. In part, it's personnel, it's the folks that, we do, to quality control for some of this data. It's a limited number of people, and we were staffed for just our traditional sources of data. Even, speaking towards Captain Mowitt, when I say external source, the *Okeanos Explorer* is not really what we consider to be one of our traditional sources. We have an external source data team within HSD that we're standing up to try and to ingest more of these things. And again, the efficiencies we've had, I should also mention, we've been using AI to help develop the tools that quality control our data. So we are using AI in that respect. It frees up the bandwidth from some of those folks who are doing traditional quality controlling of data to then pivot to some of these external sources. And part of the problem is just they're all just so different, all these different sources. So it's, as some folks like the Army Corps with their channel surveys, even though those are different, Travel Tech, now I-ATLAS for their coastal mapping program, RSD for their, there's some consistent players out there. So we're trying to develop as best we can sort of pipelines that we can attach to our own to bring those in. But really, it's resourcing. It's the lack of people to kind of take that thing on, to take on these other projects to eventually get that all into the National Bathymetric Source so everybody can really take advantage of these data sets.

Ms. Deanne Hargrave: Maybe a quick follow on then to that is, are there multiple groups that are trying to do the exact same thing? Is there kind of a synergy where that could be a centralized opportunity?

Captain Mike Gonsalves: I know within Coast Survey, over at the Coast Survey development lab with the keepers of the National Bathymetric Source, they've, similarly, they want to make sure, particularly Army Corps data for the channels, we want to make sure that data is on the charts like stat. So they've been working with them. But beyond that, I think we have to go back to our partners like Meredith to help us. She's been similarly connecting us to all these various data sources. And we're like, "Oh, boy, there's more of it out there." So certainly the Merediths and the IOCMs of the world are very helpful. But at the end of the day, we just need extra bodies to help us figure out how we get it in our pipeline.

Mr. Nathan Wardwell: All right, I'm going to have to stop us there. Sounds like we can probably keep going for another hour or so. No surprise there with this panel, which is

one of the great things that I enjoy about it. So thank you very much. How about a round of applause for our panelists? {applause}

So now we're going to go ahead and move into our public comment period. I'll hand it over to you, Rear Admiral, to guide us through that.

Rear Admiral Chris van Westendorp: All right, thank you, Nathan, and thank you to the group. That was a great discussion. I will now turn this over to Robin to read and summarize the public comments we received since yesterday. I would encourage anyone in the room who would like to provide a public comment to find a microphone so that it can be recorded for the record. We will show the comments on the screen and they will be collated into a document shared with the HSRP members and NOAA. After the meeting, the comments will be posted to the HSRP website and included in the public record. Robin, are there any comments to share that can be read into the record?

Ms. Robin Czeidinski: Thank you, Admiral. Yes, we have received one public comment this morning via the webinar. This is from Mr. Guy Noll. He says, “With respect to the theme of how to use GeoAI and related machine learning technologies more quickly at NOAA and related agencies, I highly recommend that the HSRP consider a briefing from Esri's Keith Van Graafeiland, who has already begun working with the deep sea mineral mapping data using the latest Esri GeoAI tools. If the panel is not aware of Keith's work, he maintains an ocean project hub site.” And then the link is provided.

Rear Admiral Chris van Westendorp: Okay, thank you, Robin. And we will now have a moment, and if anybody wishes to offer a comment in the room. Galen is standing back there with the microphone and we will wait a few moments. All right, is anything coming in online? I’ll set a 30-second timer in my head. {pause} Okay, thank you, Guy, for the comments. And for all others, you are still welcome to send an email to that email address that we made reference to earlier. I think, Mr. Chair, we can proceed with the agenda and we will close this public comment period.

Mr. Nathan Wardwell: All right, great, thank you. Yeah, so we'll move into break next. We'll come back at 11 a.m. Is that correct? Yeah. So break, back here at 11:00. Thank you very much, everybody, for the morning discussion. See you back at 11:00.

BREAK

Mr. Eric Peace: Welcome back everyone. It's 11 o'clock. We'll now get started with Dr. Steve Smith, senior leader supporting the National Ocean Service on modeling.

Dr. Stephan Smith: All right, joined by two linebackers here to protect me. So just thanks for the opportunity to brief this august body. I'm a big fan of federal advisory committees, having worked with the NOAA Science Advisory Board over many years, and recognize

and appreciate the very special and important role that federal advisory committees play in the federal space, in the form of recommendations on things that we should be doing, and as well, and perhaps more importantly, pointing out our organizational blind spots, the things that we should be doing that we're not doing. This is an extremely valuable service and keeps us on the straight and narrow. So I just want to say that up front. Can we go to the next slide?

Yes, so we're going to cover NOS's Modeling Modernization efforts, might be called transformation. I just, first give a brief background, I've spent over 30 years in the National Weather Service, so I'm an atmospheric scientist. And I've been over here for 6 months now and really enjoying the work that NOS conducts, both in the R and D space as well as the mission operations that serve stakeholders and communities across the Nation and the Coastal Ocean Zone.

And it's really amazing that from a modeling perspective, the Earth system doesn't really care how NOAA is organized to predict its future state, whether it's the ocean or the atmosphere. And we see on a daily basis, we saw last weekend this big nor'easter that impacted a large chunk of the East Coast, creating coastal flooding driven by an atmospheric storm, which resulted in storm surge, high tides, and so forth. It's the nature of the Earth system to do these things, and NOAA approaches modeling the Earth system through our legacy organization. But there's Navier-Stokes equations operating in the ocean and the atmosphere, and there's a lot which happens in the atmosphere rhymes with what's going on in the ocean. And the other thing that is true is that the communities and stakeholders that we serve in providing life-saving information for the atmosphere and the ocean as well as economic enhancement, doesn't care how NOAA is organized to deliver this important information. So just a reminder that NOAA's got a lot going on that benefits life and safety as well as the economy. And it's really great to be here in NOS to provide some new invigorated focus on the coastal ocean modeling space. Next slide, please.

So at a high-level view, this is kind of the broad value chain that NOS operates under for its missions, which resembles very closely what the Weather Service does on the atmospheric side or the weather side. So observations are collected, a lot of them are assimilated into core hydrodynamic models, which form the foundation for applications and tools, which serve these various mission spaces, including hazardous spill response, search and rescue, safe and efficient marine navigation, which is the big focus here at this 2-day meeting, protecting human health in forms of harmful algal blooms, and finally, coastal resilience and risk reduction. So this is not exclusively the value chain. Particularly, we look at AI, now we're looking at predictions that start with observations and go straight to predictions and sort of bypass the core hydrodynamic

models. But this is largely the way things operate and have done extremely well in serving these mission spaces for a long time. This also represents, in a sense, an investment portfolio that NOAA has to consider and NOS definitely is. If you look at this entire value chain, what's the biggest return on investment? Where should you be investing more? Where should you decrease, et cetera. And it's an ongoing challenge to understand the right balance. Certain things cost a lot more, and maintaining observation systems and core hydrodynamic models is not for the faint of heart, or for a small pocketbook. So and the overall trend in federal spaces for smaller budgets. So this is a challenge that everyone is aware of. And increasingly, we're looking to being smarter partners with the private sector and some of our folks outside of NOAA to help us deliver on this value chain. Next slide, please.

These are three timelines, parallel timelines, that focus on a very big and ambitious agenda for NOS coastal ocean modeling. They're thematic. The first one is labeled “consolidation.” And when Dr. Jacobs arrived, he gave us clear direction, which we already knew about, that we have too many and we maintain too many coastal ocean models. There are 25, 24, depending on how you count them. And the O and M burden of maintaining these models, many of them very, very outdated, just grows with time, and it diminishes our ability to deliver on this mission. So we sort of directed through a high-level priority that we need to find a way to consolidate.

At the top, we recently have implemented a new version of the Storm and Tide Operational Forecast System that covers the entire Pacific region. And recently, and very soon, we'll be implementing the so-called Northeast Coast Operational Forecast System (NCOFS), which is our first major down payment on this consolidation. It reduces four legacy models down into one, bringing better efficiency and better accuracy. We're doing all of this ahead of a transition to a new supercomputer. You may have heard Google won the contract, and so this is going to be supercomputer in the cloud, a major transition for all of NOAA's Earth system modeling. And it will be all hands on deck to port those models to this new system, but at least we'll have three fewer models to transition. They will not go onto the supercomputer in the cloud, and that represents less work. But beyond that moratorium, we will pick up the consolidation beat and look at other ways that we can reduce the number of models. And it's a complicated sort of portfolio.

The second line is labeled “modernization.” And this one is also, was directed by Dr. Jacobs, which is to look at our legacy four core hydrodynamic models that have been developed by academic partners and universities that are probably well known to many of you, and conduct a formal evaluation across different realistic scenarios being, you know, precise marine navigation, harmful algal blooms, oil spills, and some high-impact

event, and like run them through the traps objectively to see how they intercompare, with the hope that we may find one that's head, or a couple that are head and shoulders above the rest. And that might make it easier to say, "Well, we only need to use these. They sort of cover all bases. We can retire some of the other ones." That's a hope. It's not necessarily what I think the outcome may-- but we're taking this extremely seriously. And being honest brokers, the taxpayers' dollars, on how we work with these communities, and we currently rely very heavily on them for all our operational coastal ocean models and the predictions that result from them. So to get ready for this we recently conducted a market research activity known as a request for information. That closed back in August, and we received an overwhelming response. We had close to 70 individual responses from academia, private sector, NGOs, all of which represents a wealth of information about the state of play in coastal ocean modeling that can inform what we do.

Lots of new things coming online. In particular, as already been mentioned, hybrid AI models, et cetera, new data simulation techniques. And so we are on the precipice of conducting this formal evaluation, the precipice being FY27. That dashed orange line is where we are today. So the next 12 months through FY27 is really a transition period for us.

And the last line, the third one is labeled "organization." So we are looking inside of NOS of how we can better organize our modeling effort to be more efficient and effective. Currently modeling is sort of compartmentalized across multiple program offices. And a result of that, efforts have been historically siloed and led for suboptimal progress, I guess, to be diplomatic about it. And we're looking to improve how we are organized to conduct this very important activity. And this is not new in NOAA. The National Weather Service and NESDIS have also been undergoing some reorganization efforts along the same lines. But FY27 does represent, I guess, a runway to takeoff for NOS Coast Ocean modeling. So we're going to do a lot of work in the next 12 months. It will be all hands on deck. We will be focused on these priorities. To the goal of, in FY28, being producing a report upon which will contain recommendations about how we should better optimize our suite and downsize it, if you will, as well as modernize it with some of the new techniques that are coming online. So it's a very bold, ambitious agenda.

You've already heard about how we have been diminished over the last, you know, particular year. Two years ago, everyone was inside NOAA in terms of retirements. But we are building back. We have had some hires that we're very grateful for. So we're starting to pick things back up, which is very encouraging. And it really is of the nature, you know, you're going to adapt or you're not going to survive. And so I think we are in

that phase. And the team we have assembled is embracing that. And we view the future very optimistically despite what we've been through, and the workforce is the key. We need high-performance computing resources. We need contract support and we need all the community partners that we have. But most importantly, we need our workforce to be working better together, and that's what we're focused on. Next slide, please.

So we have a modeling implementation plan that we're currently revising. But suffice to say some high-level focus is, you know, we're addressing user needs through community engagement and partnership. Thinking of that valued proposition, the end of it is all the users and communities that benefit from coastal ocean modeling forecast, as it should be. We start from the end. We're not doing modeling for the sake of modeling to publish papers. We are doing modeling to apply to mission services for the benefit of the Nation--economy and life and safety. And so we need to be considering the end from the beginning and the users that benefit from that.

Our approach is grounded in community modeling. We have a community of communities. All the code is up in GitHub. And we rely on university partners to be adapting and improving their models, from which we benefit from. And ultimately we're issuing these forecasts through the accurate and reliable operational models. These models are important to atmospheric prediction. And they are coupled. And there's more and more research that shows that novel observations in the ocean, like colliders, properly assimilated into coastal ocean models, which are coupled to atmospheric models can give you vastly improved hurricane forecasts in time spans of a day or less. It's not like weeks that the ocean impacts the weather, it's hours. And we are inexorably linked to our colleagues in the National Weather Service in space. We are linked through the hydrology of the National Water Center and their flood inundation. Again, the flood doesn't care whether, you know, that the National Water Center is forecasting the outflow of the rivers and we're forecasting the head of the tide moving upstream. The flood is the flood and it inundates where it's going to inundate. And some of the stuff that Dan Roman and company talked about with the NGS is critical to making all of this work. So it's very important that this foundational work, which supports all this goodness continues and is properly resourced. So that message carried forward by you all is greatly appreciated.

Strategic priorities, I already talked about consolidating our modeling suite. Too many models, we can do better there, and we will. We're going to be integrating more data, novel data, into our modeling through improved data simulation. This has really been shown to provide the greatest stretch in increased predictability, not only for the ocean, but as I alluded to, the atmosphere.

We are going to be building coupled systems to look at compound and cascading threats-- storm surge, rainfall, harmful algal blooms--all of these are actually increasing in frequency and impact. It's not getting better, folks. The tide is rising. It is fun to be working in an agency where the tide is lifting all boats, but we're actually predicting the tide that's lifting all boats. And what you haven't heard so far, I believe, is a core fundamental framework that the NOAA has embarked on is a so-called unified forecast system framework, or the UFS. And so NOS are leaders in embracing this framework, which is a community-based framework, which allows different partners in the coastal ocean modeling space to work together with us to develop different components that allow us to sort of mix and match and try out some of the new data simulation or the surge modeling in a way that's more efficient and effective. So embracing common software packages for software development and these types of frameworks. It’s important to get the biggest bang for the buck.

Lastly, embracing emerging technologies is grounded in the juggernaut which is AI and ML capabilities. However, I want to make sure it's understood that we don't have everything figured out about what's going on in the ocean from a physical standpoint. We don't know what's happening in major areas of the ocean yet. And, therefore, the idea that we're going to wholly swap out and embrace data-driven AI techniques is a complete fantasy. So science is still needed, science grounded in Navier-Stokes and other sort of physical models. However, we can take advantage of the cost efficiencies that we may gain in employing them towards cheaper ensembles. We do not have a probabilistic framework in our coastal ocean modeling suite like the Weather Service does for its atmospheric. And we desperately need one. Decisions grounded in probabilistic framing are much better for users, and we need to get there. But it's incredibly expensive to run these coastal ocean models at high resolution. Incredible interesting things happening that you all benefit from in the navigation space that drive the port system, that drives the economy. All of that is going to higher and higher resolution: three dimensions. It's expensive. So AI could help us out there and allow us to get our hands on data that currently is difficult to assimilate.

Leveraging GPU computing is now expected. Our request for information, everybody's expecting that the next generation of coastal ocean models will be availing itself to AI and ML, will be grounded in GPUs, and it'll be all operating up in the cloud. So we're a little bit behind the curve, but we're catching up quickly.

And lastly, and this is where we're going to pivot to the next part of the talk, which Ed and Greg will pick up the baton, is, again, we're doing modeling in an applied sense. So it's driving a lot of decisions by users and communities. And so we need to be more nimble in responding to these. The typical cadence of running things on a clock is not,

no longer cuts it, if it ever really did. And so the cloud is affording us the ability to do dynamic on-demand modeling for specific cases, responding to things like the Francis Scott Key Bridge and other unexpected things that either man and Mother Nature bring upon us to respond to in an effective way.

So it's exciting what the next 12 months is going to bring, but we're more than up for this challenge. So now I'm going to like hand it over to Ed to talk about more specific things to the HSRP, which is really exciting too.

Dr. Ed Myers: Yeah, thanks, Steve. So yeah, really appreciative of this opportunity to talk to the HSRP today about NOS modeling. And so my name is Ed Myers. I'm a Branch Chief. I've been with Office of Coast Survey, and really pleased to be part of this new NOS modeling program venture that's bringing together all the program offices across NOS to all work towards a shared vision of how we can best use modeling to address user requirements nationwide. And as Steve mentioned, this is a wide group internal to NOS, but also really dependent upon those connections to the community. So we will talk about it a little bit more here, but working with academia, industry, international and so forth is really critical to all working together towards incorporating advancements into the models.

But yeah, this first slide here talks a little bit about the history of the modeling program in NOS. And this year is actually the 25-year anniversary of the first NOS Coastal Ocean model that went into operations. It was one for the Chesapeake Bay, the Chesapeake Bay Operational Forecast System. And this marked a really important point in being able to provide real-time predictions of water variables. So we've got water levels, current, salinity, and temperature. And these can be provided for an entire base system in this case, for this model. And then the success of CBOFs here extended to, you know, further models were developed in other parts of the country over the next 10 or so years.

And then a critical point came in around 2010 or so when the Weather Service-- so previous, in those first 10 years, the models had been running on our computers in our offices. And the Weather Service in 2010 or so invited NOS to bring our models and run them operationally on the same computers, the official production suite where the weather models are run and so forth. And so this was really critical to ensuring that the NOS models had the same reliability as the weather models and the rest of the NOAA models. And they were all running together on the same system. And then from there, we were really able to take advantage of computational advances over the next 10 or so years. Instead of just focusing on bays and estuaries, we were able to expand the models to be more regional in nature. And then, to the present day, we've been able to incorporate even more capabilities that allow us to have even basin-scale models, and

even some systems that are running globally. And yeah, as Steve mentioned, data simulation and other capabilities are things that we're continually trying to incorporate into the models as well. And of course, the UFS is really a cornerstone to not only working with the community but, as I mentioned with the models already, running alongside the weather models in the production suite. The models can now exchange information in real time. So the coastal model can provide information about water temperatures and so forth to the atmospheric model and vice versa. So all the NOAA models can communicate and share information as we work towards that vision of a true Earth system model for NOAA. Next slide.

So yeah, and Steve also highlighted the NOS mission themes. They're so critical that we're trying to design the models for, you know, and first and foremost, definitely being safe and efficient navigation, but also, you know, coastal resilience and the other themes as well. But, you know, especially with the maritime economy continuing to grow and the capacity of the ships are getting larger, the coastal ocean models really present a great opportunity to provide real-time predictions that can help towards, you know, the safety of navigation and efficiency as well. But to do so we, it's really critical that we have seamless nationwide coverage of these models. So that's something we'll talk a little bit more about, and also providing uncertainty of the models as well. And so these are all things that the NOS modeling program is working very closely with the Precision Marine Navigation program. So this slide is taken from the Precision Marine Navigation. But if we go to the next slide--

And this (oops, sorry) this continues to, this emphasizes the critical need of precision marine navigation because it brings together all of the components of a diverse array of data and model information that can be made available to the mariners seamlessly. And again, the real-time predictions from the models, especially for the water levels and the currents, are so critical to this when combined with the bathymetry to providing real-time information to the ships. So the modeling team has been working to make sure that the water levels are aligned with S-104 water level specifications and that the surface currents as well are available in S-111 specifications as well.

And if you just do one click, there should be a-- and this is a simple graphic, but it has a lot of meaning to it because these three things that we heard earlier about the National Bathymetric Source (NBS), how critical it is and the interconnectedness here of these three components. So the most, I would argue that the most important input to the coastal ocean models is the bathymetry. And having the authoritative NBS bathymetry feed into that is so critical to the accuracy that we generate from the models. And then, hence the accuracy of the models will, you know, fuel the success of the precision marine navigation. So we really need all these working in unison together. Next slide.

And everything that we're doing with the coastal ocean models is driven by user requirements. So earlier this year, across the NOS modeling program, we did an assessment of the user requirements across the different mission area themes. We design the models to, you know, we measure the accuracy of the models against these user requirements. And where there are gaps between the requirements and what the models are capable of, we work with the community to work on advancements that can address those gaps.

But just a quick snapshot here of the requirements, some of the requirements that were collected for navigation. You'll see different, you know, for the different variables-- water levels and currents. And we're also looking into sea and lake ice skill assessment criteria, but also, you know, water density and so forth. But for each of these variables, NOS has criteria against which the models are measured. And so for navigation, you'll see numbers like for water level accuracy, for example, there's 15 centimeters. But there are a lot of skill assessment criteria that are being measured in regards to that 15 centimeters. One example of which is, we call it the central frequency, which basically says that 90% of the time we want the models to be within 15 centimeters accuracy when compared to the observations. So, again, these user requirements are driving everything that we're doing with the models. And before we put them into operations on the Weather Service computers they really need to meet these user requirements. Next slide.

So this figure we took from, it's a service delivery framework portrayal that was developed by NOS's Office of Coastal Management and has really been embraced across NOAA. And there's wide consensus in the modeling program that this is really key to where we want to be moving ahead in the future. And of course, you can see at the center there is the requirements, continuous engagement with users is what's driving all of this. And the critical thing about this figure is that it really represents the modeling ecosystem that we're trying to build across NOS modeling. So it's not just modelers sitting behind a computer, developing a model, putting it into operations, and then saying, "That's it." It's really the whole ecosystem of how we go through the cycle of engaging users continuously, gathering the requirements, working with the community to build the models, addressing concerns, delivering the information. It's really that full cycle. And if you add or just click one more time.

Sorry, I apologize. This gets a little bit busy. But some of the things that are shown on the outside here are the components that are going to make all of this happen. So you see in the upper left some of the mission themes that are driving the motivation for the models. In the upper right are some of the model communities that we work with. So, yes, modelers feel very at home in NOAA where there are so many acronyms because

all of the models have acronyms here. So SCHISM, ADCIRC, FVCOM, ROMS, and as Steve pointed out, those aren't set in stone. We also need to be looking at AI and machine learning. So we need to continually adapt to how the community is building capabilities. But some of the applications shown in the lower right, I'll talk about those in a moment. And the various communities, we have a coastal coupling community of practice, for example, and UFS, Earth Prediction Innovation Center. All this presents an ecosystem that we're trying to build. And I think it's really appropriate that a ship's wheel is kind of represented surrounding those engagement with users in the center because this is meant to be dynamic. You know, that ship's wheel needs to be steering and turning. And, you know, as soon as we go around this cycle and develop a model, put it into operations, the first thing we need to do is be coming back to the users and working on the next version of the model. So it's a continuous cycle that is represented here. Next slide.

And, you know, it's an evolving thing, but this is just a snapshot of some of the models that we have right now. So, you know, VDatum has been a cornerstone of NOS modeling for a long time. These are our highest resolution models that represent the coastal features extremely well. The next three in the middle there are all real-time regularly operating models. So we have the Operational Forecast Systems, the OFS. We have 15 regional OFS around the country. And then STOFS is the Surge and Tide Operational Forecast System. It has two components. It has a 2D component that's focused on total water level forecasting, and then a 3D component that also captures kind of the vertical layering of current, salinity, and temperature. And then the last one, we've been working with the Hurricane Center on probabilistic information that we can capture in the models. So this is. a really important part of the portfolio moving forward is being able to capture probabilistic information that, you know, because there is so much uncertainty that is going into the models, and especially for hurricane systems. But in general, for all of our modeling, you know, we need to look towards, you know, that capability moving forward. But you'll see the same keywords, you know, throughout here, “navigation,” “mariners”. And then the collaboration, again, on the right, we're not developing these models in a silo. We're working across interagency efforts and also academia and industry as well. Next slide.

And then there are a lot of specialized products that come out of these efforts as well. So I wanted to highlight the marine channel forecasts. There's one in Tampa Bay and also in Mobile Bay. These are developed by CO-OPS but in coordination with the local weather offices, because as pilots come into a port, it's not just the model information that's really critical, it's really the ensemble of oceanographic and meteorological all being available seamlessly to the pilots. So the pilot can get information about the water levels from the models, but they can also see visibility and precipitation at all,

continuously as they come into a port. So really critical products that are coming out of the models as well here. Next slide.

And I'll hand it over to Greg here in a moment. But just a quick snapshot of, you know, the modeling systems, a visual look at what they look like. So the operational forecast systems I mentioned are in the left side there. Again, we have several of these systems. Some of these have data assimilation capabilities, like that West Coast model is a data assimilative model. And really great regional coverage provided by the OFS. And then the STOFS models are shown on the right. So in the lower right, we have that total water level model that's driven by the ADCIRT model. For STOFS 2D, that's a global system. And then the 3D component that's driven by the SCHISM model engine. So, yeah, as Steve mentioned, we just had a big milestone just a month ago, that that Pacific domain went into operations to complement the Atlantic and Gulf. And then Alaska is on the horizon as well in the near future. But the key with all of these models is high-fidelity focus on the coastal environment. So we pay particular attention to adding resolution in the near shore and representing those processes. But again, working across NOAA to make sure that we're integrating these models into the entire NOAA Earth system modeling portfolio. So, Greg, I'll hand it over to you here.

Dr. Greg Seroka: Thanks Ed, so next slide please. So my name is Greg Soroka. I'm part of this whole NOS modernization consolidation. So I'm a scientist in the Office of Coast Survey. So I'm leading a few projects, including the S-104 and S-111 effort, both at the International Hydrographic Organization (IHO) standards development with the international community, but also production of the data following the standards. So we have this IHO S-100 precision marine navigation. So this is just one important application of the modeling that we do. The main goal is translating the model output to ECDIS displays. So IMO mandates a transition to IHO S-100 standards from the traditional S-57 charts. So that is voluntary January of this year, in 2026, mandatory in January of 2029 for any new builds of electronic chart display and information systems, or ECDIS. And so we have these different layers. Ed touched upon it, but the S-101 ENC is the next generation core base layer for modern marine navigation. So Marine Chart Division at OCS is working on that transition. S-102, high resolution bathymetry, providing detailed seafloor depths with uncertainties and also provenance of the data. And so Coast Survey Development Lab is working on that. And then S-104 water levels at NOAA. So this is delivering standardized water level forecast guidance grids from STOFS-2D at NOAA reference to chart datum. That's critical to adjust the charted depths in real time. And I'll show an example of that toward the end. But for NOAA, it's mainly mean lower low water with the local datums and Great Lakes datums. So that's a critical effort using VDatum, for example, and the operational forecast systems.

S-111 surface currents is another focus at Coast Survey Development Lab. So we're providing gridded surface current velocity vector forecast guidance from STOFS-3D because we have the layering, as Ed mentioned. So for ship route planning, for example, fuel efficiency, as well as maneuvering, so avoiding hazards, for example, under keel clearance, overhead bridge clearance, et cetera. And then, also importantly, the S-412, so the weather wave warnings and then the series following that, including sea ice, S-411. So working with the National Weather Service, they're also developing the weather standards with WMO to display real-time weather hazard areas, for example. So that's a critical layer coming on. So next slide, please.

So the S-100 roadmap implementation, these are the specifications related to SOLAS or Safety Of Life At Sea navigation. So the S-100 products supporting IMO SOLAS Chapter 5 carriage requirements on nautical charts, publications, meteorological services and navigational and meteorological warnings. So we have a few phases, and so I'll talk about the phases here, and then the next slide I'll talk about the timeline for that. So Phase 1 is currently ongoing now, and this is the route monitoring mode. So I mentioned the S-101, 102, 104, and 111, as well as the navigational warnings with the Coast Guard and under keel clearance management, S-129. And the critical framework is the S-100, so the standard for the standards, that everything has to follow, as well as the things like the interoperability specifications. So how do all the different data products work together and are displayed on the navigation system, S-98? And we have the catalogs of catalogs, et cetera. So the route planning mode for Phase 2, we're adding different products here, so including, at the end, the S-411 Ice Information with WMO, S-412, Weather and Wave Hazards, as well with WMO, et cetera. That'll be ongoing in the next few years. And then Phase 3 is also route planning mode, where we're adding other various products, including the S-413, Marine Weather and Wave conditions, 414, Marine Weather and Wave Observations, and then 415, Marine Weather Synoptic. So these are all the various weather forecast products from the National Weather Service. How do we get this data into the navigation system effectively, as well as all the S-100 products used in monitoring mode? So right now all, the green with the check mark is the operational product specifications. And so we're working on these and focus here with IHO. So next slide please.

So this is the high-level timeline for the next several years. So this S-100 maintenance regime is to be approved by the IHO Council next month for inclusion in the S-100 roadmap. So this is recently revised. So in the green are the operational in force. Blue is available for testing and implementation. And then the orange is critical framework evolution. So this year, as mentioned, Phase 1 operational is S-101, 102, 104, 111, et cetera, and then the framework milestones with the interoperability, test data sets. Phase 2, selected operational, some of the product specifications there. And then some

in the blue is available for testing, S-125 and S412 et cetera. So and then the following year, we're adding aids to navigation, reaching the operational edition, and then selected Phase 2 and 3 available for testing, including Sea Ice, which is a critical product for us. And then the following year's core model evolution. So S-100 is currently in Edition 5 now, but that'll be updated to Edition 6. And then some other Phase 1 and 2 products will be coming online. So you can see that just this is all on the standards side. So working the IHO and WMO, with NOAA playing a critical role in this, we've led several parts of these efforts, including S-100. So talked about the standards, so the next slide we'll talk about some of the evolution of the products. So next slide, please.

So I'll talk about S-104 first and then S-111. So we've developed this S-104 water level prototype. And so this is for Edition 2 of S-104, using the water level forecast HDF5 files. That's the standard that we're using, as well as, S-102 is using HDF5 as well, from STOFS-2D Global. So we focused on Charleston as a key port for S-101, S-102, 104, and 111. The data sets are publicly available on the AWS S-3 bucket. And also, access is available through NowCoast. And so we've tailored the data sets to geospatially crop out individual tiles matching the NOAA OCS nautical product tiling scheme. So you see the snapshot on the bottom right of NowCoast. So we have the four prototype tiles in the certain display scale, and so the user can click on the tile. It shows some certain metadata associated with the S-104 data there. And then also, the user can get access to the data through the S-3 bucket and do some testing, including the ECDIS manufacturers, PPU manufacturers, et cetera. So you see on the top left, this is real S-101 ENC, S-102 bathymetry, and S-104 water level forecast data integrated together on an ECDIS. So OSI is a Canadian ECDIS manufacturer. So you see through time the safety contour changing and evolving with the tide coming in and out of the Port of Charleston. And so you have also the high resolution S-102 bathymetry producing that high-resolution safety contour. So it gives a dynamic picture to the mariner of what could be safe coming into port, for example. And then also the uncertainty is a key component, as we mentioned, so the user can click on and produce a PIC report and see the certain uncertainty associated with the different layers. Next slide, please.

The last slide. So S-111 surface current prototype. So we've developed a prototype S-111 in addition to surface current forecast HDF5 files from STOFS-3D Atlantic. And we'll work with STOFS-3D Pacific as well, moving forward. But, again, for Charleston, data sets available on the S-3 bucket will be available through NowCoast following the tiling scheme as with S-104 and 102 and 101.

So on the bottom, you see this is a real S-111 and S-101 displayed on the Navy NIWC ShoreECDIS, which is publicly available. So you can see the current vectors, and this also changes with time. So with S-111, we're able to use the unstructured raw model

grid to produce high resolution where it's needed. And also the uncertainty is associated with that. So for future S-104,111 production, developing production code, operational workflow, including we're using AI to develop the code for this. So that's ongoing effort, and then create the S-104 and S-111 data sets in real time for top U.S. ports for testing and evaluation. So you see some of the key ports here, depicted here in the image. So next slide, I think it's just a thank you. So I appreciate the time. Thank you.

Mr. Nathan Wardwell: Yeah, let's see. So we have about 15 minutes, I believe, for some questions. Anuj, why don't you go right ahead?

Captain Anuj Chopra: Sure, thank you. And congratulations. I think we've been missing this, the AI piece, the ML piece, what you laid out the roadmap. So congratulations and wish your team a success and speedy, as fast as possible. I think what Dr. Qassim said, maybe going to contractors who already have developed capability, will give you a shot in the arm to be even faster.

My question was specific to your models. What is the retrain frequency on these models? Because what you're modeling and what really gets observed, there's a delta there. So how does that retrain work? And especially where the models go, what you're doing, is a retrain possible during a cycle or the cycle full has to be completed before? So something on retraining of models, if you can shed some light, be very grateful.

Dr. Stephan Smith: I guess I'll start and then hand to Ed or Greg. So the retraining would be more applicable in an AI kind of mode, but historically, these models, atmospheric or oceanic, have undergone upgrades over, I would say course of years, given resources because they are complicated and difficult to apply new, require a lot of testing and making sure that they meet the requirements upon finishing the upgrade. So it's not been speedy for sure. And some of the models that NOS has in place haven't had a refresh in many years, right? Therefore, they're being euthanized. So but the whole goal, or one of the goals into this modernized framework in the cloud is to apply, you know, CI/CD agile techniques, automated testing to dramatically increase the frequency. We've historically done major, I would call like, quantum leap type of improvements. So the model stays stable for multiple years, and then there's a huge enhancement, usually anchored on one piece in the data simulation, a new data simulation thing, or changing either the hydrodynamic core or the dynamic core on the atmospheric side. And because the models are interdependent, the regression testing required downstream, so the water model is dependent on the precip coming from the atmospheric model is dependent on the head of the tide and the rivers and all of that thing, so it's complicated. And it has been difficult to maintain and complex. So I think our goal would be to go from, you know, a 5-year upgrade to something like a yearly. But private industry, when it comes to development, are doing, you know, daily

upgrades to their, you know, whatever their system or whatever they're modeling. So it seems almost too, a dream that is there but we haven't experienced it yet. On top of all of this, is the, you know, the Weather Service runs this supercomputer on behalf of all of NOAA, and they're adopting and adapting these techniques. It's still to be determined when, but it's being basically driven by the move to the cloud. So we're going to see, I think, one way or another in the next year or so how well that goes and how quickly we can change the culture because the culture is as important as the technology here of being able to, I guess, accept more risk and through frequent updates and upgrades and bug fixes, right? A lot of what happens in the space is, "Well, we found an error in the code and we want to fix it." And the result is we get a better forecast either for the ocean or the atmosphere. Ed, do you want to elaborate on?

Dr. Ed Myers: Yeah, I think you captured it well. The whole key moving forward is to be adaptive. And we need to be able to use CI/CD to make sure that we can constantly upgrade the models and look at a better cadence for upgrading the models. But also, how we save the information is also really critical. So we want to make the results available to AI machine learning that can be trained on the model outputs, both the real-time outputs and also hindcast simulations that we can do. So that's a really key area that we need to pay attention to as well. I don't know, Greg, did you?

Dr. Greg Seroka: Yeah, just quick. So right now, we also have data assimilation in a couple of the models. So it's kind of like retrain the initial conditions of the models based on the observations. And then yesterday the AI, Neurocast, that was mentioned, just a little more detail. So that's a bias correction approach. So the model runs and then the AI, actually machine learning is running on, retrained on the data, the observation and corrects the bias in the forecast. And so that's a static training, but we're working on kind of like an online training. So when they have new data from the forecast and also the observations, then it can be retrained. So I think AI can be harnessed in that fashion as well for retraining the models.

Captain Anuj Chopra: Thank you. All I can share with you is, in the private industry, we're using agile methodology and not waiting for big changes but incremental changes so that it can be done more frequently. And then the tectonic shift is not there. The tectonic shift is much smaller; the risk is much smaller, but it's incremental and more up to date, if I may say that term, because technology is changing continuously. So all those can be then incorporated. And we found a huge success in that space, you know. Thank you, thank you so much.

Mr. Nathan Wardwell: Great, thank you very much. Tuba, you have a question? Why don't you go ahead.

Dr. Tuba Özkan-Haller: Yes, I'll preface my comments by just sharing with you all that--Tuba, Oregon State University, where I serve as Dean of one of the colleges. But before I was in this administrative role, you know, my area of expertise is in coastal modeling--waves, circulation currents, specifically applied to the Columbia River system in Oregon and Washington, but also elsewhere. So I am familiar with some of these conversations, worked a lot with NSF, with the National Weather Service to transition things to you all. And my comment is really related to something that Dr. Smith said regarding artificial intelligence, how Navier-Stokes equations are really sort of the driver here and that it's a dream to have AI replace that. And quite frankly, that's what I used to think. But that thinking has really been challenged in the recent past, specifically through my interactions with an Earth system modeling group that has been very active within Nvidia, you know, the hardware company Nvidia. They are, you know, a relatively large Earth system modeling group. And they are really trying to use AI to build a climate model for the Earth system. And their scientists in my interactions have tried to convince me and have had some really, you know, arguments that are hard to argue with, that AI is smart enough to learn the Navier-Stokes equations, that we can actually use AI in ways to surface new physical relationships that we might not be aware of right now. And that in itself is both a scary but also a really promising premise. And so I guess I urge you to not be constrained in your thinking of how AI or machine learning could be used. Certainly, bias correction is one, and I certainly, I myself have shown that that kind of methodology is useful for bias correction. And certainly, what I'm saying should be amplified in those ways, having said it multiple times here with the microphone feedback that's going on. And I guess I want to just add to what Anuj was saying. We really should challenge ourselves to think very broadly about what these tools can do-- challenge them, validate them, yes. But in a world where AI can actually show us new physics, that could be a mode of discovery that we really haven't dreamt of yet at all. Let's be open to it.

Dr. Stephan Smith: Yeah, let me respond. So thanks for that comment. And I guess it's not surprising that with the explosion of AI, we've initially focused, how can we use it for our traditional problems, right? Which is predicting the atmosphere and the ocean in three dimensions in the future state. But I have wondered to myself, is that really the best use? My understanding from early on is that what AI has potential to do is to, as you say, expose things that had, through the various approaches that we had not considered, radically different ways going from like, how does this data result in, you know, maybe what humans do in predicting, go straight to the end result almost, right? And so I take your comments very wholeheartedly and agree with you. But it's interesting, the initial thrust is, how can AI be better than our traditional models? And how can it make money? And how can--? You know, it's an arms race on an old

problem. And what you're alluding to, I think, is the new frontier. And we would be really well served by pursuing that in, you know, very, I would say, exploratory, more basic kind of research than the applied side almost. So thank you.

Mr. Nathan Wardwell: Oh, yeah, Captain Armstrong, please go ahead.

Captain Andrew Armstrong: Thanks. You mentioned, Ed, the value of data assimilation. So my question is, how do we do that? We have ships and boats and observation platforms out there in the sea all the time. We collect data. How do we get that into these models in some useful way that's not just a bunch of noise in the system?

Dr. Ed Myers: Yeah, that's an excellent point. Because, yeah, with all the ships, you know, collecting bathymetry and so forth, surveys, there's an excellent opportunity to have that data be used by the models as well. We've historically been constrained by, you know, any data that's used by the models needs to be, you know, on the operational computer. So there's a whole process of getting the data onto that system. But it is something that we need to really focus on because it is, you know, we're losing opportunity if we're not, you know, accessing data that could easily be incorporated into the model. So, and data assimilation is such a, it's a complex process. But it's something that NOS, we're giving a lot of attention to and moving forward. So yeah, we definitely appreciate the opportunity to,

yeah, especially ship data that can be incorporated into models.

Captain Andy Armstrong: Right, and I'm particularly thinking of things like salinity, temperature, depth cast, not so much the outcome bathymetry, but the sort of things we take that we would like the model to be able to do for us but we'll take it as we need to. So those are the kind of things that, those observations of the water mass that seemed like would be most useful in the short term.

Dr. Ed Myers: Yeah, definitely, yeah, yeah. Yes, it's definitely a need that we need to address. And because, yeah, like I said, it's having all the ships out there collecting data, we need a better streamlined approach to getting that into the models.

Dr. Stephan Smith: Yeah, I was recently down in the Gulf for a meeting and there were some representatives from Chevron and Shell describing the instrumentation on the rigs, and it's oceanic and atmospheric instrumentation 24/7. So the Gulf is really the best observed ocean space on the planet. And are we making the best advantage of all those observations just on the rigs and the ships and the drones and so forth? And the answer is "no." But to exploit that, in a way, would require commitment, maybe NOAA isn't in the best position to do that, to work with. And the private sector folks are willing

to share the data. But it would take an effort to get that going. How serious are we about that? But it seems like an ideal laboratory to study a lot of what we're talking about.

Mr. Nathan Wardwell: We are a little past noon. But Captain Kurtz has a question here. I'd like her to get an opportunity in since this is our last day in person. And then I have a comment at the end, too. So why don't you please go ahead.

Captain Carolyn Kurtz: Thanks, Nathan. Yeah, I think this will probably be pretty quick. I worked in Tampa for many years, so I'm a huge fan of the Marine Channels Forecast. So thank you for that. But I also noticed that it's still only operational in two PORTS, and with 41 PORTS installations, I'm curious why that hasn't been expanded to other PORTS systems. And so, is it a cost issue or a lack of interest or maybe some places they don't see the value? But honestly, like I've made a lot of go/no go decisions based on that forecasting tool.

Dr. Ed Myers: I'll defer to Marian on that.

Dr. Marian Westley: I would say it's a cost and a partnership challenge. So we had a terrific partnership with the Tampa Bay WFO that started that first one. We had a second terrific partnership with the Mobile WFO that started the second one. We are, we have a strategy that we've co-written with the Weather Service to take these to more PORTS. So we have all the pieces in place where the Weather Service is undergoing transition at the moment. We're undergoing some transition at the moment, so we haven't pulled the trigger. But we're certainly planning to do more as we can.

Mr. Nathan Wardwell: All right, great, thank you. That was an amazing presentation, all the modeling efforts that go on kind of blows my mind, really. The Alaska Ocean Observing System used GNSS interferometric reflectometry to measure water levels along the North Slope of Alaska and tracked a storm surge that went a few hundred miles in coordination with the water levels from an NWLON station and, you know, with it being still considered a bit of an emerging technology, we used data from some of the models that I believe your team is working on, along with Notre Dame, and showing, hey, model agreement between the reflectometry results and what the model is showing. And so it's, you know, it's regional. It's not national, but like, it was amazing to see great agreement. And then not only that, it's not just a regional model, it's a global model, right? And so very impressive. Thank you very much for the contribution today. So how about another round of applause for the-- {applause}

Okay, well, that wraps up our morning session for the most part. We have a couple additions. So Kim Holtz, I believe, is online. And so I'd like to give her an opportunity to provide some comments. And then also we did receive a couple public comments after the public comment session, and so we'd like to get those on record while we have the

opportunity to. Oh, Kim dropped off. Okay. Well, we'll try to catch her next time. And so, who was? Robin? Okay, great. Thank you very much, Robin.

Robin Czeidinski: Thank you, Nathan. Yes, we have received two additional public comments. I'll now read into the record. The first is from Mr. David Gelinas. He said, “It appears that New York IOOS did receive continued funding this year. However, it seems that keeping the real-time ocean data buoys fully funded is a chronic problem. Our input to NOAA and NOS would be that we need certainty for the future of the system and the real-time data and forecast inputs which they give us. Thank you for looking out for Maine's waters.”

And the second public comment we received is from Mr. Chris Paternostro. He says, “I am the founder of a startup, Mesoflow, that relies on the great data and forecasts NOAA produces. A couple of comments made during yesterday's closing were concerning to me. Someone mentioned that NOAA is expecting a decade of decreased funding. Decreasing funding for NOAA will decrease the quantity and accuracy of NOAA's products, which trickles down to a decrease in the tools and consultancy that the private sector can provide. Decreasing the funding of NOAA directly results in a decrease in the commerce of America. The idea that any organization can, quote, do more with less is a well-phrased ignorant adage in government. All logic and business knows that that's not possible, especially during times of change. If you want to change into a more efficient organization and build optimizations in the future, that requires present-day funding.

In June, during Capitol Hill Ocean Week, for the second year in a row, a group of university students ran a 50-hour weather and climate livestream titled, ‘50 Hours to Save America's Forecasts, Weather, and Climate.’ They did this to bring awareness to NOAA's, NASA's, and USGS's data and forecasts that they require to study and make a career in the earth sciences. It ended with a student walking from New York City to Capitol Hill to deliver hundreds of letters of support for increased funding for these agencies. Please do more than these students and press NOAA leadership, DOC, and Congress for increased funding of NOAA.”

Mr. Nathan Wardwell: Great, thank you very much for reading those. It’s awesome to get additional public comments. This is the platform to do it. So it also means people are listening online. So that’s another benefit there. So I believe, so yeah, we’re going to roll into lunch, which started 8 minutes ago. Hopefully we didn't miss it. But after lunch, we're going to start our working group session. So panelists kind of just be prepared for, again, to provide your reflections and thoughts of the combined day and a half that we've had so far. And, you know, again, having that lens of, you know, the challenge put on by the Rear Admiral here thinking forward, the history that we got from John

Rayfield, and then, you know, how we're formulating that into our recommendation letter to the Administrator. So thank you very much and let's enjoy some lunch.

LUNCH BREAK

Rear Admiral Chris van Westendorp: All right, we are just about ready to get going. So please take your seats if you haven't already done so. Lunch service is over.

Mr. Nathan Wardwell: All right, well, let's go ahead and get started. We had a couple more people still trickling in here. We had a good, productive working lunch. And so, all right, well, welcome back. If anybody's still online, I'm going to go ahead and pass the baton over to Vice Chair Eric Peace, and he's going to go ahead and run the working group session. Go ahead and take it away, Eric.

Mr. Eric Peace: Thank you, Nathan. First order of business is to call a vote on the voting procedures the panel members have discussed over the past year. It was provided again in advance of this meeting. Members should have a copy of the voting procedures as well as the discussion of the vote. Has everyone had a chance to look? Have all the members had an opportunity to review the procedures? Anybody not have an opportunity to review the procedures? Great, okay. I'd like to also note that Qassim did a lot of work on this, and it's greatly appreciated. Thank you, sir.

And we'll proceed with calling the vote then. Per the bylaws, we will vote raising hands, where we need two thirds in favor to pass a motion. Votes will be recorded by the HSRP support team. So those in favor of adopting the voting procedures for the HSP {sic} Chair and Vice Chair raise your hand keep them raised for the record please. I think, for the record, we have everybody in favor. No opposed? Okay, the results are: all in favor, and the motion is approved.

Dr. Dan Roman: And I'm {indecipherable}. That should take effect immediately. So that would mean that December would be the next vote for the Chair and Vice Chair.

Mr. Eric Peace: Great, okay.

Mr. Nathan Wardwell: I just want to echo, Qassim, thank you very much for putting all the work in. I know you did put a lot of work in, so that was great, something I think that will really help the panel going forward. It was maybe a missing component that we had, so thank you.

Mr. Eric Peace: Now I'll hand it over to-- I'm sorry, go ahead, Tuba.

Dr. Tuba Özkan-Haller: Eric, so if December is the vote, then looking at this timeline here, 45 days before the election. So it's very soon, then, that folks would have to either self-nominate or nominate others.

Mr. Eric Peace: That's correct. So you have 45 days before, and we don't have an actual December day, but usually it's held probably beginning to middle of December for the meeting. So you need to have 45 days for the nomination, and then there was another date of 21 days, I believe, if I remember correctly. But 45 days is the long pole in the tent right now for the election meeting.

Dr. Tuba Özkan-Haller: So Qassim and I and Anuj spoke about this earlier, and we'll do a Google form that will go out to everybody in advance so that you can put in your nominations or your recommendations for Chair and Vice Chair through that. From there, we'll have further email communications, and then we'll vote at the public meeting.

Mr. Eric Peace: I already nominated Sean Duffy, so--

Dr. Tuba Özkan-Haller: Which one?

Mr. Nathan Wardwell: Which one?

Mr. Eric Peace: All right, now I'm going to turn it over to Mary Paige to go over the priority matrix, which I know she's been working on quite heavily lately.

Ms. Mary Paige Abbott: So the priority matrix, I know everybody reads this every evening, and it's forefront on your first thoughts when you get up every morning. So the thing is, is the matrix is a work in progress. It’s not stagnant. It is a living document, in other words. So the point is that we all have input for that. And one of the things with inheriting a matrix or any type of information like that, it's a learning experience as well as, just because you've done it before doesn't mean you have to keep doing it. or the same way. So you all, and I want to thank you, participated in a survey to prioritize and to look at the matrix as to, is this relevant to today? Do these topics serve today? Do we need to be involved in this or is our time better spent? And the vast majority of you came back with, or not the vast majority, everybody who worked with the matrix had input as well as the priority matrix order of importance per the survey was precision navigation, data for underserved communities and coastal resilience were tied in the sense of the three, those three were our priority. And after that came metadata standardization, and workforce development. After that came communications and outreach. Number four was emergency response; number five was sustainability; and number six was offshore wind. So we got our marching papers from ourselves. That being said, for the next 2 years, the topics that this illustrious group would like to focus on are precision navigation as number one, number two, data for underserved communities and coastal resilience. Those are combined or tied, let's say. Number three is workforce development. Number four is the metadata standardization, emergency response, communications outreach, and then lastly, offshore wind and sustainability.

We did have input. Because there was an opportunity for all of us to input new ideas. And those included new technology and systems. That's interesting. These are words we all heard yesterday and today. So we're not creating anything new or hitting the group with new out of the, well off the page, not even out of the box items. Another area was survey backlogs and efficiencies, meaning the backlog of navigational significant waters and leveraging technology to increase mapping efficiency. I think we heard that. Navigation tools and data, again, these are things that we are listening to, we need to prioritize. And national strategies, which are focusing on national and regional mapping strategies, NSRS modernization, NTD updates, and then other areas like deep sea minerals should also be considered for discussion. So these are all areas that help also define this meeting. So our input is valid and it's verified in here. So what we will do after, and I just lost it, after, we're going to have a breakout session, which will allow all of us to speak freely and to get some work done. And that will be on the top issue papers requiring urgent updates that we, again, prioritized.

Or we said that there are issue papers out there that, there are one and done as well as there are others that need to be revisited. And those, there are four of them. And I believe all of us have raised our hand or been assigned to one of the issue papers to offer your expertise or your input to help progress this into an update. One of them is automation and AI. Another one is precision navigation. Another is the Arctic: charting the maritime Arctic. And lastly, PORTS: critical data for decision making. So those four are going to be part of a breakout session after we close this meeting. So please do not dash out of here quickly as soon as the meeting is called to order.

And last but not least, to reinforce what Amanda mentioned, has to do with our next meeting, which we're looking at two dates in the month of May. One would be the, would it be a Monday, Tuesday again, Amanda? No idea. Sometime during the week of May the 3rd, which May the 5th, for those of Hispanic heritage, is Cinco de Mayo. So you could have some great fun around that. Or the week of May the 10th. And Mother's Day is the Sunday, May the 9th. Just keep that in mind because for some people that's critical. So just be aware that those are the two weeks at which we're looking and we're also looking at the location in St. Petersburg, Florida. That's all for me at this point in time. Would you like me to go any further? Yes, ma'am, Tuba.

Dr. Tuba Özkan-Haller: I have a question. Mary Paige, can you refresh my memory about the relationship between the priorities in the matrix and the issue papers? I see that some topics are represented in both lists and other topics are not.

Ms. Mary Paige Abbott: The issue papers generated from the matrix and the priorities from the standpoint of areas in which-- and please, this is my observation and mine can be a little non-technical-- so it, they became the papers from which we said (“we” being

a part of the HSRP) need to be expanded on and our Department of Commerce head should be, (whomever that was at the time) needs to pay attention to this. I remember one on recreational boating. And I could literally go through that and check off, recently, that these things have been done. So reading those papers, it's like, and, is there a need to update that paper? And that's where we looked at those from the standpoint of the issue paper. It was critical at that point in time. Does it remain so?

The priorities matrix is one of we take, we've extracted the data from these meetings and said, “All right, this was presented to us as a group. Let's not forget that it was presented to us. And where do we stand on it? We said we would do some follow-up or we would not do follow-up.” Hence, you know, are you following up? And it's a way to allow each of us to review that information and go, “That's not how I remember it,” or, “Oops, I forgot that I was supposed to do that,” or, “That's going to be a focal point and we need to at our next face-to-face or at our next telephone working group meeting, that needs to be brought and either furthered or updated and dismissed or updated and continued.” Does that make sense?

And recommendation letter, I think, is that to be done? I hand that off to Eric.

Mr. Eric Peace: Well, first of all, let me see if Anuj or Qassim had anything to add from the technology working group.

Dr. Qassim Abdullah: I can comment here. The technology group is three of us: Anuj, Deanne, and myself. So I'm losing two of them. I'm going to need more. So thank you both for your service. Great contribution. We have some of the issue paper going to fall under our jurisdiction, like the precision navigation. We're going to have to follow up on it, to update the old one or publish a new one. Mary Paige listed that and it could be another topic we can take on as a technology group. But I really need some members to volunteer to help with the work. Thank you, that's all. Anuj, do you have anything?

Captain Anuj Chopra: Sure, thank you. I was going to say the PORTS paper has been revised, that 2017 or 2018 paper. I did circulate it with all of you. I believe it's sitting in the common folder with a clean version. So I'm hoping that today afternoon we can firm that up, that wording and get that out of the door. That is the current work which has been done. And of course, we've sort of put a couple of comments on for the letter to the Administrator as some pointers to be included. And I don't know, Mary Paige, have you started working on that letter yet or? Are you assimilating it, or is?

Mr. Nathan Wardwell: That'll be me. I'll work on assembling that.

Captain Anuj Chopra: Thank you, sir.

Mr. Nathan Wardwell: And we'll have some time here. We'll do another round the table, you know, reflections and recommendations.

Mr. Eric Peace: So I think that concludes the discussion on that unless anybody else has any comments. Go ahead, Deanne.

Ms. Deanne Hargrave: Just one thing about the technology working group. In recent years, you know, primarily because of Qassim and Anuj's interests and the high focus on precision navigation, the technology group was very focused on that because it was a large topic and, you know, there's only so that the members can do. Some of the earlier ideas about, the technology working group was talking about new technologies and championing technology as it interfaces with the HSRP. I think that was a little bit where I fit in and when we had, you know, Ed Sathi and-- blanking on Ed Sathi's sidekick—anyway--

Captain Anuj Chopra: Julie.

Ms. Deanne Hargrave: Well, Julie. You know, there was there was a lot of focus there. So, you know, definitely looking for somebody to, I think, continue with that focus as well as we go forward.

Mr. Eric Peace: Yeah, definitely AI is part of that, I would assume. Any other discussion on the priority matrix or anything that Mary Paige had to mention there. Anuj?

Captain Anuj Chopra: I was just going to say, although I'm stepping out, I'm willing to work or contribute to the AI group, if required, having worked in that space, just to support you to get it out of the door. If it goes beyond December, even then, it shouldn't be a problem.

Mr. Eric Peace: We'll still pay you. With that, I think we can move on to Admiral, please. Actually, that was covered, okay,

Mr. Nathan Wardwell: Is there any other discussion about the dates that you wanted to have? Or was it just getting the dates out there for the next meeting?

Ms. Amanda Phelps: Does anybody have conflicts with those dates, or are there other meetings or events that are happening? You've got a conflict. Work?

Captain Alex Cruz {no mic}: Either May 4th or after the 15th. May 4th, May 3rd, or after the 15th.

Dr. Qassim Abdullah: Even virtually?

Captain Alex Cruz: {nods}

Ms. Amanda Phelps: Did you raise your hand? No. Okay.

Captain Carolyn Kurtz: When do you all feel like you're going to make the decision? I'm putting a hold.

Ms. Amanda Phelps: I'm going to probably take tomorrow as a breather day. And then I'm going to check back in with the contract to see if we can get that going right away because I would like to lock those dates in now so you all can plan accordingly. And then we can get the best hotel space available and start planning everything. As soon as we can, I'd like to get that locked in.

Mr. Nathan Wardwell: I have a conflict with May 3rd, that first week in May. The second week works for me.

Ms. Amanda Phelps: We'll check with Rebecca and Nicole and Kim and Jeanne.

Mr. Nathan Wardwell: And Jeanne, yes, yes, very good. What about future? In the past, we've had a list of locations, right? Let's keep it rolling. We're in person. Let's keep going.

Ms. Amanda Phelps: We have the list. Virginia and I were talking about this here the other day. We need to take another look at that list. And I'd like to be able to do that at one of the planning and engagement working group meetings.

Mr. Nathan Wardwell: Okay, great.

Ms. Amanda Phelps: We can take a look and see, rearrange the schedules and make sure that we're hitting your guys' regions. We want to be in the places that you guys are at and the stakeholders that you work with on a regular basis.

Mr. Nathan Wardwell: Yeah, because we would historically have two public meetings a year. And then there was conversations about one of those being in D.C. budget constraint- wise and the other one in another region. Are those still the conversations, or is it, any input there?

Rear Admiral Chris van Westendorp: At the moment, I would say I'm open to constructive input on that. As Rachael discussed this morning, annual budget planning. However, I know that this federal advisory committee is supported at the senior leadership level, so there. Take that non-answer as you will.

Mr. Nathan Wardwell: I'll take it and just follow it up with, I mean, I'll provide my input on and open it up to anyone else. But, you know, the, going to the different regions and getting that stakeholder input has been very valuable, at least for my, for me on the panel to get that input, both to understand the regional challenges and then

communicate that to like, “Hey these are connections between all of the different regions,” right? And that would fit well within, you know, this charge that you're assigning us. There is great value with having an opportunity to meet here in D.C. And so I definitely don't want to lose that opportunity on both standpoints.

All right, so that takes us into the round robin for kind of the wrap-up. We're almost finishing up here the in-person part for the public meeting, for our fall meeting. We'll go ahead and go around the room with any closing comments before we wrap up. Again, you know, keep in mind this is a recommendation letter that we're putting together after this. And so we'll, you know, there'll be a process of pulling that letter together after this meeting so we can get it out. And it'll be based on the collective input from the panel. So we are going to start in reverse alphabetical order which, Jay, that brings you up first. So I'll go ahead and pass it over to you.

Mr. Jay Satalich: Thank you. I don't have much else to add other than what I said this morning. It was a great first meeting for me. So thank you all very much. And, Qassim, I'd love to be on your working group. So I'll volunteer for that. And then I'll save the rest of my comments for afterwards.

Mr. Nathan Wardwell: Okay, thank you for that, Jay. And we, I mean, we have about, what do we got? We got till 2:30. So we have about 45 minutes for this round table, just to kind of give everybody an idea. So is Rebecca online? Okay, great, Rebecca, why don't you go ahead when you get a chance?

Ms. Rebecca Quintal: I’m struggling with the two buttons, the camera and the mute. Yeah, I was trying to come off mute, and you guys, I potentially have a conflict with both of those weeks due to my daughter's college graduation and a planned family trip that straddles both of those. So that will be a bummer. And I really was disappointed when I wasn't able to attend in person this time as well. It was a last minute that I wasn't able to go.

Yeah, I just, as far as comments go, I mean, I really enjoyed the panels. And there's a lot thrown at you. It's hard to digest everything, trying to read the slides and hear what they're saying. And there's a lot of effort that goes into these meetings. So definitely appreciate that. I haven't done anything yet with it, but said that would be on the AI panel. I also use AI in my professional life and we have developing products as well as just using it to get our work done. I saw the notice of when it is. I'll have to drop out in the middle of that, but I can join back up if it's still ongoing, the Google meeting later today for that. That's it for me.

Mr. Nathan Wardwell: Thank you very much, Rebecca. Appreciate you calling in virtually and getting the opportunity to attend today. Tuba, why don't you go ahead. You're up next.

Dr. Tuba Özkan-Haller: Thank you.

Mr. Nathan Wardwell: Sorry to startle you there.

Dr. Tuba Özkan-Haller: Oh, no. I should be paying attention. So the two panel discussions this morning, again, very informative, chock full of great information. And I want to thank everybody, the mapping mission session, as well as the modeling session. The modeling session is near and dear to my heart. I learned a lot. I really appreciated the technical detail you all went to. And I want to commend you. And maybe this can be part of our letter to the Administrator. This is important and timely work that you all are doing, and it will benefit NOAA's efficiency. But also just the consulting companies that are using all of these tools and models will benefit from this as well. And having a unified framework, there's just so much to be said for that. So I just, you know, if there is any wind I can provide beneath your wings or in your sails, I'm here for it. I also want to comment on another topic that we've talked more about at this meeting than any other meeting previous, and that's critical minerals. I want to tell you a little bit of a story of, you know, a year and a half ago now, we had a critical minerals symposium that we organized at OSU. And 120 participants, half of them from industry, and we had a faculty member from the Colorado School of Mines give a keynote address. It is recorded, and I'm happy to provide you with the recording. Even if you just watch the first 10 minutes of it, it really, and Rebecca mentioned this too, geology, right? She described, you know, mining practices in places where these critical minerals are being mined and processed today, right? And they're in your phones, they're in your electronics, all over your home. And some of these mining practices are just absolutely horrendous. And it is one Earth. The way in which these minerals are mined elsewhere on Earth is impacting our quality of life on this side of the Earth as well. And so I just, again, want to provide that as a backdrop for motivating this work. It is difficult work. Andy talked to us about how difficult it is to really characterize these deposits. But I think it's really important work and science needs to be at the table when this work is happening so that we can figure out how to go forward in this space in the least disruptive manner possible for Mother Earth and for life as we know it. So again, there too, I'd just like to provide a little bit of wind in your sails as you're doing this work, I think it's timely and important. And, again, you know, if we want to include a commendation to this in the Administrator's letter, I would be supportive.

Mr. Nathan Wardwell: Great. Thank you, Tuba. Kate, you are up next.

Ms. Kate Mickelson: Thank you very much. I thought, again, like everyone before me has said, I don't have a lot to add. But I do really think that today's presentations and panelists were wonderful. Hearing about ocean and Great Lakes mapping is not something I had a lot of familiarity with before being in the room. And so I was really grateful to learn more about that. And then the modeling and modernization, on the other hand, is something that I've been working with and talking with my colleagues about for a very long time. And so to go from one to the other was really nice. I really enjoyed Mr. Scott's geodesy video. Thank you so much for bringing that up. It was a nice contrast to go from talking about the geodesy crisis to something that is really engaging and will be a wonderful tool. And to hear everyone's good cheers while we were listening to it and great ideas was really inspiring also. So I know workforce development is also something that is near and dear to all of our hearts as we work towards meeting the missions here. So thank you very much. This has been a wonderful first in-person meeting for me, and I'm really grateful to all of you.

Mr. Nathan Wardwell: Great, thank you very much, Kate. Captain Kurtz, I believe you are next.

Captain Carolyn Kurtz: So once again, mirroring some of the comments, I can't overstate the importance and pleasure of having an in-person meeting. I've been on the panel for 2 years, and this is my first in-person opportunity. And the conversations at meals and outside of the room have just really been so valuable to me personally, learning more and in a less formal setting. So I really do appreciate that. The two things, and also I loved the panels today. Like, that almost goes without saying, the panels were amazing.

The two things I have written down that were my biggest takeaways of the day were funding and agency cooperation. So again, everyone's mentioning it, so important, continued proper funding for the products and services that we all rely upon, whether you're a mariner or doing much bigger global sorts of things. It's the same measuring devices and the data gets used differently. So regardless of mission, it's just so important to have access to all of that data. And then the interagency cooperation, you know, you can't do anything by yourself. You can't do anything in a vacuum. So that's just so important. And it's really encouraging to hear because I feel like there have been so many failures of various organizations and lack of communication about important things because agencies don't cooperate with each other. So the fact that, you know, we have a CMTS, you know, that just, it's great. And it's really good to see that that's being participated in to solve problems. So I am enthusiastic and optimistic about the future. And I look forward to getting that PORTS paper out this afternoon. Anuj did a great job revising that. And actually, Jeanne, who's not here today, had sent quite an interesting

commentary to incorporate in that. So I think that's going to be a good product. So thank you very much.

Mr. Nathan Wardwell: I love hearing enthusiasm. Awesome. I don't believe Kim is online. So Deanne, you are up next.

Ms. Deanne Hargrave: Well, the sessions this afternoon, or this morning were really fantastic. And I feel like I lobbed a softball, I guess, with my question this morning because it was fully addressed during the mapping session. So that was amazing. But it was also very eye-opening hearing some of the statistics. I guess I'm a numbers person at heart. You know, 2% per year of 9.9 million miles, that sticks with me. It puts things in a different perspective. And then when you think about trying to plan your mission around an annual budget and the uncertainty that's associated with that, that's daunting. So really the, kudos to NOAA for your success within those constraints. That's a very difficult playing field.

One other thing I'd like to mention that we've talked about in some prior sessions, I didn't hear today, is bringing in younger membership or member perspectives. And we've struggled with that in the past. And I think there were good reasons for that because we're kind of brought here to bring experience to the table. So maybe there's a creative way that younger membership can be brought in. I'm not sure what that looks like, but maybe in a non-voting way.

And lastly, I'd like to say, you know, this is my last public meeting. We'll be working on papers and things until the end of the year, right, Anuj? But just it's been an incredible experience, I would say highlight of my career. And, you know, every time I come here, I'm just like, “Wow, I'm sitting here at this table with these folks, and having these conversations is really amazing.” Huge thanks to NOAA staff over all the years of just making this possible, to NOAA leadership and to fellow panel members over the years. Thank you very much.

Mr. Nathan Wardwell: Great. Thank you, Deanne. Is Dr. Elko online?

Dr. Nicole Elko: Yes, I am.

Mr. Nathan Wardwell: Okay, great. Go ahead, Nicole.

Dr. Nicole Elko: Good afternoon, everyone. So yes, another kind of senior HSRP person now, I guess. And I've been thinking a lot about the Admiral's challenge to us this morning about thinking across NOAA's mission areas from the perspective of our own areas of expertise. And I was trained well by Admiral Evans, right? To like, remember what y'all say at the beginning and then talk about it at the end. So thank you for that.

And when I think about the panels today and kind of, you know, my area of coastal resilience, I typically see it and I feel like the other panel members have this same reaction. We know that, for me, for example, all of NOAA's offices and the big maze of departments are providing services for coastal resilience. We talked about it. Obviously, Marian's work in water level, that's an easy linkage. But the coastal mapping, right, the topobathy work, Digital Coast, everything that NGS does. Mike Aslaksen was really good at this, about kind of like pulling it all together and telling that story. And then all the other parts of NOAA that touch on coastal resilience. So I think that's my perspective. I think the other panel members similarly see the linkages of their own fields and area of expertise.

So I think it's our job to encourage you to kind of like step away from the putting out the fire, addressing the mission every single moment of every single day. And I know you have to do that and you're asked to do more with less. But I think it's really important for us to help tell the story for you of just how much your work is helping the rest of NOAA, right? This piece of data that I'm collecting is meeting many NOAA missions and many other agencies' missions. So documenting and communicating that, I think, is just something that we don't, it's not in our job description. But without it, we're not justifying our work. We're not showing that economic benefit or impact of what we do. So I would love to help with that some more.

And my final comment is related to the critical minerals discussion. We are deep in that world at ASBPA trying to figure out how it affects coastal resilience. One of the things that we've recognized in our communications with agencies (we work with BOEM a lot directly on this one) is a lot of sediment is going to be required over the next decades as we adapt to sea level rise, and in ways that we haven't thought of using it before. Like raising entire communities is probably a good example of one. And the critical sands area, for example, off of Virginia that was mentioned is one that we're really tracking closely and providing a lot of public comment on because once the minerals are extracted, the byproduct or the waste is probably beneficially reusable sediment. So sediment, is something that I challenged the panel with at my very first meeting, that NOAA doesn't think about sediment enough. And so I will leave with that same challenge of, let's remember that you really are very crucially important in mapping the sediment that is necessary for the future of coastal resilience. Thank you all for all that you do.

Mr. Nathan Wardwell: Great, thank you very much for that, Nicole. Captain Cruz, you're up next.

Captain Alex Cruz: Good afternoon again. It's been great being here and seeing you all in person. It makes a big difference instead of doing a virtual meeting.

Two points, a couple of points I got from the today's panels. It's good to know about the modernization of the fleet and the planning. And it's always good for the NOAA staff to keep us posted on the situation and how it's progressing and so on. It just happened, I was talking to a friend today, he does MAM modeling training for NOAA Corps officers. And they tell me that they got the model of the ships already for training. So that's good to know that that's progressing. It's an eye-opening of the challenge of the mapping of the coast and the 9.2 whatever million miles of coast that has to be mapped. That's a big challenge for NOAA and very important for the Nation.

On the modeling, for the S-100, S-104, the 111, it will be good to know how those products will end up to the end user. Because it's a lot of data that-- we use ECDIS and PPUs, PPUs are portable pilot units for the new members-- it's a lot of data that you have to see in one screen with different layers and a lot of clusters. It will be very beneficial to know how it's going to be presented to the end user. Because it's extremely critical for navigation. And precision navigation on today's shipping world, where the ships are getting bigger, the biggest ships we have ever in history, using the maximum of the canal, using the maximum of the UKC, and keep the ship flowing in a safely manner. Keep looking forward to see you in the next meeting. Cross fingers that we do it in person. Thanks.

Mr. Nathan Wardwell: Great, thank you very much, Alex. Captain Chopra.

Captain Anuj Chopra: Thank you, thank you so much. Very informative day today, I thought. Learned a lot. Both the panels were amazing and, actually, music to my ears, realizing that the challenges were placed and then they're looking at changing. So that, the will to change was there and so very positive about that.

Three areas, three large buckets I think need to focus on. Highlighting, I think it's already been said, interagency coordination, and larger sector towards the other stakeholders, that's develop an actual outreach strategy towards education, especially when we're rolling out NSRS. And as a general, maybe it's worth starting from a blank sheet and working it forward, because what we've done till now hasn't been so successful. So it's worth looking at with a professional mass media person. I think that might help. Or it's needed. That's my thought.

Second, of course, is funding. And I feel bad by saying this, that, as much as we've repetitively as HSRP brought up PORTS and the importance of PORTS, we never focused on its funding or weren't strong enough to word it in our letters to the Administrator highlighting the importance of it and pushing for that funding. I think it's needed, and I hope all of you will continue to, you know, repeat the dose until the patient dies. That's what they say. So continue pushing on it till we get the money and

make that program fully funded because it's got a direct impact on safety of navigation, safety of seafarers, and safety of port community in that area rather than just an interested commercial stakeholder.

On the last one, adoption on AI and partnering, I'm with Qassim on this, that it's much easier to partner with an established practitioner, and then you start off running rather than trying to draw the field. That may be intuitive, but this will get you there much, much quicker and you can adjust on the way, you know. To highlight, I'm so grateful to Tuba to bring out that Nvidia partnership she has and what they're doing. Maybe that can be leveraged, that relationship can be leveraged and helped and so that, there's so much more which can be done.

Like Deanna said, this is my last meeting as well. I really enjoyed it. Actually, our 8 years have been very interesting because we went through COVID as well. And that was an interesting ride for all of us. And then, the last couple of years, but so glad it's ending on a note where all of us are present with each other. I'm very, very grateful to the NOAA staff-- amazing. I've enjoyed each one of these meetings and felt enriched and learned more. I'm really trying to find ways how we could contribute more to NOAA. But I have no hesitation in saying, I think NOAA's shadow is a very long shadow. It's an amazing organization. It has tremendous depth and scientific acumen, which is not visible to the outside. To me, an iceberg is a bad example because you can still see an iceberg 10%. In my vision, NOAA, you only see 5%, while 95% is underwater. That's the strength of NOAA. So I feel maybe that's an area all of us need to work to get the ambassadors of NOAA on the outside.

Thank you again. Great to see all of you and honor and privilege to work with all of you. Thank you.

Mr. Nathan Wardwell: Thank you very much, Anuj. Dr. Qassim Abdullah, you are up next.

Dr. Qassim Abdullah: Thank you very much, Nathan. Yeah, I would like to echo Anuj. We're grateful to the Admiral and Rachael and all the NOAA staff who made it happen, you know. Because we are all going through a difficult time financially, to make face-to-face is very expensive, if some of you don't know. I have a figure about it, and I know how expensive it gets, definitely. So thank you very much.

I really enjoyed all the presentations today and yesterday. Andy, about rare mineral and deep ocean exploration is a really important topic to all of us, definitely. And the 20 plus years of HSRP was an eye-opener for us. We didn't know really that history before. Today, all the NGS, HSD, and OER, and IOCM presentation, very impressive, definitely. To know, like, we are on the right path for charting and mapping, definitely. Modeling, I

mean, nice to hear about Dr. Jacob vision, about think out of the box, which is very, very exciting to know the leadership, they have that. They support you on all the new innovation. They want you to innovate, which is a great opportunity for NOAA. The modeling, I'm glad they're going through this modernization, but I noticed they really struggling and jumping into the AI, which is, they need push. They need help, definitely, because AI, we shouldn't look at it just automation, it's a creation of new things, which is beyond just the labor automation, because a lot of people think that's what it is. So we all have obligation to run with NOAA mission on that, whether securing funds for them, publicity, marketing is really on our shoulder, all of us as industry, definitely. NOAA, and I keep telling everybody, without NOAA and NGS for me, because in the mapping, we cannot do business. All our engineering and mapping nationwide, nothing can be done without NGS and NOAA work, you know, from aerial LiDAR, aerial imagery, surveying, all that, without NOAA and the datum and the new datum now, NSRS modernization, nothing really can happen. So we definitely need all the help we can lend to NOAA. I mean, whether marketing, but NOAA also need to look into outside of their organization to not be confined to what their capability, because, like Anuj said, 95% not visible because those people working bees, I mean, working hard to create data and services. But we need part of that to be kind of marketing, kind of be, you know, just to convey the message and the value of NOAA is very crucial to our economy, definitely.

My suggestion for a future meeting, maybe we can have, I'm just curious about what is NOAA collaboration with the international community, our allies, whether NATO allies, the European, or even the United Nations. Do we have any collaboration? Because we could learn from them, and they could learn from us. They might have something we can benefit a lot without us inventing or reinventing the wheel, for example. So again, Deanne and Anuj, thank you very much. We're going to miss you, definitely. And good luck with whatever you're going to pursue. So that's really all I have. Thank you very much again, NOAA, for organizing this. It's great, definitely.

Mr. Nathan Wardwell: Thank you very much, Qassim. Mary Paige Abbott.

Ms. Mary Paige Abbott: I don't want to use the word "popcorn" because it's going to make me hungry. But I realize as I'm looking at my, like, mess of notes and such that that's probably how I'm going to approach this today. First, I'd like to say thank you to Galen Scott for showing his animation, not a cartoon. But I don't know if all of you, and I forget who said, "Don't forget the end user," because what was missing in that today? Come on, somebody tell me what was missing in those visuals besides Alaska.

Mr. Nathan Wardwell: I was going to say Alaska, you beat me to it.

Ms. Mary Paige Abbott: And Puerto Rico and Hawaii and what have you. So what was missing? What end user, what group was missing in that video?

Dr. Qassim Abdullah: Boater, recreational boater.

Ms. Mary Paige Abbott: The recreational boater, the small boat. Why? Because today's youth want to take the technology from their cars and put in their GPS, “I want to go to Walmart.” And they put that in on their GPS in their boat. And then they want to party. And where does the boat go? Across something they're not supposed to, called “land.”

So don't forget the end user on who some of this technology is being showed, And I was grateful that they were not in that animation. But at the same time, I was also scared to death as to how am I going to share that with the recreational boating education public with whom I serve. And so don't forget that all this technology is great. And everything has its use in a particular area. It cannot cross silos in some instances. The other thing is, though, we have to cross silos in here. And that's what I learned today, is in the communications side of things, is that we need to streamline our processes and accelerate getting a product to market, or getting that product out to those who may be using it, the knowledge that it is available.

I wanted to ask Ms. Westington as well as Ms. Dempsey about the fact that-- I loved Ms. Westington talking about a ‘27-‘29 work plan. Because I thought, “Yay, finally a strategic plan.” The Coast Guard has one, it's every 5 years, and they update it annually, or they're continuously working on it for the next one. I know Eric probably has an opinion about that. Well, whether you follow it or not, sometimes it's good to have a plan and then you can pass it off. It's not what you say, it's how you say it. So that being said, I was also then concerned though, with one of the panels--another thing that she had mentioned was that they invite people to attend all their quarterly meetings and such. Well, it's really nice to invite, but who attended? Did those departments, or did those divisions attend the meetings and participate or were they simply invited in and didn't send representation? That concerns me, because how are you heard if you don't have representation?

And then with regard to Rachael's comments, I loved hearing that, you know, you have the SME at the start of our discussion point, and then it goes up to their man-- I'm going to kind of put it into corporate America-- up to the manager who then has a senior manager who then takes it to so-and-so, who then it gets pushed off over here and then finally somebody says, “Yes, you can do that.” Okay, that's cool, but is it ever implemented? Are these ideas, what does it take to go from somebody coming up with an idea, the suggestion box, the what have you, to implementation? I think that's too long.

And great ideas. And this entity, NOAA, is a phenomenal best kept secret. When you hear the term NOAA, what do you think? National Weather Service. They're the warm fuzzy. Who's the warm fuzzy for offshore, or Office of Exploration? What does that mean to somebody? Critical minerals. That's a huge opportunity. And, or even marketing, first, the term “critical” and the critical blah, blah, the critical this. And maximize that use. There's things that I, I mean, I don't want to sound like I'm, I'm a total like, negative on it, there's huge opportunities here. And I just don't know which direction in which to go first. But find a success story and then exploit it. Exploit it like crazy. And then get those industry partners, and get those people who want to tag along with that. You don't want a long shout out, you want the sun overhead.

So the other thing that, and I finished with Admiral's comments about, “Strategically think about what's next, the value of data collected.” And I recall going to a, having a, listening to a guest speaker talk about, “Change or die. And the only person that enjoys change is a baby.” And it was a lasting impression. Because that was 11 years ago. And I am now finished.

Mr. Nathan Wardwell: Thank you very much, Mary Paige. We're going to now go to our non-voting members, starting with Director Westley.

Dr. Marian Westley: Great, so, I just want to thank all of you for your effort, not just being present here and having great conversations with us and continuing those conversations while you're trying to eat and while I'm like going up to you and saying, “But we need to talk about this, and I have to you tell about this,” but also the work you've been doing in the interstitial period. And Mary Paige, I just loved how you presented the priority matrix and all the papers you're working on, and just all the work you're doing. It is such a privilege to be advised by you. Thank you so much.

Mr. Nathan Wardwell: Thank you, Director. Laura Rear McLaughlin.

Ms. Laura Rear McLaughlin: Okay, yeah, thank you. And again, thank you for a great 2 days. I think there was a lot of good discussion over the last 2 days. One thing I do want to leave you with is we are, as we talk about NSRS and implementation and outreach, we are working closely with the NGAC, which is the National Geospatial Advisory Committee. So they're the FGDC's FACA committee. They have taken on the challenge of helping document why the NSRS is important and how it affects their communities. So that might be something that you guys could think about as well. And then think about potentially in your letter, like things that are actionable and within NOAA's control. You can carry that NSRS and geodesy flag, I guess, while wearing your everyday professional hats as well. And so that's something I wanted to leave you with. I did have a conversation, actually, with the NGAC folks in Alaska. And we were talking about, is

there any way to have a combined meeting at some point with HSRP and the NGAC. I know a couple of years ago, we did that with the IOOS FACA. And so that might be something else to think about.

And then, speaking of implementation and when is the data in someone's hand, there was a really great presentation in Alaska that talked about when is “done.” When are you done, right? And it was like, no, it's not just when the data is collected. It's not just when the data is processed. It's not just when the data gets out on your website. It’s when the end users have it and they're making decisions with it. And so that's something that we should also consider. It was really good, you know, it's one of those moments I'm going to think about 11 years later, Mary Paige, and think about, you know, when is “done.”

And then there's something else that I wrote down. I can't remember, so I'll just close there and say thank you to our departing members, Anuj and Deanne and Nicole, for your time on this HSRP panel. It's been really appreciated, and nice to get to know you guys for a couple of minutes as you guys depart and I come. And thanks very much for your time.

Mr. Nathan Wardwell: Great. Thank you very much, Laura. Captain Armstrong.

Captain Andy Armstrong: Well, being next to last, I'll try not to walk all over whatever the Admiral has left to say. But I thought this was a particularly useful meeting, particularly with the panels. And I just would note that one of the reasons we were able to do the panels that we did was that we're here in Washington and we're not bound up in local issues. I think it's critical that we go places and get local issues, but I think on a fairly regular basis, we need to be someplace to talk about national issues. And as maybe unfun as it is to come to Washington, D.C., this is a good place where we have access to congressional staff and NOAA staff. So I think that part of the reason this meeting was successful was because of the location and the ability to do that. And, I think I'll stop there.

Mr. Nathan Wardwell: Great. Thank you very much for that input. Eric, any thoughts before I go and then the Rear Admiral?

Mr. Eric Peace: Sure. One of the things that I think is always good in life is to look back at why you're doing what you're doing. And I think that was a fantastic, whoever came up with the idea to bring John Rayfield in here and say, “Why were we created?” was brilliant. And the reason I say that is, is because it, when you figure out why you're created, and I heard one, he said a lot, but there's one big thing that I heard, and that was a charge to us, HSRP members. And that charge is, you are not done with the meeting today or done once a week or once a month. You're the advocate for NOAA.

And whether you're on the panel or you just served on it, you continue to be an advocate for NOAA. And I think that is extremely important for all of us to remember. So when you go back to your regular job, and I don't care what you're doing, if you have an opportunity to endorse a letter from a local NOAA agency or something like that-- I do it all the time for Great Lakes Environmental Research Lab, GLOS, which is the Great Lakes Observing System, because I know how important it is. But at the same time, I understand how important it is to my members. And they know, but a lot of people don't understand how important NOAA's functions are. And a lot of it is foundational, right? It may not be the user interface that everybody's bragging about or sexy. But everything is built on the data that NOAA collects, and without it we're all screwed. So it's something, just to repeat that in the back of your mind, why you're here. But it's very rare that you will hear somebody from Congress say that you're here to advocate on behalf of an agency. So I would keep that in the back of your mind. Anytime you get a chance to talk to a congressional member or whatever, talk about NOAA.

And then one final piece I'd like to tell just a quick story. We talk a lot about technology, we talk a lot about AI, all important stuff and we have to go that way. It's just a fact of life. One of my last tours in the Coast Guard was in one of the most advanced ships we had, which isn't saying a lot for the Coast Guard, but it was advanced. We would have people come on board and they'd say, "Oh, this is fancy, This is the greatest ice breaking buoy tender ever." And I would say, "Well, it goes nowhere without the people that operate it." Workforce is important. And whether it's the staff here at NOAA, or it's the staff out in the field that's doing the work, or it's the QA people back here that they don't have enough of, it's important. So advocate, educate, go out in your communities, talk about NOAA. And one of the things I do is I sit on the National Marine Sanctuary. There's four of them in the Great Lakes. And I try to get to those meetings and educate people on the issues that are coming up and talk about education of younger folks. So how do we get young folks into those National Marine Sanctuaries? Get them excited with animations maybe, but also with hands-on experience and taking a look at what those National Marine Sanctuaries can do to educate the public and the youth.

And with that, I'll shut up. And really appreciate the meetings. I thought the fantastic presentations as always. Thank you.

Dr. Qassim Abdullah: Thank you, Eric, for using the right expression. Without NOAA, we're all screwed. I mean, I didn't think about it, I mean, but that's the right way to put it.

Mr. Nathan Wardwell: Well, Qassim, you pointed out that, with the NSRS modernization, everybody's now safe. So that'll be good once we accomplish that, or NOAA is able to accomplish that.

I, let’s see, so lots of great input to work into the letter. I’ll, you know, spend some time over the next few weeks to start pulling the draft together to share with the panel. Most everything, well, so much has been covered. My, you know, just a few comments that I wanted to add in. So before, you know, well, before I forget, Anuj and Deanne and Nicole, I mean, thank you very much. It's been great working with you on the panel, you know, and all the other members before me that I had the opportunity to work with, and they're all mentors to me, right? So it's been a pleasure.

Over the, you know, 6 years and then more that I've worked with NOAA, you know, we hear a lot about the increasing demand signal for all the data that NOAA provides and the breadth of which it covers, right? So we cover everything from remote underserved communities, National Spatial Reference System, precision navigation, Exclusive Economic Zone, critical minerals, workforce development, I mean, a large breadth of technologies and industries that the data brings value to. When Mr. Rayfield spoke yesterday, he mentioned, I mean, I came back to, like, everybody really enjoyed that. I think that was great. I love the idea of showing that history to future panelists because it's a lot of value there. Something he mentioned was, you know, in 1995, it was estimated that 440 years to complete the mapping of the EEZ, right? And then we take a look at, and it was like 2019 or 2020, so like 25 years later or so, basically there was a goal set to complete mapping the EEZ by 2030, right? You know, in 10 years. Is that major progress by HSRP and NOAA? But then we heard today that, with current resources, it’s going to take closer to 40 years from now to get there. And so lots of progress has been made by visionary ideas, of like, “Well, hey, let's start a panel to help advocate for NOAA and bring funding.” With, you know, and then to still achieve these goals like it's the U.S. exclusive economic zone, it's like to get this mapped, we know contractor assets are add to that picture and provide value. So that was just interesting kind of hearing that timeline and understanding what it takes to accomplish these goals. And it sort of ties into some of what Rachael Dempsey was talking about of the funding challenges from year to year, right? And NOS gets mandated with accomplishing these goals. But then there's unstable funding from year to year and you can't do strategic planning and outlook to accomplish those goals without that stability. And so, you know, I have a note here of how, right, you know, how can we help NOAA with that, accomplishing their goals and getting the resources? Like, Kate, you mentioned it, all the acting positions in that org chart that are there, right, you know. That's a lot of tasks that multiple people are taking on. So I'll just kind of close there. And again, well, I will say thank you to the NOAA team for pulling this together in person. I mean, everybody said it. Everybody knows that in-person meeting has so much value. And let's keep it going and continue to have these in-person meetings. And Rear Admiral, I'll go ahead and hand it to you.

Rear Admiral Chris van Westendorp: All right. Ah, whew! That was a lot. Yeah, I will just reflect without staring at my notes for a moment. Hearing you all and what your initial takeaways are from the last day and a half plus-- can you believe it's only been a day and a half plus? I think you're on the right track. If I were to be a judge, then my judgment would be that I think you're on the right track. I like hearing about, I like the how part; I like thinking about the end user. I'm recalling a moment with a former mentor, who may or may not have been one of my predecessors in this role, telling me about this technological innovation that another agency had come up with that has to do with the maritime realm, and talking about, “Wow, that's a great solution. I wonder what the problem is that they're trying to solve.” Clearly not thinking about the end user, right? Like, what are the problems we're trying to solve? And so I think that you're on the right track there. You've kind of heard from all of the different groups over the last day and a half. And you've heard just kind of the updates and the things that government has been thinking about. And now it is your task, your challenge, as I said earlier today, to think about, “Okay, either good job or maybe alter course or what's next, regardless.” And so that's all I'm going to say, and that's not even very technical. But that's as technical as it's going to get for me, because you all are covering that very well.

What I do want to reflect on in a bigger regard is Hydrographic Services Review Panel. And the critical word for me in Hydrographic Services Review Panel is the service part. And service is something that I take very seriously. And one of the reasons that I take it seriously, we're all doing a job, but part of doing that job is also understanding that a lot of this is a labor of love as well. Every single one of you on this panel, that's exactly what you're doing. And I could not be more grateful for you taking on this task and being a part of this panel and part of this FAC.

And on that note, I want to express some gratitude. First, I want to express gratitude to Nathan and Eric. Thank you for your chairmanship and vice chairmanship of this panel, well done. I want to express gratitude to our staff. I know everybody has expressed gratitude to the staff, but let's do it one more time. In particular, someone who has gone well above and beyond in duties as required, my alternate DFO, Amanda Phelps, please give her a big round of applause. {applause} And finally, I know that, in that spirit of a labor of love, your work is not done. But we do appreciate that labor over the next several months. Captain Chopra, thank you. And Deanne. And Nicole, you're not here. If you were here, then I would also give you a token of my appreciation. I will get it to you another way, but thank you very much, Nicole, for your service. Okay, now that everybody's palms are sufficiently stingy, I will yield the floor, and back to the Chair, and thank you again.

Mr. Nathan Wardwell: Thank you very much, Rear Admiral. I echo everything everybody says. And I'll now say that the meeting is adjourned.

ADJOURNED